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ORIGINAL ARTICLE

Colorectal cancer among Indigenous and non-Indigenous people in Queensland, Australia: Toward survival equality

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Abstract

***Aim*:** While Indigenous people in Queensland have lower colorectal cancer (CRC) incidence and mortality than the rest of the population, CRC remains the third most frequent cancer among Australian Indigenous people overall. This study aimed to investigate patterns of care and survival between Indigenous and non-Indigenous Australians with CRC.

***Methods*:** Through a matched-cohort design we compared 80 Indigenous and 85 non-Indigenous people all diagnosed with CRC and treated in Queensland public hospitals during 1998–2004 (frequency matched on age, sex, geographical remoteness). We compared clinical and treatment data (Pearson's chi-square) and all-cause and cancer survival (Cox regression analysis).

***Results*:** Indigenous patients with CRC were not significantly more likely to have comorbidity, advanced disease at diagnosis or less treatment than non-Indigenous people. There was also no statistically significant difference in all-cause survival (HR 1.14, 95% CI 0.69, 1.89) or cancer survival (HR 1.01, 95% CI 0.60, 1.69) between the two groups.

***Conclusions*:** Similar CRC mortality among Indigenous and other Australians may reflect both the lower incidence and adequate management. Increasing life expectancy and exposures to risk factors suggests that Indigenous people are vulnerable to a growing burden of CRC. Primary prevention and early detection will be of paramount importance to future CRC control among Indigenous Australians. Current CRC management must be maintained and include prevention measures to ensure that predicted increases in CRC burden are minimized.

Key words: colorectal cancer, comorbidity, Indigenous, matched cohort, Queensland.

INTRODUCTION

Outcomes are generally worse for Indigenous people with cancer,[1] underpinned variously by later stage at diagnosis,[2,3] less cancer treatment[4] and a greater comorbidity burden.[5] Colorectal cancer (CRC) is the third most commonly occurring cancer among Indigenous men and women in Australia.[1] In Queensland, however, cancer incidence and mortality were lower (standardized incidence ratio 0.63, 95% CI 0.54, 0.74; and standardized mortality ratio 0.66, 95% CI 0.50, 0.85), compared with the whole population during 1997–2006.[6] As CRC incidence rates have reportedly increased in Indigenous populations in Australia overall[7] and internationally,[8] it is plausible that mortality rates among Indigenous people may rise in the future.

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Conflict of interest: none

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In this paper, we compare the patterns of cancer care between Indigenous and non-Indigenous people diagnosed with CRC in Queensland, Australia. We also estimate survival in Australian Indigenous people to quantify the current prognosis after a diagnosis of CRC. An assessment of CRC profiles among Indigenous Australians is of public health importance, given the paucity of available data needed to inform effective cancer control measures among Indigenous peoples.

METHODS

Participants

The design of this matched-cohort study has been described previously.[4] Briefly, a cohort of Indigenous adults residing in Queensland and diagnosed with CRC during 1998–2004 were compared with a random sample of non-Indigenous cases, frequency matched for age, sex, remoteness and cancer type. A key criterion for inclusion was attendance at any public hospital in Queensland for their cancer management, as do 95% of Indigenous patients.

Clinical data (diagnostic details, cancer stage and presence of comorbidities) were abstracted from hospital medical records. A modified Charlson Comorbidity Index score[9] ("comorbidity score") was assigned based on severity and number of comorbid conditions and were grouped as follows: no score (no comorbidity identified), 1, 2–5 and 5+. Remoteness (rurality of residence) was determined using the Accessibility/Remoteness Index of Australia[10] ranging from 1 (*highly accessible*) to 5 (*very remote*), further aggregated to three groups to achieve sufficient numbers (1 "most accessible" to 3 "most remote). The Socio-Economic Index for Areas was used to classify place of residence into quintiles, ranging from 1 (*most disadvantaged*) to 5 (*most advantaged*), similarly aggregated to three categories.[11] Cancer stage was categorized as localized cancer, regional spread or metastatic disease.[12] AJCC staging and Dukes staging were converted to the aforementioned stage categories using commonly accepted cut-points. Treatment type (surgery, radiotherapy and chemotherapy), intention to treat (any intent, curative intent or intention unknown), start date, duration and quantity (e.g. measured in Grays [Gy] and fractions, and number of chemotherapy cycles) were also elicited. Date and cause of death were obtained from the Australian National Death Index and all cases followed up with respect to vital status until December 31, 2006.

Ethical approval to conduct the study was obtained from the Queensland Health Department, all hospitals where data collection took place, and the Queensland Institute of Medical Research. An Indigenous reference group was established to inform the study investigators about cultural matters and the translation of results to the community.

Statistical methods

Pearson's χ^2 analysis or Fisher's exact test was used for categorical data. Unadjusted and adjusted survival analyses were conducted using Cox proportional hazard models. The fitted models were adjusted for stage of cancer at diagnosis, comorbidity score, socioeconomic status and cancer treatment. Comparisons were made between Indigenous and non-Indigenous (reference group) people with CRC.

RESULTS

The study included 80 Indigenous and 85 non-Indigenous patients with CRC (ICD-10 C18–C20), for whom clinical data were extracted from records at 20 hospitals. As a result of matching, there were only minor differences in age (median 60 years for both groups), sex, socioeconomic status and place of residence (Table 1). After exclusion of CRC cases with missing stage data (4% Indigenous, 10% non-Indigenous), there was no difference in stage at diagnosis, nor was there any difference in the histological subtypes (similar proportions had adenocarcinomatous tumors comprising adenocarcinoma, mucinous adenocarcinoma, adenocarcinoma arising in a polyp [94% *vs* 98%, $P = 0.26$]). The median time between presentation due to symptoms or screening and histological diagnosis was 17 days compared with 7 days ($P = 0.03$) for Indigenous and non-Indigenous people, respectively.

There was a doubling of comorbidity (score of 2 or more) among Indigenous compared with non-Indigenous people (19% *vs* 9%), with borderline significance ($P = 0.06$). Indigenous people were significantly more likely to have diabetes (29% *vs* 13%, $P = 0.01$) and renal disease (6% *vs* 0%, $P = 0.02$), but there was no difference in the proportion of people with cardiovascular disease. Indigenous women were significantly more likely to have a comorbidity score of 1 or more (52% *vs* 27%, $P = 0.04$) and diabetes (33% *vs* 10%, $P = 0.01$), but there was no difference between Indigenous and non-Indigenous men.

Similar proportions of Indigenous and non-Indigenous people received treatment for their cancer (91% *vs* 94%), although details of treatment were missing for 4% of non-Indigenous people compared with no missing data

Table 1 Demographic and clinical characteristics of patients diagnosed with colorectal cancer, 1998–2004, by Indigenous status

	Indigenous ($n = 80$) *N* (%)	Non-Indigenous ($n = 85$) *N* (%)	*P*-value*
Sex			
Male	38 (48)	37 (44)	0.64
Female	42 (52)	48 (56)	
Age			
18–39	10 (13)	8 (9)	0.78
40–59	28 (35)	33 (39)	
60+	42 (52)	44 (52)	
Degree of remoteness			
Highly accessible/accessible	26 (33)	35 (41)	0.51
Moderately accessible	38 (47)	35 (41)	
Remote/very remote	16 (20)	15 (18)	
Socioeconomic status (SEIFA)			
1 Most disadvantaged	50 (63)	53 (62)	0.74
2 Moderate advantage	17 (21)	15 (18)	
3 Most advantaged	13 (16)	17 (20)	
Cancer stage at diagnosis[¶]	$N = 76$	$N = 75$	
Localized cancer	27 (36)	29 (39)	0.91
Regional spread	30 (40)	29 (39)	
Distant metastasis	19 (25)	17 (23)	
Histology			
Adenocarcinoma[†]	75 (94)	83 (98)	0.26
Other histology	5 (6)	2 (2)	
Comorbidity score[‡]			
No score	44 (55)	61 (72)	0.06
1	21 (26)	16 (19)	
2 or more	15 (19)	8 (9)	
Diabetes			
No	57 (71)	74 (87)	0.01
Yes	23 (29)	11 (13)	
Cardiovascular disease			
No	74 (93)	82 (97)	0.31
Yes	6 (7)	3 (3)	
Renal disease			
No	75 (94)	85 (100)	0.02
Yes	5 (6)	0	
Any cancer treatment	$n = 80$	$n = 82$	
Given treatment	73 (91)	80 (98)	0.08
No treatment[¶]	7 (9)	2 (2)	
Mode of treatment[§]	$N = 54$	$N = 54$	
Surgery only	30 (56)	29 (54)	0.63
Chemotherapy only	1 (2)	1 (2)	
Radiotherapy only	0	1 (2)	
Surgery and chemotherapy	15 (28)	14 (26)	
Surgery and radiotherapy	0	2 (4)	
Surgery, chemotherapy and radiotherapy	7 (13)	6 (11)	
Chemotherapy and radiotherapy	1 (2)	1 (2)	
Vital statistics (December 31, 2006)			
Alive	45 (56)	49 (58)	0.66
Cancer death	31 (39)	34 (40)	
Noncancer death	4 (5)	2 (2)	

*P-values for the differences between the Indigenous and non-Indigenous groups (Pearson's χ^2 analysis or Fisher's exact test when cell count <5). [†]Histology includes all adenocarcinoma types, that is, mucinous adenocarcinoma. [‡]Charlson Comorbidity Index[9]: scores 2–5 and 5+ were grouped. [§]Excludes cases with metastatic disease at diagnosis and three cases with missing data. [¶]Excludes cases with missing data. SEIFA, Socio-Economic Index for Areas.

Table 2 Proportional hazard ratios, using Cox regression models, of time to death for Indigenous ($n = 76$) compared with non-Indigenous ($n = 75$) people with colorectal cancer in Queensland, Australia

	HR	(95% CI)
All-cause death		
Unadjusted	1.14	(0.69, 1.89)
Adjusted†	1.35	(0.76, 2.39)
Cancer death		
Unadjusted	1.01	(0.60, 1.69)
Adjusted†	1.29	(0.72, 2.33)

Cases with missing data were excluded. Reference group "non-Indigenous." †Adjusted for: sex, age, comorbidity score (modified Charlson Comorbidity Index): 0, 1, 2+; ARIA (proximity to major center): 1 = highly accessible/accessible, 2 = moderately accessible, 3 = remote/highly remote; SEIFA (Socio-economic Index for Areas): 1 = most disadvantaged, 2 = intermediate advantage, 3 = most advantaged; stages: 1 = localized, 2 = regional spread, 3 = metastatic disease (missing excluded), any treatment (Yes *vs* No).

for Indigenous people ($P = 0.05$). When stratified by cancer stage, there was no difference in overall treatment uptake at any cancer stage, nor in the uptake of individual treatments, namely surgery, chemotherapy or radiotherapy (data not shown). When cases with metastatic disease were excluded, there was no significant difference in treatment mode between the two groups (Table 1), and comorbidity score did not influence treatment uptake. Unadjusted odds ratios (ORs) for treatment versus no treatment were 0.39 (95% CI 0.07–2.07) (small numbers rendered unreliable results for adjusted OR). The number of cycles of chemotherapy ($P = 0.95$) and the median number of Gy ($P = 0.62$) were similar in the two groups (data not shown). There was little difference in median time from diagnosis to first treatment (14 days *vs* 12 days, $P = 0.75$, Indigenous and non-Indigenous, respectively).

Finally, unadjusted and adjusted all-cause survival and cancer survival were similar for Indigenous and non-Indigenous people with CRC in Queensland (Table 2).

DISCUSSION

To the best of our knowledge, patterns of care and survival have not previously been reported for Indigenous people with CRC in Australia. We found similar stages of CRC at diagnosis, morphology and treatment uptake between Indigenous and non-Indigenous Queenslanders who were treated in public hospitals. Indigenous patients were more likely to have diabetes and renal disease than their non-Indigenous counterparts, but there were no statistically significant differences in the comorbidity scores between the two groups. We also found no difference in all-cause survival or cancer survival between the two groups. We acknowledge that our cohort included only patients primarily treated in the public health system, the number of cases included here was small, and survival proportions calculated with all cancer patients in Queensland, including private patients, may produce somewhat different results. Of greater concern, however, is that the reported trend of increased CRC incidence will lead to increasing mortality over time for Indigenous people, unless early detection and prevention are encouraged.

CRC has been attributed to poor diet, in particular a lack of fresh fruits and vegetables, reduced physical activity, and obesity,[13,14] risk factors that are considered modifiable.[15] Rates of obesity and a sedentary lifestyle have increased among Indigenous people in recent decades, and Indigenous people are reportedly less likely to consume fresh fruits and vegetables than non-Indigenous Australians.[16,17] As we found no evidence in the literature that Indigenous people currently have a lower prevalence of lifestyle risk factors or genetic predisposition for CRC, the lower CRC incidence among Indigenous people in Australia may be related to other factors. CRC primarily affects older people (median age in Australia is 70 years),[18] so the shorter life span experienced by Indigenous people (approximately 12 years)[19] may mean that they do not live long enough to develop CRC.[18] The lower rates of bowel cancer screening participation by Indigenous people[20] might also contribute to a lower detection of cancerous lesions,[18] though it does not explain the lower mortality. With the increase in life expectancy of Indigenous people,[21] and an increase of bowel screening participation, we need to monitor CRC incidence closely.

Of some concern is the reported increases in CRC incidence rates in recent years among Indigenous Australians,[7] First Nation people in Ontario, Canada,[8] and Inuit in the Circumpolar region.[22] The concurrent decline in incidence and mortality among American Indian and Alaskan Natives has been attributed to screening and precancerous lesion removal.[23] Australian Indigenous people are reportedly less likely to participate in the population-based bowel screening program compared with the rest of the population.[24,25] The patients included in this study were diagnosed prior to the introduction of widespread screening Australia in 2006[26] and we are unable to report the number of patients diagnosed through screening, as this information was not routinely

recorded in the medical records. However, we found no difference in cancer stage in Indigenous compared with non-Indigenous people, in contrast to studies among Indigenous people in the Northern Territory of Australia,[27] Maori people in New Zealand[28] and American Indians in the United States,[29] which report later stage at diagnosis.

Similar proportions of Indigenous and non-Indigenous people underwent cancer treatment. A New Zealand study similarly reported no difference in rates of surgical resection between Maori and non-Maori, but reported that Maori people with advanced cancer stage were significantly less likely to receive chemotherapy and experienced a delay in chemotherapy commencement.[30] Another study reported that Maori people with more advanced stage and a higher comorbidity score were less likely to receive chemotherapy,[31] but again this was not shown in our study. We found no difference in survival between Indigenous and non-Indigenous people in our study. In New Zealand, a recent study reported similar survival for Maori patients with CRC compared with their non-Indigenous counterparts; factors contributing to poorer survival in Maori were patient comorbidity and markers of health care access.[32]

It is important to bear in mind that this study included a small number of Indigenous cases, particularly in some of the strata, resulting in little statistical power to assess differences. In particular, the sample size does not permit the analysis of additional groupings (e.g. by sex), and may have rendered unreliable results for adjusted ORs.

Conclusion

We found no significant difference in cancer stage, treatment regimen and cancer survival between Indigenous and non-Indigenous people with CRC treated in Queensland public hospitals. Given that Indigenous people have higher morbidity and mortality for many other cancers,[3,4,27] these findings of apparent parity of outcomes are welcome. However, continued vigilance is important given the estimates were based on a relatively small number of cases. Nevertheless, we conclude that the lower mortality experienced by Indigenous patients is likely to be the result of lower rates of CRC incidence and adequate cancer management. As CRC is a major cause of cancer death in Indigenous peoples in general and CRC incidence rates are reported to be on the rise, prevention and early detection through bowel screening are of paramount importance to future CRC control among Indigenous Australians.

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