Prevalence and factors associated with major depressive disorder in children and adolescents at the Uganda Cancer Institute

Benedict Akimana 1*, Catherine Abbo 1, Joyce Balagadde-Kambugu 2 and Etheldreda Nakimuli-Mpungu 1

Abstract

Background: The prevalence and factors associated with major depressive disorder (MDD) among adults with cancer have been documented in the scientific literature. However, this data is limited among children and adolescents with cancer; especially in low resource settings such as Uganda. We assessed the prevalence and factors associated with MDD in children and adolescents attending the Uganda cancer institute out-patient clinic.

Methods: This was a cross-sectional study in which three hundred and fifty-two children and adolescents with any cancer diagnosis were screened for depression using the Child Depression Inventory (CDI) and evaluated with the mini neuropsychiatric interview for children and adolescents (MINI-KID). Associated factors were assessed using a standardized questionnaire that assessed child and caregiver demographic and psychosocial characteristics. Multiple logistic regression models were used to assess factors independently associated with MDD.

Results: Of the 352 children and adolescents recruited in the study 134(38%) scored above a cut-off point of 13 on the CDI indicating significant depression symptoms. However, 91(26%) met criteria for MDD. The majority of those with MDD (n = 59 64.8%) had CDI scores of 13–19 indicating mild depression, 30(33%) had scores of 20–25 indicating moderate depression and 2(2.2%) had scores of 25 and above indicating severe depression. Protective factors against MDD were having a special person in the respondent’s life (p = 0.002) and using self-distraction as a coping method (p = < 0.001). Risk factors were being an adolescent (p = < 0.001).

Conclusion: The prevalence of MDD is substantial in children and adolescents with cancer in Uganda. Given that the majority had a mild-moderate depression, there is an urgent need to integrate psychotherapy—the first-line treatment for depression into the routine care of children and adolescents with cancer.

Keywords: Depression, Children, Adolescents, Cancer, Uganda, Out-patient, Prevalence, Low-resource

Background

Cancer is a major public health problem worldwide, accounting for 8.2 million deaths in 2012. More than 60% of the world’s total new annual cases occur in Africa, Asia and Central and South America. It is projected that cancer cases will rise annually from fourteen million in 2012 to twenty-two million within the next two decades. It is estimated that two hundred thousand children and adolescents suffer from different types of cancer worldwide yearly, with the majority living in low and middle-income countries which translates to a high mortality rate in these countries. [1].

Like any other chronic disease, individuals living with cancer are faced with numerous psychological and social challenges. These challenges are even more pronounced in children and adolescent who have to cope with a number of issues as they move from one stage of development to another [2]. One such challenge is co-morbid mental disorders; with depression being the most common mental health problem [3]. A quarter of patients with cancer suffer from depression, whose symptoms should be looked for and treated by the health workers as they negatively impact the patient’s quality of life [4].

© The Author(s). 2019 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.
Depression is more prevalent in individuals with physical illnesses than in those without these illnesses; e.g., 33% with cancer, 22% with myocardial infarction, 27% with diabetes, and 29% with hypertension [5]. Cancer patients with depression are usually missed out, this is because the signs and symptoms of depression like weight loss, sleep disturbance, sad mood are mistakenly taken to be due to the medical illness [6]. Thus, serious medical and psychiatric comorbidity is often overlooked, leading to undertreatment that complicates cancer and at the least adversely affects patients’ quality of life [6].

Studies of general psychiatric burden among children and adolescents with cancer estimate the prevalence rates of depression symptoms between 5 and 50% and prevalence rates of depressive disorders between 0 and 46% [7]. Factors that contribute to depression include; patient-related factors such as family history of depression, disease- and treatment-related variables such as pain and other physical symptoms, awareness of cancer diagnosis, and contributions of the patient’s surroundings such as social support [7].

In Uganda, we do not know the extent to which these factors may be associated with depression in children and adolescents with cancer. Most of these studies about the prevalence and factors associated with depression have been done in the adult population, and a limited number of these studies have been specific to children and adolescents.

In the present report, we examine the prevalence of depression, child and caregiver demographics, psychosocial and clinical features associated with having major depression among children and adolescents with any cancer diagnosis. Potential associated factors were selected based on evidence from the pre-existing literature that they are important correlates of depression in populations with chronic disease.

**Methods**

**Study setting and population**

Study participants were children and adolescents aged 7–17 years recruited from Uganda Cancer Institute (UCI) which is situated at the Mulago National Referral Hospital in Kampala District. It is the sole cancer treatment and training facility in Uganda. Approximately 1200 patients are seen per year 30% being children and adolescents. The child and adolescent clinic operates on Monday, Wednesday and Thursday seeing averagely 20 patients on clinic days. The clinics are run by a team of medical personnel which include the Paediatric oncologist, pharmacist, nurses and support staff.

**Study procedure**

Study data were collected between July and December 2015. The eligibility criteria required participants to be present on the days of the interview, an aged 7–17 year with a histological confirmation of active cancer disease and on treatment, provide assent and have parental/guardian written informed consent. On a given clinic day, research assistants (at the level of a nursing assistant who underwent a week-long training in the use of the research tools) under the supervision of the principal investigator worked with clinic staff to obtain a register of clients who had come to the clinic on that day. The clients would be seated in the waiting area awaiting their turn to see the clinician. Research assistants then explained study procedures, determined eligibility and then obtained assent from the client and informed consent from the parent/guardian. The questionnaires were then administered and it took approximately 45 min to complete. The research protocol was approved by the Makerere University School of Medicine Research Ethics Committee, as well as the Uganda National Council of Science and Technology.

**Study measures**

**Socio-demographic variables**

Descriptive information including age, gender, orphan status, educational, and income status was assessed using a standardized demographic questionnaire for both children and adolescents as well as the caregivers.

**Psychosocial variables**

Depression was assessed using the CDI [8] followed by the MINI-Kid diagnostic interview this is the children and adolescent version of the Mini-International Neuro-psychiatric Interview. It is a short structured diagnostic interview that was developed for DSM-IV psychiatric disorders. The specific modules of the tool that were used in this study were to assess for; MDD [9].

The psychometric properties of the CDI have been assessed in this study. At a cut-off point of 18, the measure attained a sensitivity of 87% and a specificity of 86%. Cronbach alpha was 0.8277 in this study sample diagnostic interview.

Coping skills among the study sample were assessed using the modified coping inventory [10]. A binary variable was created, with the variable coded 1 for endorsing the use of a coping skill and coded 0 for not endorsing the use of the given coping skill. In the analyses coping skills were assessed as a binary variable.

Perceived social support was assessed using four items obtained from the 12-item multi-dimensional social support scale [11], which provides an assessment of three sources of support: family (FA), friends (FR), and significant other (SO). The scale has been validated in Uganda and the three-subscale structure (Family, Friends, and Significant Other) of The Multidimensional Scale of Perceived Social Support was confirmed [12]. The Cronbach
α for the four items in this sample was 0.81. Responses were based on a 7-point scale where 1–4 referred to those who very strongly, strongly, mildly disagreed and those who were neutral about having enough support from friends, family and significant others respectively. Scores of 5–7 referred to those who mildly, strongly or very strongly agreed to have enough support respectively. Therefore, a binary variable was created, with the variable coded 1 for an agreement to adequate social support and coded 0 for disagreement or being neutral. Perceived social support was also assessed as a binary variable.

**Clinical variables**
These were assessed from the patient’s medical charts, they included the cancer type, cancer stage, type of treatment, treatment duration (0–1.1–3, > 3 years), HIV status, and family history of depression assessed by a single question and recorded in a clinical data form for each individual.

**Psychosocial variables**
Both negative and positive coping strategies were employed by the participants, with the majority endorsing the positive coping mechanisms. Details of the coping mechanisms are presented in Table 1.

**Caregiver characteristics**
Majority of the caregivers enrolled in the study were female, their ages ranged from 17 to 70 years with a mean age of 38.9 years (SD 8.68). In their household, they had an average of 6 people (SD 8.68) under their care with age range of 2–15. The majority was also low-income earners and had primary education. Detailed baseline characteristics of the caregivers are presented in Table 2.

**Prevalence and factors associated with depression symptoms**
Of the 352 participants assessed with the MINI-KID 91 (26%) had a major depressive disorder with the majority having mild depression as shown by the scores of 13–19 on the CDI. Table 3 illustrates the bivariate logistic regression analyses results of the child and adolescent characteristics, and Table 4 illustrates the bivariate analyses results of the caregiver characteristics. Table 5 illustrates the multivariate logistic regression analyses.

Significant bivariate logistic regression analyses include the following; adolescents were more likely to suffer from depression as compared to children, single orphans more likely to suffer from depression compared to non-orphans, HIV positive participants were more likely to suffer from depression compared to HIV the negative ones, those suffering from other type of cancers were more likely to suffer from depression compared to those with leukemia, those with a treatment duration of 12–36 months were less likely to suffer from depression as compared to those with a treatment duration of 0–12 months, those with a caregiver such as a friend or caretaker were more likely to suffer from depression compared to those taken care of by parents. Positive coping mechanism of self-distraction and emotional support plus a good perception of social support were protective against depression.
| Socio-demographic variables | N = 352 | Percentage% |
|-----------------------------|---------|-------------|
| Age category (years)        |         |             |
| Children (7–9)              | 115     | 32.67       |
| Adolescents (10–17)         | 237     | 67.33       |
| Gender                      |         |             |
| Male                        | 240     | 68.18       |
| Female                      | 112     | 31.82       |
| Orphanhood status           |         |             |
| Both parents alive          | 279     | 79.30       |
| Single Orphan               | 61      | 17.30       |
| Double Orphan               | 12      | 3.40        |
| Ethnic group according to region |   |          |
| Western Uganda              | 80      | 22.70       |
| Northern Uganda             | 66      | 18.60       |
| Eastern Uganda              | 72      | 20.50       |
| Central region              | 110     | 31.30       |
| Foreigners                  | 24      | 6.81        |
| Psychosocial variables      |         |             |
| Negative coping strategies  |         |             |
| Denial                      |         |             |
| Yes                         | 141     | 40.1        |
| No                          | 211     | 59.9        |
| Self-blame                  |         |             |
| Yes                         | 56      | 15.9        |
| No                          | 296     | 84.1        |
| Substance use               |         |             |
| Yes                         | 17      | 4.8         |
| No                          | 335     | 95.2        |
| Behavioural disengagement   |         |             |
| Yes                         | 173     | 49.2        |
| No                          | 179     | 50.8        |
| Positive coping strategies  |         |             |
| Self-distraction            |         |             |
| Yes                         | 250     | 71          |
| No                          | 102     | 29          |
| Active Coping               |         |             |
| Yes                         | 329     | 93.5        |
| No                          | 23      | 6.5         |
| Use of emotional support    |         |             |
| Yes                         | 301     | 85.5        |
| No                          | 51      | 14.5        |
| Use of instrumental support |         |             |
| Yes                         | 295     | 83.8        |
| No                          | 57      | 16.2        |
| Acceptance                  |         |             |
| Yes                         | 190     | 54          |

Table 1 Socio-demographic, clinical and psycho-social variables of children and adolescents with Cancer at UCI outpatient clinic (Continued)

| Socio-demographic variables | N = 352 | Percentage% |
|-----------------------------|---------|-------------|
| No                          | 162     | 46          |
| Positive reframing          |         |             |
| Yes                         | 223     | 63.4        |
| No                          | 129     | 36.6        |
| Use of religion             |         |             |
| Yes                         | 264     | 75          |
| No                          | 88      | 25          |
| Perception of social support|         |             |
| A special person in patient’s life |  |          |
| Yes                         | 292     | 83.8        |
| No                          | 60      | 16.2        |
| Emotional Support from family |       |             |
| Yes                         | 293     | 83.2        |
| No                          | 59      | 16.8        |
| Friends in the patient’s life |       |             |
| Yes                         | 290     | 82.4        |
| No                          | 62      | 17.6        |
| Family help                 |         |             |
| Yes                         | 292     | 83          |
| No                          | 60      | 17          |
| Clinical variables          |         |             |
| A family history of depression |     |             |
| Yes                         | 127     | 36.1        |
| No                          | 225     | 63.9        |
| HIV/AIDS                    |         |             |
| Yes                         | 47      | 13.4        |
| No                          | 233     | 86.6        |
| Cancer stage                |         |             |
| I                           | 31      | 8.8         |
| II                          | 45      | 12.8        |
| III                         | 80      | 22.7        |
| IV                          | 49      | 13.9        |
| Other                       | 150     | 42.6        |
| Cancer category             |         |             |
| Lymphomas                   | 152     | 43.2        |
| Leukaemia’s                 | 94      | 26.7        |
| Embryonal tumours           | 49      | 13.9        |
| Primary bone tumours        | 14      | 4.0         |
| Others                      | 43      | 12.2        |
| Treatment duration          |         |             |
| 0–12 months                 | 239     | 68.0        |
| 12–36 months                | 103     | 29.3        |
| > 36 months                 | 10      | 2.8         |
Significant bivariate logistic regression analyses include the following: children and adolescents whose parents had died were more likely to suffer from depression compared to those with a single parent, those taken care of by a friend or non-relative caretaker were also more likely to suffer from depression compared to those taken care of by a parent.

Both forward and backward stepwise regression models were run to determine factors independently associated with major depression, they include; having a supportive special friend, positive coping by use of self-distraction techniques and older age as shown in Table 5 below. Both stepwise regression models attained $R^2 = 0.184$ which indicates that the selected independent variables explained almost 18% of the variability of our dependent variable.

Table 2 Socio-demographic characteristics of caregivers of children and adolescents with cancer at the UCI outpatient clinic

| Socio-demographic variables | N = 352 | Percentage% |
|----------------------------|---------|--------------|
| Gender                     |         |              |
| Male                       | 109     | 31.0         |
| Female                     | 243     | 69.0         |
| Marital status             |         |              |
| Single                     | 30      | 8.5          |
| Married/co-habiting        | 255     | 72.4         |
| Divorce/separated          | 33      | 9.4          |
| Widowed                    | 34      | 9.7          |
| Employment                 |         |              |
| Yes                        | 287     | 81.5         |
| No                         | 65      | 18.5         |
| Relationship with patient  |         |              |
| Parent                     | 203     | 57.7         |
| Relative (other than sibling/parent) | 42 | 11.9 |
| Sibling                    | 26      | 7.4          |
| Self (no relative/caregiver) | 77 | 21.9 |
| Other (friend/caregiver)   | 4       | 1.1          |
| Number of caregiver’s children |     |              |
| 0                          | 26      | 7.4          |
| 1–3                        | 96      | 27.3         |
| 4–6                        | 132     | 37.5         |
| > 6                        | 98      | 27.8         |
| Monthly income             |         |              |
| < 75,000 shs               | 109     | 74           |
| 75,000–300,000             | 173     | 27.3         |
| 300,000–500,000            | 62      | 37.5         |
| > 500,000                  | 8       | 27.8         |

Discussion

This study contributes to the research literature on the prevalence and factors associated with depression among children and adolescents with cancer in sub-Saharan Africa. The prevalence of major depressive disorder (MDD) was estimated at 26% among children and adolescents with cancer attending the Uganda Cancer Institute Out-patient clinic. This is quite substantial meaning that one in four children and adolescents at the UCI outpatient clinic (1/4) has major depression.

This finding is comparable to the findings of studies investigating depression in adults with cancer. For example, Atesci and colleagues conducted a study in Turkey in which the prevalence of major depression was estimated at 25% among 117 cancer patients using DSM-IV SCID. [4]. Furthermore, a review of studies reporting on the integration of mental health care into the Non-Communicable Disease Agenda reports a prevalence estimate of depression at 33% among adults with cancer [5].

Research studies on depression in children and adolescents with cancer are limited, and the few studies are concentrated in developed countries and report variable prevalence rates of depression. For example, Farhangi and colleagues conducted a study in 42 children and adolescents with Acute Lymphocytic Leukemia referred to pediatric haematology department of Dr. Sheikh hospital using CDI, they found a prevalence of 59.5% of depressive symptoms [13]. A possible explanation of this high rate could be that they assessed depression using a screening measure rather than a diagnostic interview.

Studies on the prevalence of MDD in individuals with cancer in our setting could not be found, therefore there is a need for such studies to be carried out. This is because findings from such studies will provide information that may be useful in directing policy and designing counselling intervention strategies that will help reduce depression and improve the overall prognosis of child and adolescent cancers. This is the first study to describe the prevalence of MDD in children and adolescents with cancer in our setting.

Adolescents (10–17 years) were four times more likely to suffer from MDD as compared to children. This is in line with study findings that indicate that the rate of major depressive episodes dramatically increases as children turn into adolescence [14, 15]. This could also be explained by the various hormonal changes happening during adolescence, the societal expectations during this age group and their ability to better conceptualize their emotions. This calls for intervention programs to be tailor-made to suit more of the adolescent population.

Notably, there wasn’t a significant association between MDD and the gender of the respondents, this is similar to findings of a study at Yale University that examined the emergence of gender difference in depression and
| Characteristic                  | Depression (N = 91) n (%) | No depression (N = 261) n (%) | OR (95% CI) | P value |
|-------------------------------|---------------------------|-------------------------------|-------------|---------|
| **Age**                       |                           |                               |             |         |
| (7–9 years)                   | 14(15.4)                  | 101(38.7)                     | 1           |         |
| (10-17 years)                 | 77(84.6)                  | 160(61.3)                     | 3.47(1.83–6.56) | < 0.001 |
| **Region of origin**          |                           |                               |             |         |
| Central Uganda                | 25(27.5)                  | 89(34.1)                      | 1           |         |
| Eastern Uganda                | 25(27.5)                  | 46(17.6)                      | 1.5(0.49–4.77) | 0.45    |
| Western Uganda                | 16(17.6)                  | 67(25.7)                      | 0.85(0.41–1.7) | 0.65    |
| Northern Uganda               | 210(21.9)                 | 47(18)                        | 1.51(0.75–3.0) | 0.23    |
| Foreigners                    | 5(5.5)                    | 12(4.6)                       | 1.45(0.47–4.63) | 0.49    |
| **Orphanhood status**         |                           |                               |             |         |
| Not orphan                    | 63(69.2)                  | 180(69.0)                     | 1           |         |
| Single orphan                 | 23(37.7)                  | 96(36.8)                      | 2.07(1.11–3.76) | 0.01    |
| Double orphan                 | 5(5.4)                    | 14(6.0)                       | 2.44(0.76–8.03) | 0.12    |
| **HIV status**                |                           |                               |             |         |
| Negative                      | 72(79.1)                  | 233(89.3)                     | 1           |         |
| Positive                      | 19(20.9)                  | 28(10.7)                      | 2.19(1.15–4.19) | 0.01    |
| **Cancer category**           |                           |                               |             |         |
| Lymphomas                     | 31(34.1)                  | 121(46.4)                     | 1           |         |
| Leukæmia’s                    | 23(25.3)                  | 71(27.2)                      | 1.26(0.68–2.34) | 0.45    |
| Embryonal tumours             | 15(16.5)                  | 34(13.0)                      | 1.72(0.82–3.57) | 0.13    |
| Primary bone tumours          | 3(3.3)                    | 11(4.2)                       | 1.06(0.27–4.06) | 0.92    |
| Others                        | 19(20.9)                  | 24(9.2)                       | 3.09(1.47–6.48) | < 0.001 |
| **Treatment duration**        |                           |                               |             |         |
| 0–12 months                   | 72(79.1)                  | 167(64.0)                     | 1           |         |
| 12–36 months                  | 15(16.5)                  | 88(33.7)                      | 0.39(0.21–0.73) | 0.002   |
| > 36 months                   | 4(4.4)                    | 6(2.3)                        | 1.54(0.42–5.6) | 0.50    |
| **Relationship with caregiver**|                           |                               |             |         |
| Parent                        | 46(50.4)                  | 157(60.2)                     | 1           |         |
| Relative                      | 12(13.2)                  | 30(11.5)                      | 1.36(0.64–2.88) | 0.43    |
| Sibling                       | 7(7.7)                    | 19(7.3)                       | 1.25(0.49–3.18) | 0.62    |
| Self (no relative/no caregiver)| 23(25.3)                 | 54(20.7)                      | 1.45(0.80–2.62) | 0.21    |
| Other (friend/caretaker)      | 3(3.3)                    | 1(0.4)                        | 10.23(1.0–104.8) | 0.01    |
| **Negative coping strategies**|                           |                               |             |         |
| Denial                        |                           |                               |             |         |
| Yes                           | 37(40.7)                  | 104(39.8)                     | 1.03(0.63–1.68) | 0.89    |
| No                            | 54(59.3)                  | 157(60.2)                     | 1           |         |
| Self-blame                    |                           |                               |             |         |
| Yes                           | 20(22)                    | 36(13.8)                      | 1.76(0.95–3.24) | 0.06    |
| No                            | 71(78)                    | 225(86.2)                     | 1           |         |
| Substance use                 |                           |                               |             |         |
| Yes                           | 3(3.3)                    | 14(5.4)                       | 0.60(0.16–2.14) | 0.42    |
| No                            | 88(96.7)                  | 249(94.6)                     | 1           |         |
found no gender differences in depression rates in pre-pubescent children [16].

Children and adolescents with a good perception of social support were less likely to suffer from MDD. These respondents felt that they had a special person in their lives and this protected them against MDD. This is in line with findings by a study conducted by Grav, Siv et al. [17] about association between social support and depression in the general population which showed that aspects of greater social support were related to less

Table 3 Bivariate logistic regression analyses of children and adolescent characteristics (Continued)

| Characteristic                      | Depression (N = 91) | No depression (N = 261) | OR (95% CI) | P value |
|-------------------------------------|---------------------|-------------------------|-------------|---------|
| Behavioural disengagement           |                     |                         |             |         |
| Yes                                 | 51(56)              | 122(46.7)               | 1.42(0.89–2.35) | 0.12    |
| No                                  | 40(44)              | 139(53.3)               | 1           |         |
| Positive coping strategies          |                     |                         |             |         |
| Self-distraction                    |                     |                         |             |         |
| Yes                                 | 40(44)              | 210(80.5)               | 0.19(0.10–0.33) | < 0.001 |
| No                                  | 51(56)              | 51(19.5)                | 1           |         |
| Active coping                       |                     |                         |             |         |
| Yes                                 | 85(93.4)            | 244(93.5)               | 0.98(0.37–2.58) | 0.97    |
| No                                  | 6(6.6)              | 17(6.5)                 | 1           |         |
| Use of emotional support            |                     |                         |             |         |
| Yes                                 | 72(79.1)            | 229(87.7)               | 0.52(0.28–0.99) | 0.04    |
| No                                  | 19(20.9)            | 32(12.3)                | 1           |         |
| Use of instrumental support         |                     |                         |             |         |
| Yes                                 | 73(80.2)            | 222(85.1)               | 0.71(0.38–1.32) | 0.28    |
| No                                  | 18(19.8)            | 39(14.9)                | 1           |         |
| Acceptance                          |                     |                         |             |         |
| Yes                                 | 42(46.2)            | 148(56.7)               | 0.65(0.40–1.05) | 0.08    |
| No                                  | 49(53.8)            | 113(43.3)               | 1           |         |
| Positive reframing                  |                     |                         |             |         |
| Yes                                 | 27(29.7)            | 176(67.4)               | 0.51(0.31–0.84) | 0.07    |
| No                                  | 44(70.3)            | 85(32.6)                | 1           |         |
| Use of religion                     |                     |                         |             |         |
| Yes                                 | 63(69.2)            | 201(77)                 | 0.67(0.39–1.14) | 0.14    |
| No                                  | 28(30.8)            | 60(23)                  | 1           |         |
| Perception of social support        |                     |                         |             |         |
| Special person in patient’s life    |                     |                         |             |         |
| Yes                                 | 63(69.2)            | 229(87.7)               | 0.34(0.18–0.61) | 0.002   |
| No                                  | 28(30.8)            | 32(12.3)                | 1           |         |
| Emotional Support from family       |                     |                         |             |         |
| Yes                                 | 65(71.4)            | 228(87.4)               | 0.39(0.21–0.71) | 0.001   |
| No                                  | 26(28.6)            | 33(12.6)                | 1           |         |
| Friends in patient’s life           |                     |                         |             |         |
| Yes                                 | 64(70.3)            | 226(86.6)               | 0.36(0.20–0.65) | 0.004   |
| No                                  | 27(29.7)            | 35(13.4)                | 1           |         |
| Family help                         |                     |                         |             |         |
| Yes                                 | 65(71.4)            | 227(87)                 | 0.40(0.23–0.73) | 0.001   |
| No                                  | 26(28.6)            | 34(13)                  | 1           |         |
depressive symptomatology and social support was seen as one of the social determinants for overall health in the general population [18]. Another study by Barger Steven and colleagues about the social relationship correlates of major depressive disorder and depressive symptoms in Switzerland further demonstrated that perceived quality and frequency of social relationships are associated with clinical depression and depressive symptoms, as his finding indicated good perception of social support was protective against depressive disorders [17].

Use of self-distraction as a positive coping strategy protected the children and adolescents against MDD. This is in line with the findings of a meta-analysis of the effectiveness of strategies derived from the process model of emotion regulation which concluded that distraction was an effective way to regulate emotions [19].

This study had limitations. The first temporal relationship between cancer and MDD could not be established.

| Table 4 Bivariate logistic regression analyses of caregiver characteristics |
|--------------------------------------------------|
| Caregiver characteristic | Depression (N = 91) n (%) | No depression (N = 261) n (%) | OR (95% CI) | P Value |
|--------------------------|--------------------------|-----------------------------|-----------|---------|
| Marital status           |                          |                             |           |         |
| Single                   | 4 (4.4)                  | 26 (10)                     | 1         |         |
| Married/cohabiting       | 66 (72.5)                | 189 (72.4)                  | 2.26 (0.75 – 6.78) | 0.13 |
| Divorced/separated       | 8 (8.8)                  | 25 (9.6)                    | 2.08 (0.54 – 7.97) | 0.27 |
| Widowed                  | 13 (14.3)                | 21 (8)                      | 4.44 (1.16 – 17.01) | 0.01 |
| Income                   |                          |                             |           |         |
| < 75,000 shs             | 32 (35.2)                | 71 (27.2)                   | 1         |         |
| 75,000-300,000           | 42 (46.2)                | 131 (50.2)                  | 0.71 (0.41 – 1.22) | 0.21 |
| 300,000-500,000          | 11 (12.1)                | 51 (19.5)                   | 0.47 (0.21 – 1.04) | 0.06 |
| > 500,000                | 4 (4.4)                  | 4 (1.5)                     | 2.21 (0.51 – 9.57) | 0.27 |
| Gender                   |                          |                             |           |         |
| Male                     | 26 (28.6)                | 83 (31.8)                   | 0.85 (0.50 – 1.45) | 0.56 |
| Female                   | 65 (71.4)                | 178 (68.2)                  | 1         |         |
| Employment               |                          |                             |           |         |
| Yes                      | 70 (76.9)                | 217 (83.1)                  | 0.65 (0.37 – 1.21) | 0.18 |
| No                       | 21 (23.1)                | 44 (16.9)                   | 1         |         |
| Number of caregiver’s children |                 |                             |           |         |
| 0                        | 3 (3.3)                  | 23 (8.8)                    | 1         |         |
| 1–3                      | 23 (25.3)                | 73 (28)                     | 2.40 (0.65 – 8.92) | 0.17 |
| 4–6                      | 36 (39.6)                | 96 (36.8)                   | 2.87 (0.80 – 10.32) | 0.09 |
| > 6                      | 29 (31.9)                | 69 (26.4)                   | 3.22 (0.87 – 11.85) | 0.06 |
| Relationship with patient|                          |                             |           |         |
| Parent                   | 46 (50.4)                | 157 (60.2)                  | 1         |         |
| Relative                 | 12 (13.2)                | 30 (11.5)                   | 1.36 (0.64 – 2.88) | 0.43 |
| Sibling                  | 7 (7.7)                  | 19 (7.3)                    | 1.25 (0.49 – 3.18) | 0.62 |
| Self (no caregiver)      | 23 (25.3)                | 54 (20.7)                   | 1.45 (0.80 – 2.62) | 0.21 |
| Other (friend/caretaker) | 3 (3.3)                  | 1 (0.4)                     | 10.23 (1.0 – 104.8) | 0.01 |

| Table 5 Multivariate logistic regression analyses |
|-----------------------------------------------|
| Characteristic | Adjusted OR (95% CI) | P value |
|----------------|----------------------|---------|
| Age            |                      |         |
| 7–9 years (children) | 1                  |         |
| 10–17 years (adolescents) | 4.02 (2.05 – 7.88) | < 0.001 |
| Perception of social support                   |                      |         |
| A special person in the patient’s life          |                      |         |
| No                                         | 1                    |         |
| Yes                                        | 0.36 (0.19 – 0.69) | 0.002   |
| Positive coping strategies                    |                      |         |
| Self-distraction                             |                      |         |
| No                                         | 1                    |         |
| Yes                                        | 0.17 (0.10 – 0.30) | < 0.001 |

OR Odds ratio, CI Confidence interval, N Population size, n Sample size, < Less than, % Percent
so was causal associations. This is because the outcome and exposure were measured at the same time. We would want to do a prospective study to establish a causal relationship. Second, the study sample consists of individuals at the clinic; therefore the findings can only be generalized to children and adolescents in a clinical setting. Third, there was a recall bias caused by differences in the accuracy or completeness of the recollections retrieved by study participants regarding events or experiences from the past. This is a methodological issue due to use of interviews or questionnaires.

Fourth, the measure for perceived social support was not comprehensive, never the less, it gave an indication of the level of support perceived by the children and adolescents. There is a need to conduct a full assessment of the measure of perceived social support in future studies.

Lastly, we would like to acknowledge that the size difference between the odds ratio of the protective and risk factors and the large confidence interval in some categories could be due to the small sample size of these categories.

Despite these limitations, this study to our knowledge provides the first prevalence estimates of depression symptoms among children and adolescents with cancer in Uganda. Our study has important implications for the management of children and adolescents with cancer; first training of the UCI staff in basic mental health care to enable them screen for mental health issues in the day to day care offered to the children and adolescents with cancer will ensure early diagnosis and intervention for mild to moderate depression thereby preventing the progression to severe depression. Prompt management of depression may lead to improved adherence to treatments and better cancer treatment outcomes. Second, knowledge of the factors associated with depression will guide the development of first-line psychological treatments for depression for both the affected individuals and their caregivers which can be integrated into the routine care of children with cancer.

Conclusion

The prevalence of MDD in children and adolescents with cancer is substantial. Given that the majority had mild-moderate depression, first line psychological treatments for depression should be integrated into the routine care of children and adolescents with cancer.

Acknowledgements

We wish to thank Uganda Cancer Institute for their help in carrying out this study, Teopista and Sarah for their help in data collection, last but not least, the study participants without whom this study would not have been possible.

Funding

The lead author was supported by the Medical Education Partnership Initiative (MEPI), this catered for research assistants’ payments and data collections materials. EN-M is supported by Grand Challenges Canada, Grant Number: 0770–05 and the MQ Mental Health Science Fellowship Award, Grant Number: MQ15FIP100024. This catered for statistical analysis.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Authors’ contributions

BA, CA, JBK, and EN-M conceptualized and designed the study and BA sought and obtained funding. BA and EN-M managed the literature searches. EN-M carried out the data analysis. BA, CA, JBK, and EN-M revised the manuscript critically for important intellectual content. All authors contributed to the final study protocol. All authors read and approved the final manuscript.

Ethics approval and consent to participate

This study was approved by the Makerere University School of Medicine Research and Ethics Committee Institutional Review Board (IRB). The children and adolescent’s guardians provided voluntary written informed consent and the participating child/adolescent assented to the study in writing.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Publisher’s Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Author details

1Department of Psychiatry, College of Health Sciences, Makerere University, P.O. Box 7072 Kampala, Uganda. 2Uganda Cancer Institute, Kampala, Uganda.

Received: 31 January 2018 Accepted: 23 April 2019
Published online: 17 May 2019

References

1. WHO, GLOBOCAN 2012: Estimated Cancer Incidence Mortality and prevalence worldwide 2012. 2010.
2. Pinquart M, Shen Y. Depressive symptoms in children and adolescents with chronic physical illness: an updated meta-analysis. J Pediatr Psychol. 2011; 36(8):375–84.
3. Aldridge AA, Roesch SC. Coping and adjustment in children with cancer: a meta-analytic study. J Behav Med. 2007;30(2):115–29.
4. Atesci FC, Baltalarli B, Oguzhanoglu NK, Karadag F, Ozdel O, Karagoz N. Psychiatric morbidity among cancer patients and awareness of the illness. Support Care Cancer. 2004;12(3):161–7.
5. Ngo VK, Rubinstein A, Ganju V, Kanelis P, Loza N, Rabadan-Diehl C, Daar AS. Grand challenges: integrating mental health care into the non-communicable disease agenda. PLoS Med. 2013;10(5):e1001443.
6. Spiegel D, Giese-Davis J. Depression and cancer: mechanisms and disease progression. Biol Psychiatry. 2004;55(3):269–82. 54(3):269–82.
7. Masde M. Prevalence of depression in patients with cancer. JNCI Monogr. 2004;2004(32):57–71.
8. Kovacs M. Children’s depression inventory. Manual multi-health Syst. 1992.
9. Sheehan DV, Lecrubier Y, Sheehan KH. The MINI-international neuropsychiatric interview (MINI): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. J Clin Psychiatry. 1998;59(2):22–3.

Abbreviations

CDI: Child Depression Inventory; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders Fourth edition; HIV: Human immunodeficiency virus; MDD: Major depressive disorder; MINI-Kid: The Mini-International Neuropsychiatric Interview for Children and Adolescents; SCID: Structured Clinical Interview; UCI: Uganda Cancer Institute
10. Litman J a. The COPE inventory: dimensionality and relationships with approach- and avoidance-motives and positive and negative traits. Pers Individ Dif. 2006 [cited 2016 Aug 5];41(2):273–284. Available from: http://linkinghub.elsevier.com/retrieve/pii/S0191886906000638

11. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. J Pers Assess. 1998;52(1):30–41.

12. Nakigude J, Musisi S, Ehrvall A, Airaksinen E, Agren H. Adaptation of the multidimensional scale of perceived social support in a Ugandan setting. African Heal Sci 2009. 2009;9:35–41.

13. Soper D. A-priori sample size calculator for multiple regression. Stat. Calc. https://www.danielsoper.com/statcalc/calculator.aspx?id=1. Accessed 15 Jan 2018

14. Farhangi H, Badiei Z, Moharreri F. Prevalence of psychiatric symptoms in all patients during maintenance therapy. Iran J Pediatr Hematol Oncol. 2015;5(2):77.

15. Saluja G, Iachan R, Scheidt PC, Overpeck MD, Sun W, Giedd JN. Prevalence of and risk factors for depressive symptoms among young adolescents. Arch Pediatr Adolesc Med. 2004;158(5):760–5.

16. Dopheide JA. Recognizing and treating depression in children and adolescents. Am J Heal Pharm. 2006;63(3):233–43.

17. Grav S, Helfzen O, Ronald U, Stordial E. Association between social support and depression in the general population: the HUNT study, a cross-sectional survey. J Clin Nurs. 2012;21(1–2):111–20.

18. Simsek Z, Erol N, Öztöp D, Münir K. Prevalence and predictors of emotional and behavioural problems reported by teachers among institutionally reared children and adolescents in Turkish orphanages compared with community controls. Child Youth Serv Rev. 2007;29(7):883–99.

19. Barger SD, Messerli-Bürgy N, Barth J. Social relationship correlates of major depressive disorder and depressive symptoms in Switzerland: nationally representative cross-sectional study. BMC Public Health. 2014;14(273).