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Original Research

The risk of being depressed is significantly higher in cancer patients than in the general population: Prevalence and severity of depressive symptoms across major cancer types

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Abstract ***Background:*** Depression is a common co-morbidity of cancer that has a detrimental effect on quality of life, treatment adherence and potentially survival. We conducted an epidemiological multi-center study including a population-based random comparison sample and estimated the prevalence of depressive symptoms by cancer site, thereby identifying cancer patients with the highest prevalence of depression.
Patients and methods: We included 4020 adult cancer inpatients and outpatients from five distinct regions across Germany in a proportional stratified random sample based on the

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nationwide cancer incidence and a comparison group consisting of 5018 participants. Both groups reported depressive symptoms by filling in the Patient Health Questionnaire (PHQ-9). In multivariate analyses adjusted for age and sex, we calculated the odds of being depressed.

Results: Out of 5818 eligible patients, 69% participated (51% women, mean age = 58 years). We estimated that one in four cancer patients (24%) is depressed (PHQ-9 $\geq$ 10). The odds of being depressed among cancer patients were more than five times higher than in the general population (OR, 5.4; 95% CI, 4.6–6.2). Patients with pancreatic (M = 8.0, SD = 5.0), thyroid (M = 7.8, SD = 6.3) and brain tumours (M = 7.6, SD = 4.9) showed the highest prevalence, whereas patients with prostate cancer (M = 4.3, SD = 3.8) and malignant melanoma (M = 5.3, SD = 4.3) had the lowest levels of depressive symptoms.

Conclusion: Our results help clinicians identify cancer patients in need of psychosocial support when navigating in the growing survivor population.

1. Introduction

Clinical depression is a common immediate and late co-morbidity of cancer with prevalence estimates ranging from 4% to 16% over the first 5 years following diagnosis [1,2]. Beyond suffering from the symptoms of depression itself, depressed cancer patients show lower treatment adherence and even worse survival compared with non-depressed cancer patients [3]. Oncology clinicians as well as GPs could improve both quality of life and survival in cancer patients by adequately diagnosing and treating depression.

Patients with different types of cancer have been known to vary largely in their risk of suffering from depression. Yet there have been few, if any, comprehensive epidemiological studies comparing depressive symptoms across all major cancer types and treatment settings. Clinical depression can be assessed by diagnostic interviews [4] or inferred from register-based data such as psychiatric hospitalisations [5] or prescriptions of anti-depressants [6]. We chose to use self-reported depressive symptoms as these also capture sub-threshold symptom burden, which may be due to paraneoplastic syndromes or cancer treatment but may still need to be treated without a clinical diagnosis of major depression.

One of the largest self-report studies published so far (N = 1, 385), which used the PHQ-4, a version of the Patient Health Questionnaire (PHQ), observed the highest depressive symptom burden in patients with cancers of the female genital organs (30% depressed), followed by lung (22%) and breast cancer (21%); patients with malignant melanoma reported the lowest rates of depressive symptoms in their study (8%) [7]. However, this article neither reported the cut-off value that was used nor data on cancers of the urinary tract, haematological malignancies and thyroid cancer.

Meta-analyses have managed to cover a broader range of cancer types and settings [8,9]. Across these studies, patients with cancers of the female genital organs, lung and pancreatic (digestive tract) cancers showed high rates of depressive symptoms, but overall results were heterogeneous.

However, these meta-analyses summarised patients in heterogeneous groups with largely varying levels of symptom burden, such as Krebber *et al.* [9] who did not differentiate between different cancers of the digestive tract, e.g. pancreatic or colorectal cancer. In addition, these analyses have combined studies using either relatively liberal or more conservative instruments and as a result some groups may have been overestimated or underestimated in their prevalence of depression. Furthermore, data on rare cancers such as brain tumours or thyroid cancer were sparse or completely absent.

To identify those cancer patients who are most depressed, we conducted an epidemiological multicenter study, randomly sampling cancer patients to ensure a reliable comparison of depressive symptoms across patients diagnosed with and treated for all types of cancer, including rare cancer types. We compared depressive symptoms in cancer patients with a large random population-based sample, adjusting for age and sex.

2. Methods

2.1. Study protocol

The full study protocol to this study has been published elsewhere [10] but briefly followed these steps:

2.2. Patients and procedures

We used a proportional stratified random sample based on the nationwide incidence of all cancer diagnoses in Germany [11]. Patients were consecutively recruited from a total of 84 inpatient oncology wards, outpatient oncology clinics and cancer rehabilitation centres in five