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ORIGINAL ARTICLE

Obesity and cardiovascular risk in an oncology day ward population

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Abstract

Introduction The burden of obesity and risk of cardiovascular (CV) disease amongst an oncology population receiving active treatment is ill-defined. We performed a retrospective analysis assessing the incidence of obesity and cardiovascular (CV) risk factors in this group (grp) of patients as well as the predicted 10-year risk of a CV event.

Methods Data from all patients (pts) receiving intravenous chemotherapy in an Irish oncology satellite unit over an 18-month period was extracted from chemotherapy prescriptions and electronic patient records. To calculate patients' 10-year risk of developing CV disease, we used QRISK, a predictive risk calculator.

Results The prevalence of obesity (BMI > 30) amongst the total population was 19% ($n = 21$), with 26% ($n = 28$) overweight (BMI, 25–< 30). Information on CV risk factors was available in 93 pts. with the following rates being observed: hypertension 34%, dyslipidaemia 19%, current smoker 18% and diabetes 11%. The average 10-year risk of a CV event (stroke/MI) in this cohort was 19.2% (± 16.6), with a relative risk of 1.4 compared to their age-matched controls without CV risk factors.

Conclusions We observed similar or lower rates of obesity and CV risk factors in this cohort compared to the general adult Irish population. The average predicted risk of developing CV disease in this grp was moderate to high. This can have significant future implications with regard to cancer survivorship, disease recurrence and suitability for further oncological treatments.

Keywords Cardiovascular risk · Chemotherapy · Obesity · Oncology

Introduction

Inflammation is inherent in the pathology of malignancy, obesity and cardiovascular disease.

The aetiological role of inflammation in malignancy has been proven in cervical cancer (HPV), pancreatic cancer (chronic pancreatitis), colorectal cancer (inflammatory bowel disease, IBD), lymphoma (EBV) amongst others. Equally, obesity and atherosclerosis are recognised as chronic inflammatory disorders [1–3].

Malignancy and obesity are both associated with an inflammatory microenvironment. Therefore, not surprisingly, obesity is associated with a large number of malignancies including oesophageal adenocarcinoma, gastric, biliary tract, colon, pancreas, breast, ovarian, endometrium and renal neoplasms [4]. It has been estimated that 800 new cancers and 300 cancer deaths have been attributable to excess body weight between the years of 2003–2012 in Ireland [5]. Additionally, obesity has been shown to be a poor prognostic marker in breast and colorectal malignancies [6, 7]. A number of causations have been proposed including underdosing of therapies (due to dose capping above a certain body surface area), associated comorbidities or a pro-inflammatory environment leading to increased metastatic potential.

The rising rates of obesity in the Irish population are uncontested. Between the years of 1948 and 2002, the average weight of a 14-year-old child increased by almost 40% [8]. These trends are mirrored worldwide [9]. The rise in prevalence of severe obesity is outpacing that of moderate obesity in the USA, which is particularly concerning as these patients have a far higher usage of health care services [10]. This may be resulting in changing demographics in the oncology day ward. The typical patient with malignancy associated cachexia may become replaced, at least to some extent, with those who have a raised BMI. There has been extensive work to date assessing the prevalence of obesity amongst patients with cancer. However, this has not been extended into our day ward population (i.e. patients fit enough to receive therapeutics) [4, 11].

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The selection of patient's in the day ward is biased by performance status, comorbidities and cancer status. Is the obesity epidemic extending to this selected population?

Obesity and cardiovascular risk are innately intertwined due to their shared association with diabetes, a sedentary lifestyle and of course their common pathology—inflammation [12]. With an ever-increasing prevalence of obesity, it is apparent that we also need to consider cardiovascular risk in patients with malignancy. Patients may have cardiovascular disease prior to their cancer diagnosis or it may develop secondary to a cardiotoxic treatment, e.g. doxorubicin, trastuzumab, especially in those with pre-existent cardiovascular risk factors [13, 14].

Taking the above observations into account, we sought to identify the prevalence of obesity and risk of cardiovascular disease in a cohort of patients with cancer attending our oncology day ward for chemotherapy.

Methods

We designed an observational study using data collected from an Irish oncology satellite unit from a cohort of patient's who attended for intravenous chemotherapy over an 18-month period. We collected patient's details, including weight, height, diagnosis, stage at diagnosis, cardiovascular risk factors (diabetes, hypertension, dyslipidaemia, family history, rheumatoid arthritis, chronic kidney disease), and history of cardiovascular disease (stroke/TIA/ischaemic heart disease/atrial fibrillation). These risk factors and past medical history were identified at the time of their first visit to out-patient clinic (i.e. prior to starting any chemotherapy). Their height and weight was gathered at the time of their first cycle of chemotherapy. Data was retrieved from chemotherapy prescriptions and electronic patient records. We calculated patients' 10-year cardiovascular risk profile using the QRisk score [15]. The QRisk score was chosen as it is a validated predictor of 10-year risk of coronary heart disease (MI/angina)/cerebrovascular disease (stroke/TIA), and the data available to us was compatible with that of QRisk. Patients were excluded if their age was > 84 or < 25 years, or had a history of coronary heart disease/cerebrovascular disease as they were not eligible for the QRisk score in this case. Data was collected and analysed by one researcher over a 1-month period (DOR). Rates of obesity and cardiovascular risk factors were assessed in those with and without metastatic disease. However, subgroup analysis of individual malignancies was deemed inappropriate due to sample size limitations.

Results

A total of 106 pts. were identified (median age = 66). Fifty-eight patients had (55%) metastatic disease and 48 (45%) patients were free of metastatic disease. The following malignancies were represented: lung 29% ($n = 32$); colorectal 21% ($n = 23$); breast 20% ($n = 22$); ovarian 8% ($n = 9$); and other 17% ($n = 22$) (see Table 1). The prevalence of obesity (BMI > 30) amongst the total population was 19% ($n = 21$), with 26% ($n = 28$) overweight (BMI 25–< 30) and the remainder being of normal or low BMI (see Fig. 1). Six percent ($n = 6$) were underweight (BMI < 20). Forty-eight percent of patients with stage 4 disease were classified as overweight or obese, and 47% of patients without metastatic disease were overweight or obese. The rate of obesity was significantly less in those without metastatic disease 27% compared to 11% amongst those with metastatic disease. A chi-square test demonstrated that this was a significant finding ($p < 0.0011$). Information on cardiovascular risk factors was available in 93 pts. with the following rates being observed: hypertension 32% ($n = 34$); dyslipidaemia 20% ($n = 19$); current smoker 17% ($n = 18$); ex-smoker 26% ($n = 28$); and diabetes 10% ($n = 11$) (see Table 1). The median 10-year risk of a CV event (stroke/MI) in this cohort was 14% (± 16%), with a mean relative risk of 1.4 compared to their age-matched controls without CV risk factors. A total of 7% ($n = 7$) of patients were ineligible for QRisk calculation due to a previous history of coronary heart disease/cerebrovascular disease.

Discussion

The modern oncology population suffers from extremes of nutritional status, have a high prevalence of cardiovascular risk factors, and cardiovascular risk is a significant competing cause of mortality amongst patients with malignancy.

A survey from 2017 demonstrated that 23% of Irish adults are obese, 39% are overweight and 2% are underweight (16-048825-Healthy-Ireland-Survey-18-October_for-printing.pdf). The patients in this study are almost as likely to be obese, much less likely to be overweight and much more likely to be underweight compared to the general population. While the age distribution of participants in this observational study is likely to complicate direct comparisons, it is the most up-to-date data on an Irish population. There is no international data available on an oncology day ward population. This presents unique challenges to the oncologist in managing distinct cohorts of patients. Malnutrition can be associated with infections, cardiac dysfunction and poorer outcomes while obesity can be associated with a multitude of medical conditions, and may impact on a patient's performance status [16, 17]. There are similar rates of overweight/obese patients with metastatic disease, but there are statistically significant less obese patients in this subgroup. We could hypothesise that patients may have been obese prior to diagnosis but have lost weight in the

Table 1 Results on the demographics, malignancies and information on cardiovascular risk factors

Demographics		BMI	
No. of patients	106	Underweight (< 20)	6 (6%)
Median age ± SD	66 ± 12	20–25	51 (48%)
Median wgt (kg) ± SD	68 ± 15	Overweight (25–30)	21 (19%)
Mean hgt (metres) ± SD	1.64 ± 0.08	Obese (> 30)	28 (26%)
Median BMI ± SD	24.9 ± 5		
Malignancies		QRisk score	
Lung	32(29%)	Median risk ± SD	14% ± 16%
Breast	22 (20%)	Relative risk	1.4
Colorectal	23 (21%)	Ineligible	7 (7%)
Ovarian	9 (8%)		
Other	22 (17%)		
Metastatic		Risk factors	
Non-metastatic	48 (45%)	Hypertension	34 (32%)
Metastatic	58 (55%)	Dyslipidemia	20 (19%)
		Diabetes	10 (11%)
		Current smoker	17 (18%)
		Ex-smoker	28 (26%)

months leading to treatment. This is supported by an array of evidence to suggest patients lose weight prior to treatment [18].

Smoking rates are similar to those represented in the Healthy Ireland survey—22% versus 18% currently smoking in our population, and 26% versus 27% ex-smokers in our population (16-048825-Healthy-Ireland-Survey-18-October_for-printing.pdf). It is disappointing that there are not more ex-smokers amongst patients diagnosed with malignancies.

Cardiovascular disease is a significant competing cause of mortality in patients with malignancy [19, 20]. It has previously been demonstrated in a cohort of patients with breast cancer that the 5-year mortality from cardiovascular risk was more than half that of the malignancy itself and our study is consistent with this [21].

Our study is limited by the sample size, and the lack of age-matched controls to compare with our cohort. Additionally, electronic records may have underestimated cardiovascular risk factors, and so it is possible that the overall risk is greater than we predict. Despite this, it is the first study (to the best of the authors' knowledge) that looks at obesity and cardiovascular risk in this vulnerable population, and we hope that it may be a catalyst to further work in this area.

Overall, our study is supportive of the complex relationship between inflammation, obesity, cardiovascular risk and malignancies. Inflammation is a crucial component in the pathogenesis of all, but equally a component in the progression of these often deadly pathologies. Our understanding of the importance of inflammation and obesity in cancer is continuously evolving almost as fast as the rates of obesity are rising within

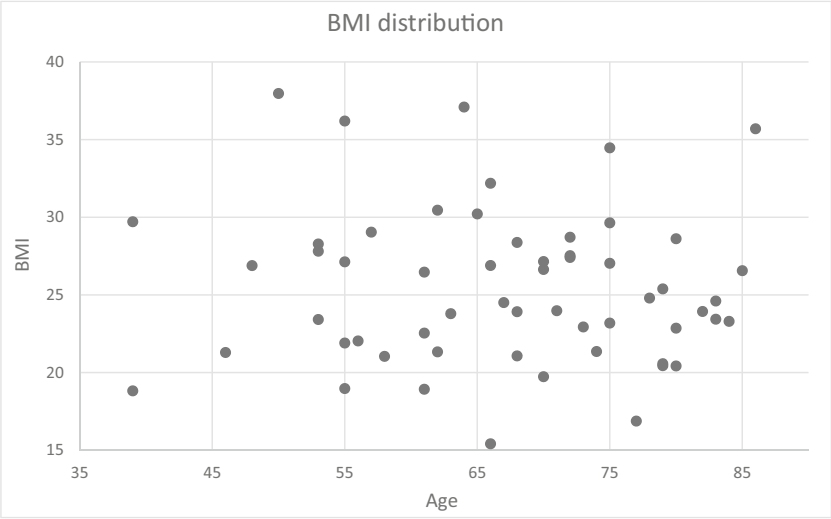

Fig. 1 BMI distribution

our population. Obesity and cardiovascular risk are highly prevalent in our day ward population because of their exponentially increasing rates in our society, but also because they have a role in the aetiology of malignancies. Tackling the obesity epidemic will reduce the associated comorbidities of our day ward patients, and the incidence of certain cancers. However, even after diagnosis, we should aim to optimise nutritional status and cardiovascular risk factors to further overall survival.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

Ethical standards The research fully complied with local ethical standards. All data was fully anonymised at the time of record review.

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