

Birthplace is not a determinant of colorectal adenomas

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Abstract

AIM: To examine the impact of the patient's birthplace on the prevalence of colonic polyps and histopathological subtypes.

METHODS: This is a retrospective audit of the colonoscopy practice of one Gastroenterologist in a tertiary-referral hospital from 2008 to 2011. Data collected include demography, birthplace, language spoken, details of the colonoscopy including indications, completion rates, complications, results including prevalence and histopathology of polyps. Statistical methods used were binary logistic regression, χ^2 and Mann-Whitney *U*.

RESULTS: A total of 623 patients (48% male, 67% aged over 50 years) were recruited and categorised according to birthplace: Australia/New Zealand 42%, European 20%, Asian 15%, Middle Eastern/African 11%, South American 9% and Pacific Islander 3%. The median age of the cohort was 56.3 years (range: 17-91 years), median body mass index 27.3 kg/m²

(range: 16-51 kg/m²), 25% were smokers, 25% had hypercholesterolemia, 20% had diabetes mellitus 16% were on aspirin and 7% were on non-steroidal anti-inflammatory drugs. A total of 651 colonoscopies were performed for standard indications. The prevalence of polyps varied according to patient's birthplace: Europe 45.1%, Australia and New Zealand 39.5%, Pacific Islands 33.3%, Asia 30.3%, Middle East and Africa 26.9% and South America 24.5% ($P = 0.027$, $df = 6$). However, multivariate analysis revealed that birthplace was not an independent predictor of developing polyps, including adenomas and advanced adenomas after correcting for age and male sex.

CONCLUSION: Birthplace is not a predictor for developing colorectal neoplasia, including adenomas and advanced adenomas; hence, should not influence the recommendations for colorectal cancer screening.

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Key words: Ethnicity; Polyps; Adenomas; Advanced adenomas; Colorectal cancer

Core tip: The detection and removal of colorectal adenomas is a vital component of colorectal cancer prevention. The provision of colorectal cancer screening by medical practitioners is influenced by patient's ethnicity. However, birthplace is not a predictor for developing colorectal neoplasia, including polyps, adenomas and advanced adenomas; hence, should not influence the recommendations for colorectal cancer screening.

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INTRODUCTION

Colorectal cancer (CRC) is the second leading cause of cancer death in Australia with the age-standardised incidence rate of 46 and 32.1 per 100000 for men and women respectively^[1]. The incidence rate is lower than parts of Asia, Africa and the Middle East. Nonetheless, it has been recognised that the risk of CRC of immigrants will gradually increase over time, attributed to adoption of the western lifestyle including diet and exercise^[2,3]. Despite this, the provision of CRC screening by primary care providers has been shown to be influenced by the patient's ethnicity and birthplace^[4] and that doctor-patient ethnic concordance was associated with decrease provision of preventive medicine^[5].

The detection and removal of colorectal adenomas decreases the incidence and mortality of CRC^[6,7]. The exact incidence and prevalence of polyps in different countries is not well described; however it is expected to mirror the incidence of CRC. Recent studies from Asia have revealed comparable prevalence of advanced neoplasm compared with Western nations, especially in Japanese and Korean populations^[8]. However, there is conflicting evidence regarding the prevalence of colorectal adenomas between ethnic groups living in the same country. In an Australian cohort, the prevalence of advanced adenomas was significantly higher in Caucasians compared with Chinese; however, this study did not adjust for confounders including smoking, diabetes and body mass index in multivariate analysis^[9]. A study examining Asian Americans ($n = 2723$) found no difference in advanced adenomas between Asian and non-Asian participants^[10]. Similarly, there is emerging evidence that there is no difference between adenoma detection rates between ethnic groups previously thought as low risk for developing CRC, such as Hispanics compared with those of high risk^[11,12]. Nonetheless, there is no study to date that examines the effect of patient's birthplace on detection of colorectal neoplasia. The aim of this study was to examine the effect of birthplace on the detection of colorectal adenomas and advanced adenomas.

MATERIALS AND METHODS

We conducted a retrospective review of the colonoscopy practice of a single gastroenterologist (Koo JH) in a tertiary-referral hospital from 2008 to 2011. The hospital serves an ethnically diverse population, with greater than 40% of residents born overseas^[13]. Patients were eligible if they were aged over 16 years. Demographic and clinical details were obtained from medical record review. Characteristics obtained include age, sex, anthropometric data, birthplace, language spoken at home, employment status, co-morbidities including diabetes and hypercholesterolemia, medications including aspirin and non-steroidal anti-inflammatory drugs (NSAIDs) and smoking. Colonoscopy details were recorded including primary indication, number, location and size of colonic

polyps, histopathological type of resected polyps. The endoscopic size of the polyp was based on comparison with the known diameter of open biopsy forceps. The colonoscopies were performed by Koo JH and advanced gastroenterology trainees under his supervision.

All resected and retrieved colonic polyps were formalin-fixed and paraffin-embedded. These specimens were stained with haematoxylin and eosin and examined by a gastrointestinal pathology service. Advanced adenomas were defined as size ≥ 10 mm, had villous histology or any evidence of high grade dysplasia^[14]. The study was approved by the Ethics Committee of the Sydney South West Local Health District.

Statistical analysis

Statistical analysis was performed using SPSS, version 22.0 (SPSS Inc, Chicago, IL, United States). Descriptive statistics are reported as mean \pm SD or median (range) unless otherwise stated. The prevalence of polyps, adenomas and advanced adenomas were compared between ethnic groups using independent *t*-tests, Kruskal-Wallis one-way analysis of variance or Mann-Whitney *U* tests for continuous non-parametric variables and χ^2 tests for categorical data. Binary logistic regression analysis was used to examine factors associated with polyp, adenomas and advanced adenoma detection. In each model, polyp, adenoma and advanced adenoma detection were the dependent variables respectively, with age, sex, ethnicity, body mass index, co-existing diabetes mellitus and hypercholesterolemia, use of aspirin and NSAIDs, and smoking included as independent variables.

The adenoma detection rate was compared between birthplaces using chi-squared tests. Adenoma detection rate (ADR) was defined as the number of colonoscopies where one or more adenomas were detected divided by the total number of colonoscopies^[15].

RESULTS

Patient characteristics

A total of 623 patients (48% male, 67% aged over 50 years) were recruited and categorised according to birthplace: Australia/New Zealand 42%, European 20%, Asian 15%, Middle Eastern/African 11%, South American 9% and Pacific Islander 3%. Among patients where data was available ($n = 446$), 66.8% reported English as their language spoken at home and 49% were employed. The median age of the cohort was 56.3 years (range: 17-91 years), median body mass index (BMI) 27.3 kg/m² (range: 16-51 kg/m²), 25% were smokers, 25% had hypercholesterolemia, 20% had diabetes mellitus 16% were on aspirin and 7% were on NSAIDs (Table 1).

In the study period, a total of 651 colonoscopies were performed for standard indications: 29% rectal bleeding, 20% altered bowel habits, 16% anaemia, 16% abdominal pain, 9% colorectal neoplasia surveillance, 8% positive faecal occult blood test (FOBT), 6% asymptomatic colorectal cancer screening, 4% abnormal imaging

Table 1 Clinical characteristics according to birthplace

Characteristics	Australia/New Zealand	Asia	Europe	Middle East/Africa	South America	Pacific Islands	P-value
Age > 50 yr	56%	70%	85%	65%	74%	67%	< 0.01
Aspirin	17%	12%	17%	12%	9%	14%	0.16
NSAID	8%	5%	11%	10%	13%	0%	0.15
Smoking	2%	12%	21%	19%	26%	18%	0.09
Hypercholesterolemia	18%	25%	35%	25%	30%	20%	0.03
Diabetes	18%	19%	23%	21%	15%	60%	0.05

NSAID: Non-steroidal anti-inflammatory drugs.

Table 2 Adenoma detection rate according to birthplace

Birthplace	Adenoma detection rate ¹	P-value ³	Advanced adenoma detection rate ²	P-value ³
Australia and New Zealand	47.50%		18.80%	
Asia	29.50%	0.002	9.50%	0.03
Europe	50.40%	0.12	14.20%	0.25
Middle East and Africa	38.00%	0.50	9.90%	0.07
South America	40.70%	< 0.001	7.40%	0.04
Pacific Islands	31.80%	0.03	9.10%	0.25

¹Adenoma detection rate is defined as number of colonoscopies where one or more adenomas were detected divided by the total number of colonoscopies;

²Advanced adenoma detection rate is defined as number of colonoscopies where one or more advanced adenomas were detected divided by the total number of colonoscopies; ³ χ^2 test between Australia and New Zealand-born and those born elsewhere.

findings, 4% progress colonoscopy for inflammatory bowel disease and 2% weight loss. Of the 14% who were asymptomatic, there was no statistically significant difference in birthplace. The caecal intubation rate was 93%.

A total of 21 colorectal cancers and 635 polyps (281 adenomas and 91 advanced adenomas, 166 hyperplastic polyps, 24 normal histology, 3 inflammatory polyps, 1 hamartomatous, 69 polyps were not retrieved) were detected in 227 patients. The overall ADR was 20.4%. Of all the colorectal cancers, 18 were adenocarcinomas (14 moderately differentiated, 4 poorly differentiated), 1 mucinous colorectal cancer, 1 lymphoma, 1 gastrointestinal stromal tumour.

Prevalence of colonic polyps and colorectal cancers

The prevalence of polyps varied according to patient's birthplace: Europe 45.1%, Australia/New Zealand 39.5%, Pacific Islands 33.3%, Asia 30.3%, Middle East/Africa 26.9% and South America 24.5% ($P = 0.027$, $df = 6$). The number of adenomas according to patient's birthplace: Australia/New Zealand 46.2% ($n = 129$), Europe 25.4% ($n = 71$), Middle East/Africa 13.3% ($n = 37$), Asia 10.0% ($n = 28$), South America 3.9% ($n = 11$), Pacific Islands 1.2% ($n = 3$). The prevalence of adenomas and advanced adenomas was not statistically different according to birthplace ($P = 0.543$ and $P = 0.754$ respectively). There was no statistically significant difference in detected adenomas and advanced adenomas between patients born in Australia/New Zealand compared with those born elsewhere ($P = 0.21$, $P = 0.65$ respectively). However, in patients aged > 50 years, greater proportion of those born in Australia/NZ had advanced adenomas compared with those born elsewhere (25/133, 19% *vs*

27/257, 11%, $P = 0.022$).

There was a greater proportion of European-born patients with polyps detected compared with Australia/New Zealand (125/195, 64% *vs* 102/258, 40%, $P < 0.001$). There was a trend towards a significant difference in adenomas detected in this group compared with Asian-born ($P = 0.07$) and European-born patients ($P = 0.06$). However, there was no statistically significant difference in polyps, adenomas or advanced adenomas detected between Australian/New Zealand-born and those born in South America, the Middle East/Africa and the Pacific Islands. In those aged > 50 years, there was a difference between advanced adenomas detected in those born in Australia/New Zealand (25/137, 18%) compared to those born in Asia (8/90, 9%) ($P = 0.05$).

In patients with adenomas detected, the median age of Asian-born patients was lower than Australia/New Zealand-born (Median age 63 years *vs* 58 years, $P = 0.016$, $df = 1$). Similarly, in all patients with advanced adenomas detected, there was a statistically significant difference in median age of Asian-born patients compared to Australia/New Zealand-born ($P = 0.015$).

The ADR and advanced adenoma detection rate varied according to birthplace (Table 2). There was a significant difference between ADR of Australia/New Zealand-born patients compared with those born in Asia ($P = 0.002$), South America ($P < 0.001$) and Pacific Islands ($P = 0.03$). Similarly, there was a significant difference between advanced ADR of Australia/New Zealand-born patients compared with Asia ($P = 0.03$), and South America ($P = 0.04$). There was no statistically significant difference in the prevalence of colorectal cancers by patients' birthplace ($P = 0.49$).

Table 3 Predictors of polyp detection, adenoma detection, advanced adenoma detection

Univariate analysis	OR	95%CI	P-value	Multivariate analysis	OR	95%CI	P-value
Polyp detection							
Male sex	2.5	1.8-3.5	< 0.001	Male sex	2.4	1.5-4.1	0.001
Older age	1.004	1.02-1.05	< 0.001	Older age	1.04	1.02-1.0	< 0.001
Aspirin use	0.5	0.4-0.9	0.008	Positive FOBT	0.2	0.1-0.5	0.003
Hypercholesterolemia	0.6	0.4-0.96	0.031				
Diabetes	0.6	0.4-0.9	0.02				
Anaemia	1.7	1.1-2.7	0.03				
Positive FOBT	0.3	0.2-0.5	< 0.001				
BMI	1.05	1.01-1.09	0.02				
Smoking	0.65	0.43-0.96	0.03				
Birthplace	-0.64	-0.43-0.01	0.12				
Adenoma detection							
Male sex	2.3	1.4-3.8	0.001	Male sex	2.0	1.2-3.4	0.01
Older age	1.02	1.01-1.04	0.01	Older age	1.02	1.003-1.04	0.03
NSAID use	3.4	1.2-9.5	0.02	Positive FOBT	0.2	0.1-0.6	0.002
Positive FOBT	0.2	0.1-0.5	0.001				
Birthplace	0.02	-0.37-0.04	0.94				
Advanced adenoma detection							
Male sex	2.7	1.5-4.8	0.001	Male sex	2.3	1.2-4.2	0.008
Older age	1.04	1.02-1.06	< 0.001	Rectal bleeding	0.4	0.2-0.7	0.002
Rectal bleeding	0.5	0.3-0.8	0.008	Positive FOBT	0.1	0.1-0.3	< 0.001
Positive FOBT	0.2	0.1-0.4	< 0.001				
Birthplace	-0.01	-0.03-0.01	0.21				

FOBT: Faecal occult blood test; BMI: Body mass index.

Predictors of colorectal neoplasia

Binary logistic regression was performed to identify predictors of colonic polyps, adenomas and advanced adenomas to determine whether birthplace was a risk factor. The predictors of polyp detection in multivariate analysis included male sex, older age and positive FOBT (Table 3). In univariate analysis, the predictors for adenoma detection were male sex, older age. In multivariate analysis, the predictors for adenoma detection were male sex, positive FOBT (Table 3).

The predictors for advanced adenoma in univariate analysis include male sex, older age, smoking, rectal bleeding, positive FOBT. In multivariate analysis, the predictors for advanced adenomas included male sex, rectal bleeding and positive FOBT (Table 3). Other risk factors and confounders including, body mass index, diabetes mellitus, hypercholesterolemia, smoking, aspirin and NSAID use were not statistically significant in both univariate and multivariate analysis for adenoma and advanced adenomas.

DISCUSSION

In an ethnically diverse population in Australia, this study revealed that birthplace was not a significant predictor for the detection of colonic polyps, adenomas or advanced adenomas. It further reinforced previously demonstrated risk factors for developing colorectal neoplasia, such as older age and male sex. In addition, Asian-born patients had adenomas and advanced adenomas detected at younger ages compared with Australia/New Zealand-born patients.

The prevalence of colorectal neoplasia differed ac-

cording to patient's birthplace, with higher prevalence among Western-born and Australian/New Zealand-born patients. However, after correcting for risk factors and confounders on multivariate analysis, birthplace was no longer a predictor of colorectal neoplasia. This important finding supports recent studies conducted in a multiethnic Asian population which demonstrated that race was not a predictor for colorectal adenomas in multivariate analysis^[16] and a retrospective study in the United States which also revealed no significant differences in the adenoma detection rate in Hispanic patients compared with Whites^[11]. In contrast, a recent multi-ethnic Australian population study reported polyp detection varied with race with significantly higher prevalence of advanced adenomas in Caucasians compared with Chinese, although the study did not correct for risk factors and confounders^[9]. Furthermore, it did not clarify the category of "Chinese" - Chinese patients may have originated from different Asian countries, and therefore had differing intrinsic risks for developing colorectal neoplasia. Our study importantly reinforces the observation that birthplace is not a predictor of colorectal neoplasia and that recommendations and provision of CRC screening tests should not be based on patients' birthplace. Previous studies have reported medical practitioners' recommendation of CRC screening tests varied according to their patients' birthplace, resulting in lower recommendations to ethnic minority patients who were considered at lower risk of developing colorectal neoplasia compared with Western-born patients^[4,17]. As medical practitioner recommendation is the single most important predictor of CRC screening participation^[18], appropriate and timely recommendations for screening irrespective of patients'

birthplace is crucial to improve outcomes.

This study demonstrated that Asian-born patients had adenomas and advanced adenomas detected at a younger age compared with Australian/New Zealand-born patients. This has been previously reported in a study comparing concurrent cohorts of Chinese and Western patients, where Chinese patients had a slightly lower age-adjusted prevalence of adenomas^[19]. Notwithstanding the incomplete family history data, this has significant implications for colorectal cancer screening, in particular the age of initiation of screening. The younger ages of diagnosis of CRC in African Americans had subsequently resulted in recommendations for earlier age of initiation of screening in the United States^[20]. Additional prospective studies are therefore recommended to determine the appropriate age to start screening in Asian patients, given the complexities that already exist with current CRC screening guidelines.

This study adjusted for important predictors of developing colorectal neoplasia such as demographic factors including age, sex and clinical factors such as body mass index, diabetes mellitus, hypercholesterolemia, smoking and aspirin use. Factors such as quality of bowel preparation were also considered as this has been demonstrated to affect adenoma detection^[21]. Correcting for these variables further strengthens the validity of the study, and reinforces the well-established independent predictors for developing adenomas and advanced adenomas including male sex, older age and positive FOBT. The predictors for polyp detection also include smoking and higher BMI. This is supported by a study, which demonstrated a higher risk of advanced adenomas in female smokers without a family history of colorectal cancer^[22]. Similarly, a recent meta-analysis demonstrated a 5-unit increase in BMI was associated with a relative risk increase of developing colorectal adenomas by 1.19 (95%CI: 1.13-1.26)^[23].

It has been well documented that there are differences in the provision and uptake of colorectal cancer screening based on patients' ethnicity and birthplace. Patient's ethnicity and birthplace have been associated with participation in colorectal cancer screening. In screening studies in the United Kingdom, return of FOBT, colonoscopy attendance following a positive FOBT and attendance rate for flexible sigmoidoscopy screening were significantly lower in Asians compared with Whites, after controlling for demographic factors^[24,25]. The Australian National bowel cancer screening pilot study also revealed lower FOBT return rates among subjects who spoke a language other than English^[26]. In addition, foreign-born Asians and Hispanics had lower CRC screening participation compared with United States-born Asians and Hispanics living in the United States^[27]. The finding from our study that birthplace does not influence polyp detection, especially among subjects previously considered low risks such as Asians, reinforces the need to promote CRC screening participation irrespective of subjects' birthplace and ethnicity. A study examining a multi-ethnic community revealed that fewer immigrants had their

colorectal cancer diagnosed through screening practices compared with Australian-born patients^[28]. Furthermore, patient's ethnicity has been demonstrated to influence the physician's likelihood of recommending colorectal cancer screening^[4]. However, the findings of this study demonstrate that birthplace is not a predictor developing colorectal neoplasia and Asian-born patients have colorectal neoplasia detected at a lower age compared to Australia/New Zealand-born patients.

There are several limitations to this study. It is a retrospective, single-centre study, which limits the external validity of the conclusion. Additionally, there is limited data on the duration of residency of immigrants in Australia, which could influence their colorectal polyp and cancer risk^[2]. This can be addressed in future, multi-centre, prospective studies, including this demographic data. There is also heterogeneity of colorectal cancer risk within the ethnic groups. For example, in patients who are classified as "Asian," the CRC risk varies between those who are South East Asian, such as Vietnamese patients, who are known to be low risk, compared with North East Asian, such as Koreans and Japanese patients whose risks are comparable with Western patients. In this study, there was no significant difference in adenoma and advanced adenomas detected between South East Asian and North East Asian patients. Furthermore, the proportion of patients classified as North East Asian was small ($n = 7/89$, 8%) and hence, the "Asian" subgroup was predominantly a lower risk group. Nonetheless, studies have demonstrated a similar risk in colorectal cancer between Asian migrants and those born in Western countries^[29].

Birthplace is not a predictor for developing colorectal neoplasia, including polyps, adenomas and advanced adenomas; hence, should not influence the recommendations for colorectal cancer screening.

COMMENTS

Background

The detection and removal of colorectal adenomas is a vital component of colorectal cancer prevention. A lower incidence of colorectal polyps has been previously reported in non-Western populations.

Research frontiers

Colorectal cancer is a leading cause of morbidity and mortality. Currently, there exist multiple complexities in guidelines for colorectal cancer screening.

Innovations and breakthroughs

The result of this study suggests that birthplace is not a predictor for developing colorectal neoplasia, including polyps, adenomas and advanced adenomas.

Applications

The results of this study suggest that patient's ethnicity should not influence the recommendations for colorectal cancer screening.

Terminology

Advanced adenomas were defined as size ≥ 10 mm, had villous histology or any evidence of high grade dysplasia. Adenoma detection rate was defined as the number of colonoscopies where one or more adenomas were detected divided by the total number of colonoscopies.

Peer review

This is an important topic to study as, if differences in adenoma detection rate are identified among different ethnic populations, it could lead to changes in recommendations for colorectal cancer screening. Although similar data has been explored, more data is still needed on the topic.

REFERENCES

- 1 **Shin HR**, Masuyer E, Ferlay J, Curado MP. Cancer in Asia - Incidence rates based on data in cancer incidence in five continents IX (1998-2002). *Asian Pac J Cancer Prev* 2010; **11** Suppl 2: 11-16 [PMID: 20553065]
- 2 **Grulich AE**, McCredie M, Coates M. Cancer incidence in Asian migrants to New South Wales, Australia. *Br J Cancer* 1995; **71**: 400-408 [PMID: 7841061]
- 3 **Seow A**, Quah SR, Nyam D, Straughan PT, Chua T, Aw TC. Food groups and the risk of colorectal carcinoma in an Asian population. *Cancer* 2002; **95**: 2390-2396 [PMID: 12436447 DOI: 10.1002/cncr.10971]
- 4 **Koo JH**, You MY, Liu K, Athureliya MD, Tang CW, Redmond DM, Connor SJ, Leong RW. Colorectal cancer screening practise is influenced by ethnicity of medical practitioner and patient. *J Gastroenterol Hepatol* 2012; **27**: 390-396 [PMID: 21793910 DOI: 10.1111/j.1440-1746.2011.06872.x]
- 5 **Szczepura A**. Ethnicity: United Kingdom Colorectal cancer screening pilot. Centre for Health Services Studies. Coventry: Univeristy of Warwick, 2003
- 6 **Zauber AG**, Winawer SJ, O'Brien MJ, Lansdorp-Vogelaar I, van Ballegooijen M, Hankey BF, Shi W, Bond JH, Schapiro M, Panish JF, Stewart ET, Waye JD. Colonoscopic polypectomy and long-term prevention of colorectal-cancer deaths. *N Engl J Med* 2012; **366**: 687-696 [PMID: 22356322 DOI: 10.1056/NEJMoa1100370]
- 7 **Winawer SJ**, Zauber AG, Ho MN, O'Brien MJ, Gottlieb LS, Sternberg SS, Waye JD, Schapiro M, Bond JH, Panish JF. Prevention of colorectal cancer by colonoscopic polypectomy. The National Polyp Study Workgroup. *N Engl J Med* 1993; **329**: 1977-1981 [PMID: 8247072 DOI: 10.1056/NEJM199312303292701]
- 8 **Leung WK**, Ho KY, Kim WH, Lau JY, Ong E, Hilmi I, Kullavanijaya P, Wang CY, Li CJ, Fujita R, Abdullah M, Tandon R, Sung JJ. Colorectal neoplasia in Asia: a multicenter colonoscopy survey in symptomatic patients. *Gastrointest Endosc* 2006; **64**: 751-759 [PMID: 17055869]
- 9 **Kumbhari V**, Behary J, Hui JM. Prevalence of adenomas and sessile serrated adenomas in Chinese compared with Caucasians. *J Gastroenterol Hepatol* 2013; **28**: 608-612 [PMID: 23278321 DOI: 10.1111/jgh.12100]
- 10 **Lam KD**, Garcia RT, Nguyen LH, Trinh H, Triadafilopoulos G, Phan JT, Nguyen K, Nguyen H, Ahmed A, Nguyen MH. Prevalence of colorectal neoplasms in Asian Americans. *Dig Dis Sci* 2009; **54**: 160-167 [PMID: 18975084 DOI: 10.1007/s10620-008-0499-0]
- 11 **Thoma MN**, Jimenez Cantisano BG, Hernandez AV, Perez A, Castro F. Comparison of adenoma detection rate in Hispanics and whites undergoing first screening colonoscopy: a retrospective chart review. *Gastrointest Endosc* 2013; **77**: 430-435 [PMID: 23317579 DOI: 10.1016/j.gie.2012.11.003]
- 12 **Lee B**, Holub J, Peters D, Lieberman D. Prevalence of colon polyps detected by colonoscopy screening of asymptomatic Hispanic patients. *Dig Dis Sci* 2012; **57**: 481-488 [PMID: 21918852 DOI: 10.1007/s10620-011-1898-1]
- 13 **Australian Bureau of Statistics**. Regional population growth, Australia, 2007-08. Canberra: Australian Bureau of Statistics, 2009
- 14 **Lieberman DA**, Weiss DG, Bond JH, Ahnen DJ, Garewal H, Cheifec G. Use of colonoscopy to screen asymptomatic adults for colorectal cancer. Veterans Affairs Cooperative Study Group 380. *N Engl J Med* 2000; **343**: 162-168 [PMID: 10900274 DOI: 10.1056/NEJM200007203430301]
- 15 **Millan MS**, Gross P, Manilich E, Church JM. Adenoma detection rate: the real indicator of quality in colonoscopy. *Dis Colon Rectum* 2008; **51**: 1217-1220 [PMID: 18500502]
- 16 **Rajendra S**, Ho JJ, Arokiasamy J. Risk of colorectal adenomas in a multiethnic Asian patient population: race does not matter. *J Gastroenterol Hepatol* 2005; **20**: 51-55 [PMID: 15610446]
- 17 **Jerant AF**, Fenton JJ, Franks P. Determinants of racial/ethnic colorectal cancer screening disparities. *Arch Intern Med* 2008; **168**: 1317-1324 [PMID: 18574089]
- 18 **Hudson SV**, Ferrante JM, Ohman-Strickland P, Hahn KA, Shaw EK, Hemler J, Crabtree BF. Physician recommendation and patient adherence for colorectal cancer screening. *J Am Board Fam Med* 2012; **25**: 782-791 [PMID: 23136316]
- 19 **Soon MS**, Kozarek RA, Ayub K, Soon A, Lin TY, Lin OS. Screening colonoscopy in Chinese and Western patients: a comparative study. *Am J Gastroenterol* 2005; **100**: 2749-2755 [PMID: 16393230]
- 20 **Agrawal S**, Bhupinderjit A, Bhutani MS, Boardman L, Nguyen C, Romero Y, Srinivasan R, Figueroa-Moseley C. Colorectal cancer in African Americans. *Am J Gastroenterol* 2005; **100**: 515-23; discussion 514 [PMID: 15743345]
- 21 **Yoo JY**, Blum RR, Singer GK, Stern DK, Emanuel PO, Fuchs W, Phelps RG, Terry SF, Lebwohl MG. A randomized controlled trial of oral phosphate binders in the treatment of pseudoxanthoma elasticum. *J Am Acad Dermatol* 2011; **65**: 341-348 [PMID: 21496949 DOI: 10.1016/j.jaad.2010.05.023]
- 22 **Anderson JC**, Moezardalan K, Messina CR, Latreille M, Shaw RD. Smoking and the association of advanced colorectal neoplasia in an asymptomatic average risk population: analysis of exposure and anatomical location in men and women. *Dig Dis Sci* 2011; **56**: 3616-3623 [PMID: 21750931 DOI: 10.1007/s10620-011-1814-8]
- 23 **Ben Q**, An W, Jiang Y, Zhan X, Du Y, Cai QC, Gao J, Li Z. Body mass index increases risk for colorectal adenomas based on meta-analysis. *Gastroenterology* 2012; **142**: 762-772 [PMID: 22245665 DOI: 10.1053/j.gastro.2011.12.050]
- 24 **Szczepura A**, Price C, Gumber A. Breast and bowel cancer screening uptake patterns over 15 years for UK south Asian ethnic minority populations, corrected for differences in socio-demographic characteristics. *BMC Public Health* 2008; **8**: 346 [PMID: 18831751]
- 25 **Robb KA**, Power E, Atkin W, Wardle J. Ethnic differences in participation in flexible sigmoidoscopy screening in the UK. *J Med Screen* 2008; **15**: 130-136 [PMID: 18927095]
- 26 **Ward PR**, Javanparast S, Matt MA, Martini A, Tsourtos G, Cole S, Gill T, Aylward P, Baratin G, Jiwa M, Misan G, Wilson C, Young G. Equity of colorectal cancer screening: cross-sectional analysis of National Bowel Cancer Screening Program data for South Australia. *Aust N Z J Public Health* 2011; **35**: 61-65 [PMID: 21299702]
- 27 **Goel MS**, Wee CC, McCarthy EP, Davis RB, Ngo-Metzger Q, Phillips RS. Racial and ethnic disparities in cancer screening: the importance of foreign birth as a barrier to care. *J Gen Intern Med* 2003; **18**: 1028-1035 [PMID: 14687262]
- 28 **Koo JH**, Kin S, Wong C, Jalaludin B, Kneebone A, Connor SJ, Leong RW. Clinical and pathologic outcomes of colorectal cancer in a multi-ethnic population. *Clin Gastroenterol Hepatol* 2008; **6**: 1016-1021 [PMID: 18558515]
- 29 **McCracken M**, Olsen M, Chen MS, Jemal A, Thun M, Cokkinides V, Deapen D, Ward E. Cancer incidence, mortality, and associated risk factors among Asian Americans of Chinese, Filipino, Vietnamese, Korean, and Japanese ethnicities. *CA Cancer J Clin* 2007; **57**: 190-205 [PMID: 17626117]

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