



Prevalence of Neoplasms among Former Adolescent Psychiatric Inpatients

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Objective To examine the association between psychiatric disorders and neoplasms.

Methods A follow-up study of a population-based cohort of patients admitted for psychiatric care between the ages 13–17 years. The cases were patients with a follow-up diagnosis of neoplasm. The K-SADS-PL interview was used to assess DSM-IV based psychiatric diagnoses at adolescence. The treatment episodes due to neoplasms and related psychiatric disorders were extracted from the National Health Care Registers.

Results Of the original cohort, 6.3% of subjects had a neoplasm diagnosis. Male cases were characterized as taking snuff and females as having a fear of becoming obese. 75% of cases had smoked regularly and 47% suffered from substance misuse disorder already in adolescence. At a mean age of 22 years, the diagnoses of skin or soft tissue neoplasms were prevailing, three being malignant neoplasms of the skin, mouth or colon. Non-psychotic disorders were comorbid both two years before (26%) and after (33%) the neoplasm diagnosis.

Conclusion Focus on psychiatric symptoms of patients with neoplasms may enhance their treatment outcome and quality of life.

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Key Words Neoplasm, Psychiatric disorder, Adolescent, Young adult.

INTRODUCTION

Associations between mental disorders and cancer risk have been demonstrated in adult populations. BarChana et al.¹ showed that bipolar disorder increased the risk for cancer by 1.6-fold in men and 1.8-fold in women, compared to the general population. However, among patients who have accessed mental health services, the increased cancer mortality cannot always be explained by an increased cancer incidence rate.² In a large epidemiological cohort study, a 1.7-fold increased risk in smoking-related cancers was found in men requiring psychiatric hospitalization.³ Lichtenmann and workgroup⁴ also found an increased overall cancer risk in patients

with schizophrenia.

Researchers have attributed the increased cancer risk of psychiatric patients to difficulties in communication, poor treatment compliance and unhealthy living habits, such as excessive smoking and substance use.² Many ingredients of tobacco are involved in tumorigenesis in specific locations of the body and, therefore, certain cancers, such as lung cancer, are classified as being smoking-related. Alcohol use is known to play a role in oncogenic processes which are linked to dysregulation of the immune system. Heavy opioid use has been found to have mutagenic effects increasing cancer risk.⁵ Further, a recent study of a large cohort of young people with common mental disorders showed a poor longitudinal socio-occupational functioning among those who were early-onset alcohol, tobacco, cannabis or amphetamine-type stimulant users. The mean onset-age of substance use varied between 13–15 years. Varying neurotoxic effects of substances on the brain were proposed as an explanation for this association.⁶

Previous studies of cancer among psychiatric patients suffer from study heterogeneity, and the findings are often controversial.³ Catts and workgroup⁷ performed a large meta-analysis and concluded that the overall cancer incidence in

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schizophrenia patients was not significantly increased compared with the general population. In their meta-analysis, a slightly increased lung cancer risk was explained by the excessive smoking noted in patients with schizophrenia. Female patients with schizophrenia also showed an increased risk for breast cancer. There are also studies which show a reduced incidence of cancer among severely mentally ill patients.⁸

A reverse causality–increased risk for psychiatric disorders among cancer patients–has also been proposed.³ Of those patients with advanced cancer, 30% meet the criteria for adjustment or depressive disorder. 6–8% of cancer patients have reported to suffer from anxiety disorders.⁹

Even though previous psychiatric disorder-cancer studies are epidemiological, large in size and based on valid registers, the findings of the putative association between mental disorders and cancer morbidity has remained open.^{3,4} Tobacco and substance use are factors that contribute to this association, but other unfavorable living habits are rarely considered. For example, people with a fear of being obese often engage in unhealthy eating behaviors that may lead to eating disorders. A recent large population-based study of US adults showed that anorexia nervosa was associated with a 2-fold increased odds of developing cancer.¹⁰ Previous studies are mainly focused on mentally ill adult samples and their cancer risk. Studies of psychiatric symptoms and disorders in adolescent patients with neoplasms remain relatively rare.¹¹

The aim of this descriptive study is to analyze whether an association exists between psychiatric disorders and neoplasms among young adult patients. We used a cohort of young adult psychiatric patients who were hospitalized due to psychiatric disorders between the ages 13–17 years, which may minimize the problem of reverse causality.³ The lifetime information of hospital-treated neoplasms and psychiatric disorders around the diagnosis of neoplasm were obtained by linkage to national health care registers. In this study we also paid attention to nicotine dependence, other substance use and unhealthy lifestyle behaviors assessed in adolescence.

METHODS

Sample

This study is a part of the STUDY-70 project, which was initiated to examine the associations of several psychosocial risk factors with different psychiatric disorders. The study sample includes 508 (n=208, 41% males; n=300, 59% females) adolescent inpatients admitted to psychiatric Unit 70 at Oulu University Hospital between April 2001 and March 2006 (referred to here as the index hospitalization period). Unit 70 treats all acute hospitalizations of adolescent (13–17 years

old) psychiatric patients in Northern Finland. The mean (SD) age (in years) at admission was 15.4 (1.4) among males and 15.5 (1.3) among females. Inpatients older than 18 years and people with diagnosed mental retardation or organic brain disorders were excluded from the final study sample. All subjects gave written informed consent to participation. The study protocol was approved by the Ethics Committee of Oulu University Hospital, Finland (44/2001).

Research instruments

All subjects were interviewed during their hospitalization using the semi-structured Schedule for Affective Disorder and Schizophrenia for School-Age Children Present and Lifetime (K-SADS-PL) to evaluate DSM-IV psychiatric diagnoses.¹² Details from the parents' or guardians' K-SADS-PL interview were used to complete the information missing from adolescents' interviews.

National registers

Hospital discharges and outpatient visits were collected from the Care Register for Health Care (CRHC) provided by the Finnish National Institute for Health and Welfare. In this study details of outpatient visits in specialized level care were available from 1998 to the end of 2016, while information on inpatient treatments covered the entire life-time of the study subjects. All diagnoses in the CRHC were based on ICD-8 (until 1986), ICD-9 (1987–1996) and ICD-10 (1996–2016) classifications.

The psychotropic medicine purchases (ATC: N02, N03, N05, N06, and N07B) of subjects were obtained from the Social Insurance Institution (SII) of Finland. The information on purchases of psychotropic medication was available from 1999 to the end of 2012.

Neoplasms

Type of neoplasm

The neoplasm diagnoses, based on treatment in outpatient or inpatient settings, were obtained from the CRHC. Neoplasms were categorized into three different groups based on their location in the body: 1) Oral cavity and digestive system (ICD-10: C00–C26, D00–D01, D10, D12–D13, D37), 2) Skin and soft tissue (C43–C49, D03–D04, D17–D23), and 3) Other types (C30–C41, C50–C97, D02, D05–D09, D11, D14–D16, D24–D36, D38–D48).

Clinical diagnosis of psychiatric disorders immediately before and after neoplasm diagnosis

The information on psychiatric diagnoses of the subjects around the time of their neoplasm diagnosis (± 2 years) was

extracted from the CRHC. Psychiatric diagnoses were completed with the details of continuous psychotropic medicine purchases obtained from the SII register. Three major groups are formed: 1) Psychotic disorders (ICD-10: F20-F29 or SII: N05A), 2) Non-psychotic disorders (F30-F39 or N06), and 3) Substance use disorders (F10-F19 or N02 or N05BA).

Information assessed during adolescent psychiatric inpatient care

Psychiatric disorders

The DSM-IV-based psychiatric diagnoses during index hospitalization period were based on the K-SADS-PL interview. The adolescent psychiatric disorders were classified into three major groups: 1) psychotic disorders (DSM-IV: 295, 296.0, 296.4–9, 297.1–3, 298.8–9, 301.13, 301.22), 2) non-psychotic disorders (296.2–3, 300.4, 311, 300.00–02, 300.21–23, 300.29, 300.3, 308.3, 309.81, 312.8–9, 313.81, 314, 299.80), and 3) substance use disorders (303.9, 304.0–6, 304.8–9, 305.0, 305.2–7, 305.9). Some adolescents belonged to two or more major groups.

Family type

The family type (home environment) of each subject before admission to adolescent psychiatric inpatient care was obtained from the K-SADS-PL interview. The family types were categorized as follows: 1) Two-parent family (i.e. two biological parents or biological mother/father with married/cohabiting couple), 2) One-parent family (one biological parent), 3) Out of home placement (foster family or child welfare placement), and 4) Other family type (e.g. living alone or in a residential home).

Nicotine dependence

The level of nicotine dependence in adolescence was defined using the 7-item modified Fagerström Tolerance Questionnaire (mFTQ) for adolescents.¹³ The items of the mFTQ cover subject's smoking rate, frequency of inhalation, interval between waking up and their first cigarette, level of unwillingness to give up the first cigarette in the morning, difficulty of refraining from smoking in places where it is forbidden, smoking despite medical illness, and smoking more during the first 2 hours than during the rest of the day. The sum score of the test ranges from 0 to 9 points and the level of the dependence is classified into: 1) No dependence (0–2 points), 2) Moderate dependence (3–5 points), and 3) High dependence (6–9 points).

Unhealthy lifestyle

Variables describing unhealthy lifestyle were based on the

K-SADS-PL interview. Tobacco use was assessed in two questions. The subjects were asked whether they smoke regularly (yes/no) or have been taking snuff (yes/no). Fear of becoming obese was defined as being present (yes/no) if an adolescent answered it to be persistent. Information on unhealthy weight control behaviors (including emaciation, use of weight loss pills, vomiting, exercising excessively, drinking only non-energy fluids and binge eating) was defined as being present (yes/no) if at least one of those items listed in parenthesis fulfilled the criteria of use at least once a week.

Statistical tests

Statistical significance of group differences in categorical variables were assessed using the Pearson's chi-square test or Fishers' Exact test and in continuous variables with the Students' T-test or Mann-Whitney U-test. All statistical tests were two tailed and the limit for statistical significance was set at $p \leq 0.05$. The software used in analyses was IBM SPSS Statistics version 24 (IBM Corp., Armonk, NY, USA).

RESULTS

Study subjects with neoplasms

Prevalence of neoplasms

Of the total data for former adolescent psychiatric inpatients ($n=508$), a diagnosis of hospital-treated neoplasm(s) was found in 6.3% ($n=32$) of study subjects until the year 2016. The prevalence of neoplasms was higher in females (8.0%, $n=24$) compared to males (3.8%, $n=8$) ($p=0.064$). The mean age at first neoplasm diagnosis was 22.3 (SD=6.9) years in males and 20.0 (SD=6.7) years in females ($p=0.428$).

Background and clinical characteristics at adolescence

Table 1 shows the adolescence-related characteristics of the study subjects with neoplasms. Male study subjects were characterized as living in an out of home placement ($p=0.047$) and taking snuff ($p=0.005$), while fear of becoming obese was a characteristic of females ($p=0.035$).

Of the adolescent psychiatric disorders, nearly half of study subjects with neoplasm had substance use disorder and approximately 90% had a non-psychotic disorder during their index hospitalization period. Regular smoking in adolescence was common (75.0%) and one fifth of the study subjects with neoplasms already had high nicotine dependence in adolescence.

Treatment episodes due to neoplasms

Characteristics of neoplasms and immediate psychiatric diagnosis, by gender

Table 2 presents the characteristics of treatment episodes

for neoplasms and clinical diagnoses of psychiatric disorders within two years before and after the neoplasm diagnosis, by gender. The total number of treatment episodes for neoplasms was 42. Skin/soft tissue neoplasms and other type of neoplasms accounted for the majority of treatment episodes,

Table 1. Background and clinical characteristics assessed during adolescent psychiatric hospitalization of the study subjects with neoplasms, by gender

Characteristics assessed at index hospitalization	Study subjects with neoplasms			P
	Total (N=32)	Male patients (N=8)	Female patients (N=24)	
Age (in years) at admission, mean (SD)	15.9 (1.3)	16.5 (1.2)	15.8 (1.4)	0.175
Family type, N (%)				
Two-parent family	43.8 (14)	50.0 (4)	41.7 (10)	0.703
One-parent family	28.1 (9)	0.0 (0)	37.5 (9)	0.070
Out of home placement	21.9 (7)	50.0 (4)	12.5 (3)	0.047
Other family type	6.3 (2)	0.0 (0)	8.3 (2)	1.000
Psychiatric diagnoses,* N (%)				
Substance use disorder	46.9 (15)	50.0 (4)	45.8 (11)	1.000
Psychotic disorder	6.3 (2)	12.5 (1)	4.2 (1)	0.444
Non-psychotic disorder†	87.5 (28)	87.5 (7)	87.5 (21)	1.000
Nicotine dependence (ND), N (%)				
No ND	50.0 (16)	37.5 (3)	54.2 (13)	0.685
Moderate ND	28.1 (9)	37.5 (3)	25.0 (6)	0.654
High ND	21.9 (7)	25.0 (2)	20.8 (5)	1.000
Unhealthy lifestyle,* N (%)				
Regular smoking	75.0 (24)	75.0 (6)	75.0 (18)	1.000
Taking snuff	31.3 (10)	75.0 (6)	16.7 (4)	0.005
Fear of becoming obese	31.3 (10)	0.0 (0)	41.7 (10)	0.035
Unhealthy weight control methods	18.8 (6)	12.5 (1)	20.8 (5)	1.000

*the percentages and number indicate positive response (yes), †non-psychotic disorder included anxiety disorder N=2, conduct disorder N=9, depressive disorder N=13, eating disorder N=2, PTSD N=2

Table 2. Characteristics of hospital treatment episodes for neoplasms and clinical diagnosis of psychiatric disorders around neoplasm diagnosis during register-based follow up by the end of year 2016, by gender

Neoplasm-related characteristics	Number of treatment episodes for neoplasm			P
	Total (N=42)	In males (N=8)	In females (N=34)	
Age (in years) at neoplasm diagnosis, mean (SD)	22.0 (6.6)	22.3 (6.9)	22.0 (6.7)	0.916
Type of neoplasm, N (%)				
Oral cavity/digestive system	23.8 (10)	25.0 (2)	23.5 (8)	1.000
Skin/soft tissue	38.1 (16)	50.0 (4)	35.3 (12)	0.454
Other types*	38.1 (16)	25.0 (2)	41.2 (14)	0.688
Immediate psychiatric diagnosis within two years before neoplasm,† N (%)				
Substance use disorders (F10-F19)	14.3 (6)	12.5 (1)	14.7 (5)	1.000
Psychotic disorders (F20-F29)	16.7 (7)	12.5 (1)	17.6 (6)	1.000
Non-psychotic disorders (F30-F89)	26.2 (11)	25.0 (2)	26.5 (9)	1.000
Immediate psychiatric diagnosis 2 years after neoplasm,† N (%)				
Substance use disorders (F10-F19)	9.5 (4)	0.0 (0)	11.8 (4)	0.572
Psychotic disorders (F20-F29)	4.8 (2)	12.5 (1)	2.9 (1)	0.348
Non-psychotic disorders (F30-F89)	33.3 (14)	50.0 (4)	29.4 (10)	0.406

*other types included bone N=1, brain N=3, breast N=3, ovary/uterus N=4, peritoneum N=1, thyroid N=1, naturae incertae N=3, †the percentages and number indicate positive response (yes). ICD-10 diagnostic codes in parenthesis

38.1% and 38.1%, respectively. The remaining 23.8% of treatment episodes were due to neoplasms of the oral cavity/digestive system. There was no statistically significant gender difference in the amount of treatment episodes according to type of neoplasm or age at neoplasm diagnosis.

The most psychiatric diagnosis around the time of the neoplasm diagnosis was non-psychotic disorder. Treatment periods due to non-psychotic disorders preceded the diagnosis of neoplasm in 26.2% of episodes, showing equal proportion in males (25.0%) and females (26.5). The prevalence of non-psychotic disorder diagnoses after the neoplasm diagnosis increased to 33.3% of all treatment episodes, being 50.0% in males and 29.4% in females.

Immediate psychiatric diagnoses, by the type of neoplasm

The psychiatric disorders within two years before and after the neoplasm diagnosis are seen in Table 3. An excess of non-psychotic disorders before the neoplasm diagnosis were found in treatment episodes for other types of neoplasm (p=0.017).

The diagnoses for substance use disorders within two years after neoplasm diagnosis was accumulated in the group of other types of neoplasm (p=0.034).

Table 4 presents the unhealthy lifestyle habits in adolescence in relation to treatment episodes for different types of neoplasm. Regular smoking in adolescence was more common in treatment episodes for the skin and soft tissue neoplasms and other types of neoplasms compared to those with oral cavity and digestive system neoplasms (p=0.049). A high level of nicotine dependence in adolescence was also pronounced in these subgroups.

Case table of study subjects with malignant neoplasms

Table 5 describes three study subjects (all female) diagnosed with malignant neoplasms. When proportioned to the total study sample of 508 former adolescent inpatients, the prevalence of malignant neoplasms was 0.6% (n=3 out of 508), being 1.0% (n=3 out of 300) in females and 0% (n=0 out of 208) in males. The onset age of malignant neoplasm varied

Table 3. Clinical diagnosis of psychiatric disorders within two years around neoplasm diagnosis during register-based follow up by the end of year 2016, by type of neoplasms

Psychiatric disorders relating to diagnosis of neoplasm	Number of treatment episodes, by type of neoplasm			P
	Oral cavity/digestive system (N=10)	Skin/soft tissue (N=16)	Other types (N=16)	
Immediate psychiatric diagnosis within two years before neoplasm,* N (%)				
Substance use disorders (F10-F19)	10.0 (1)	12.5 (2)	18.8 (3)	1.000
Psychotic disorders (F20-F29)	20.0 (2)	18.8 (3)	12.5 (2)	0.884
Non-psychotic disorders (F30-F89)	20.0 (2)	6.3 (1)	50.0 (8)	0.017
Immediate psychiatric diagnosis 2 years after neoplasm,* N (%)				
Substance use disorders (F10-F19)	0.0 (0)	0.0 (0)	25.0 (4)	0.034
Psychotic disorders (F20-F29)	10.0 (1)	6.3 (1)	0.0 (0)	0.703
Non-psychotic disorders (F30-F89)	30.0 (3)	18.8 (3)	50.0 (8)	0.171

*the percentages and number indicate positive response (yes). ICD-10 diagnostic codes in parenthesis

Table 4. Unhealthy lifestyle habits in adolescence in relation to the treatment episodes of neoplasms, by type of neoplasms

Characteristics assessed at index hospitalization	Number of treatment episodes, by type of neoplasm			P
	Oral cavity/digestive system (N=10)	Skin/soft tissue (N=16)	Other types (N=16)	
Nicotine dependence (ND), N (%)				
No ND	70.0 (7)	43.8 (7)	43.8 (7)	0.367
Moderate ND	20.0 (2)	25.0 (4)	25.0 (4)	1.000
High ND	10.0 (1)	31.3 (5)	31.3 (5)	0.496
Unhealthy lifestyle habits* N (%)				
Regular smoking	50.0 (5)	87.5 (14)	87.5 (14)	0.049
Taking snuff	10.0 (1)	37.5 (6)	18.8 (3)	0.282
Fear of becoming obese	50.0 (5)	50.0 (8)	37.5 (6)	0.788
Unhealthy weight control methods	40.0 (4)	37.5 (6)	25.0 (4)	0.765

*unhealthy lifestyle habits include regular smoking, use of snuff, fear of becoming obese and use of unhealthy weight control methods (emaciation, use of weight loss pills, vomiting, exercising excessively, drinking only non-energy fluids and binge eating)

Table 5. Case table for study subjects with malignant neoplasm

Neoplasm characteristics		Information assessed during psychiatric hospitalization at ages 13–17 years old		Information from the register-based follow-up				
				Immediate psychiatric diagnosis (ICD-10 code)		Immediate use of psychotropic medication		
Case	ICD-10 code	Onset age, gender	Psychiatric disorders at adolescence	Family type and lifestyle habits at adolescence	Within two years before neoplasm	Within two years after neoplasm	Within two years before neoplasm	Within two years after neoplasm
#1	Basal cell carcinoma of skin of trunk (C44)	29 years, female	Affective and substance use disorder	Other family type, high nicotine dependence (ND), fear of becoming obese	Non-organic psychosis (F29)	None	Sertraline, mirtazapine, quetiapine, aripiprazole	None
#2	Malignant neoplasm of ascending colon (C18)	20 years, female	Affective, conduct and substance use disorder	One-parent family background, moderate ND, fear of becoming obese	Drug use (Z72)	Anxiety disorder (F41)	Oxazepam	Oxazepam
#3a	Malignant neoplasm of floor of mouth, unspecified (C04)	11 years, female	Anxiety and affective disorder	Two-parent family, no ND, fear of becoming obese, emaciation, vomiting, exercising a lot, drinking only non-energy fluids, binge eating	None	Anorexia nervosa (F50)	None	Citalopram
#3b	Malignant neoplasm of border of tongue (C02)	22 years, female	Same as above	Same as above	Anorexia nervosa (F50)	None	None	Codeine

Case #3 had two different treatment episodes for malignant neoplasm

from 11 to 29 years and three out of four were situated in the oral cavity or digestive system. All patients had affective disorder diagnosed already in adolescence.

In the case of the female patient with two malignant neoplasms of oral cavity, her diagnosis of anorexia nervosa was made within two years after the first diagnosis (malignant neoplasm of floor of mouth) at the age of 11. She had comorbid anxiety and affective disorders in adolescence. In her case, her anorexia nervosa continued into adulthood and, at age of 22, she received a further diagnosis of malignant neoplasm of the border of her tongue.

DISCUSSION

Our study, being descriptive in its nature, revealed that 42 hospital-treated neoplasms were diagnosed during the early adulthood of 32 (6.3%) study subjects. Of all neoplasms, 4 out of 42 were malignant neoplasms occurring in three patients. The overall prevalence of malignant neoplasms in our study population was low (0.6%). In Finland, the cancer incidence has reported to be 45 per 100,000 persons among peo-

ple aged 20–29 in the year 2015. In that same year the total cancer rate per 100,000 population among people aged under 30 years was 183 in Finland being slightly higher than in Scandinavia (112/100,000).¹⁴ Unfortunately, the corresponding incidence rate of benign or malignant neoplasms are not available from the Finnish national health care registers. According to the Finnish Cancer Registry, the prevalence of cancers begins to increase significantly after 45 years of age in both genders.¹⁴ In our study, all former adolescent psychiatric inpatients were in their young adulthood at the end of follow-up, the oldest person being 33 years of age which is a limitation of our study. The neoplasm or cancer might be more prevalent when they become older.

Half of the study subjects with neoplasm had either moderate or high nicotine dependence and approximately 30% were taking snuff already in their adolescence. With respect to the fact that in Finland the sale and possession of tobacco products by persons aged below 18 years is strictly prohibited, these rates of tobacco use are very high. Our study showed that regular smoking in adolescence was associated with later diagnoses of “other” and “skin and soft tissue” neoplasms

rather than “oral cavity and digestive system” neoplasms as could have been expected from the literature.³ The strength in this study was that nicotine dependence was measured using the semi-structured interview technique in which scoring moderate ND and high ND is standardized and item scoring is based on analysis of the size of the component loadings for each item for the overall FTQ scores.¹³ We consider the number of adolescents with high ND in our study notable since approximately 20% of high-school students who smoked reported scores of 6 and above in a modified version of the Fagerström Tolerance Questionnaire.¹³

In our study, female study subjects with diagnosed neoplasms typically had fear of becoming obese in adolescence. From all the malignant neoplasm cases, one female with anorexia nervosa and two different malignant neoplasm episodes drew our attention. At the age of 11 years she was diagnosed as having a malignant neoplasm of floor of mouth and within two years she was also found to suffer from anorexia nervosa. Her anorexia nervosa continued until 22 years of age when a new malignant neoplasm on the border of tongue was diagnosed. An association between anorexia nervosa and neoplasms is demonstrated in earlier literature. Based on animal studies, as cited from the study by Mellenkjaern and colleagues,¹⁵ researchers have formed a “restricted energy hypothesis” proposing that a diet with very low energy and abnormal eating habits among patients with anorexia nervosa might decrease the risk of cancers. Their study findings did not support to the energy restriction hypothesis because no general reduction in cancer occurrence was observed among patients with anorexia nervosa. Another study also showed that patients previously hospitalized with eating disorders are at increased risk of developing esophageal, lung and liver cancer.¹⁶ The authors concluded that unfavorable lifestyle habits, such as alcohol use, smoking and nutritional deficiency, were the likely explanations for the positive association between cancer and anorexia nervosa. Further, patients who suffer from eating disorders often practice self-induced vomiting which may lead to acidic damage of the gastrointestinal tract and, thus, associate with an increased cancer risk.¹⁶

Fisher and colleagues studied young adult survivors of cancer and found that metacognitive beliefs, especially uncontrollability and danger of worry, associate with emotional distress and post-traumatic stress symptoms at the time of cancer diagnosis.¹⁷ A transdiagnostic psychological mechanism was proposed to explain multiple forms of emotional symptoms such as anxiety and depression. Negative metacognitive beliefs include thoughts of worry and danger, beliefs about need to control thoughts and obsessive-compulsive symptoms.¹⁸ Based on our study, we suggest that fear of becoming obese and use of unhealthy weight control meth-

ods might also be related to uncontrollable metacognition. Over 40% of our female patients with neoplasms had a fear of becoming obese; one fifth of them had used some weight control method and approximately 90% suffered from non-psychotic disorders in adolescence. Thus, impaired metacognition may not only exist at the level of thoughts but may also lead to emaciating activity. This also appeared to be present in the female patient in our study with malignant neoplasm and a diagnosis of anorexia nervosa.

Strengths, limitations and future research directions

The main strength of this study is the valid and reliable psychiatric DSM-IV based psychiatric diagnoses made using the valid semi-structured interview K-SADS-PL in adolescence. The Finnish National CRHC was used to gather follow-up information of hospital discharges and outpatient visits. The validity of the CRHC has been demonstrated earlier.¹⁹ The study sample consisted of psychiatric adolescent patients hospitalized in a large geographical area in northern Finland, so it includes a wide range of severe psychiatric disorders in a young Finnish population in need of acute psychiatric inpatient care. Our study is an important addition to previous literature since studies examining the association of benign neoplasms to psychiatric disorders are still scarce. In our study most of the neoplasms were benign, but still may cause emotional distress and trauma symptoms among young patients.

A limitation of our study, which will evidently have caused lack of power in statistical analyses, is the low number of study subjects with neoplasms. Although the National Health Care Registers include exact diagnostic codes for neoplasms, it did not include information of details on treatment practices and recovery. The study population consisted of former psychiatric adolescent inpatients and, therefore, the results are not directly generalizable to the general population of the same age.

Our preliminary finding warrant further studies investigating the association between neoplasms and psychiatric disorders in larger samples and with longer follow-ups of young adults. For example, the impact of psychotropic medication, psychoactive drugs and other important contributing factors can be taken into account when such information is available for research purposes. Based on our study findings, it is easy to agree with earlier conclusions made in the study by Mullen and Algin,¹¹ that diagnosing and treating psychiatric symptoms among patients with neoplasms might lead to better treatment outcomes and improve their quality of life.

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Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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Conceptualization: Santtu Räsänen, Hannu Mäkelä, Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Data curation: Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Formal analyses: Santtu Räsänen, Hannu Mäkelä, Helinä Hakko. Funding acquisition: Kaisa Riala, Pirkko Riipinen. Investigation: Santtu Räsänen, Hannu Mäkelä, Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Methodology: Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Project administration: Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Resources: Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Supervision: Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Validation: Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Visualization: Santtu Räsänen, Hannu Mäkelä, Pirkko Riipinen, Kaisa Riala, Helinä Hakko. Writing—original draft: Santtu Räsänen, Hannu Mäkelä. Writing—review & editing: Santtu Räsänen, Hannu Mäkelä, Pirkko Riipinen, Kaisa Riala, Helinä Hakko.

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