



The relationship between ethnicity, social deprivation and late presentation of colorectal cancer



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ABSTRACT

Introduction: Tumour staging at time of presentation is an important factor in determining survival in colorectal cancer. The aim of this paper is to investigate the relationship between ethnicity and deprivation in late (Stage IV) presentation of colorectal cancer.

Methods: Data from the Thames Cancer Registry comprising 77,057 colorectal cancer patients between the years 2000 and 2012 were analysed.

Results: A total of 17,348 patients were identified with complete data, of which 53.9% were male. Patients from a Black Afro/Caribbean background were diagnosed with CRC at a much younger age than the White British group (median age 67 compared with 72, $p < 0.001$). In multiple regression, ethnicity, deprivation and age were positive predictors of presenting with advanced tumour stage at time of diagnosis. Black patients were more likely to present with Stage IV tumours than white patients (OR 1.37, 95% CI 1.18–1.59, $p < 0.001$). Social deprivation was also a predictor of Stage IV cancer presentation, with the most deprived group (Quintile 5) 1.26 times more likely to be diagnosed with Stage IV cancer compared with the most affluent group (CI 1.13–1.40, $p < 0.001$). Sub-group analyses demonstrated that Black & Affluent patients were still at greater risk of Stage IV CRC than their White & Affluent counterparts (OR 1.24, 95% CI 1.11–1.45, $p = 0.023$). Patients with rectal cancer were less likely to present with Stage IV CRC (OR 0.66, 95% CI 0.61–0.71, $p < 0.001$).

Conclusion: Racial and age related disparities exist in tumour presentation in the United Kingdom. Patients from black and socially deprived backgrounds as well as the elderly are more likely to present with advanced tumours at time of diagnosis.

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1. Introduction

Tumour staging at time of first presentation is one of the strongest predictors of future survival in colorectal cancer (CRC). Currently in the United Kingdom, nearly a third of patients with colorectal cancer present with Stage III and IV disease, predisposing them to a significantly reduced survival [1]. Certain patient groups may be at higher risk of presenting to healthcare services

with advanced disease. There is evidence in the literature that two such potential groups include patients from ethnic minorities and the socially deprived [2–5]. Explanations proposed for this potential disparity in the literature mostly reflect the limitations in accessibility and affordability of colorectal cancer diagnosis and treatment to these patient groups [6,7].

In various healthcare systems, colorectal screening programmes have been established with the aim of identifying cancer patients at an early stage of the disease process. Social deprivation has been documented to have a significant negative impact on participation in such programmes [8,9]. In consequence, it has been proposed that there is a tendency for socially deprived patients to present at a later stage in the disease process [10] with poor associated outcome [11–13]. In the United Kingdom, despite universal health coverage and a system of free health care at the

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point of delivery, social and ethnic disparity continues to exist resulting in a worse outcomes for socially deprived patients diagnosed with a variety of cancers including ovarian, cervical, lymphoma, prostate and lung [14–16]. In breast cancer, Black Afro-Caribbean women have a consistently worse uptake of screening and survival, even when adjusting for social deprivation [17].

The purpose of this study is to determine whether personal characteristics are associated with late (Stage IV) presentation of colorectal cancer in a healthcare system with universal coverage. In particular, the study seeks to explore the relationship between patient ethnicity, socioeconomic status and age on disease stage presentation.

2. Methods

2.1. Thames cancer registry (TCR)

The Thames Cancer Registry (TCR) is one of the largest of the eleven population-based cancer registries in the UK. The registry encompasses much of southeast England including London, Surrey, Sussex and Kent, covering a population of 12 million people (25% of the UK population). Information on patient demographics, disease stage, treatments, patient cancer outcomes and survival is prospectively collected. Ethical approval was obtained and data were obtained on all patients diagnosed with primary adenocarcinoma of the colon and rectum between the years 2000 and 2012. Colorectal cancers of other origin, bowel lymphomas, squamous cell carcinomas and anal cancers were excluded. Information was available on patient age, gender, socioeconomic status (using Indices of Multiple Deprivation – IMD) and ethnicity. Tumour staging using Union for International Cancer Control (UICC) classification was available.

2.2. Measuring social deprivation

The Indices of Multiple Deprivation (IMD) is an area based measure of social deprivation used by the UK government. It is based on seven fundamental areas; income, employment, health deprivation and disability, educational skills and training, barriers to housing services, crime and the living environment. A score is allocated to each postcode, the higher the score, the more socially deprived the region. As the IMD takes into account a variety of different deprivation measures to form an overall score, it serves as a comprehensive measure of deprivation and is used formally in UK Government policy making and official business.

2.3. Statistical methods

Data on social deprivation were grouped into Quintiles, with Quintile 1 (Q1) being the most affluent and Q5 being the most socially deprived. Patients were grouped into three ethnic categories, White: British/Irish, Asian: Indian/Pakistani/Bangladeshi and Black: Afro-Caribbean. To ensure completeness of data, only patients who had data for all variables of interest were selected. Differences between groups were examined using the Chi Squared and Kruskal-Wallis test. Logistic regression analysis with one independent variable at a time was undertaken to determine variables associated with the outcome (Stage IV CRC). Variables with a resulting p value of 0.10 or less were entered into a multiple logistic regression model, which used a cut-off p value of 0.05 for statistical significance.

2.4. Sub-group analysis

Sub-group analysis examining the interaction between ethnicity and social deprivation was performed. The variables

of ethnicity and social deprivation were combined into White & Affluent (social deprivation Q1/Q2 combined), White & Deprived (Q4/5 combined), Black & Affluent and Black & Deprived subgroups. Similarly, age and social deprivation variables were combined to form new variables of Elderly & Affluent (80+ years combined with Q1/Q2) and Elderly & Deprived (80+ years combined with Q5). Further logistic regression analyses were performed to test the relationship between the above variables and the outcome. All statistical analyses were carried out using IBM® SPSS®, Version 20.0.

3. Results

A total of 17,348 patients were diagnosed with colorectal cancer between the years of 2000–2012, of which 53.9% (n = 9354) were male. The median age at diagnosis across the entire population was 72.0 years (Interquartile Range [IQR] 62–67 years). However, the median age at diagnosis in the Black Afro-Caribbean group was 67 years compared with 72 years in the White British/Irish group ($p < 0.001$). Only 7.7% of the Black Afro-Caribbean patients were over the age of 80 years old compared with 25.1% of the White British/Irish population ($p = 0.016$). Amongst the total population, 4357 (25.1%) had Stage I disease, 3718 (21.4%) had Stage II disease, 4347 (25.1%) had stage III disease and 4926 (28.4%) had Stage IV (metastatic) disease. Black Afro-Caribbean patients had the highest proportion of Stage IV (metastatic) disease (37.9%) amongst all the ethnic groups (Table 1). Similarly, the highest proportion of social deprivation (Quintile 5) was amongst the Black Afro-Caribbean community (51.6%, compared with 17.1% in the White British population, $p < 0.001$). Although colonic cancers predominated across all the ethnic groups, there was some variation in site of tumour across the ethnic groups.

3.1. Ethnicity, deprivation & Stage IV cancer

In the unadjusted analyses (Table 2 – Regression Model 1), age, tumour site, social deprivation and ethnicity were all associated with Stage IV CRC at time of diagnosis and these variables were therefore entered into a multiple regression model. In this model, Black Afro-Caribbean ethnicity, social deprivation and elderly age were independently associated with an increased likelihood of having Stage IV CRC at time of diagnosis. Black Afro-Caribbean patients had a 37% increased risk of a diagnosis of Stage IV CRC compared with the White British/Irish group ($p < 0.001$). Similarly, the most socially deprived group (Quintile 5) were 26% more likely to have Stage IV CRC at time of diagnosis compared with the most affluent, Quintile 1 group ($p < 0.001$). Patients with rectal cancer were less likely to be diagnosed with Stage IV disease compared with those with colonic cancers (OR 0.66, 95% CI 0.61–0.71, $p < 0.001$).

3.2. Ethnicity & social deprivation

To investigate the interaction between ethnicity and social deprivation, the two variables were combined to make four new groups (White & Affluent, White & Deprived, Black & Affluent and Black & Deprived) and entered into a regression model involving 10,076 patients (Table 3). In the multiple regression, the Black & Affluent group still had a higher risk of presenting with Stage IV CRC when compared with the White & Affluent group (OR 1.24, 95% CI 1.11–1.45, $p = 0.023$). The Black & Deprived group had an even higher risk (OR 1.59, 95% CI 1.30–1.95, $p < 0.001$). A formal test of variable interaction for ethnicity and social deprivation variables was carried out to confirm these findings ($p < 0.001$).

Elderly patients were again at higher risk of Stage IV diagnosis (OR 1.38, 95% CI 1.25–1.52, $p < 0.001$). The Asian group were not

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