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Prevalence of depressive symptoms among older children and young adolescents: a longitudinal population-based study

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Abstract

Introduction: This paper investigates levels of depressive symptoms among older children and young adolescents, 11–14 years of age. The population-based sample was assessed twice during a 12-month period. Point-prevalence, 12-month prevalence, and 12-month incidence were measured by a validated self-reported scale (SFMQ) and are presented in this paper.
Methods: A total of 2148 pupils were invited to participate in this study, and 1748 pupils and at least one parent/guardian provided informed consent. The population was assessed twice within one 12-month period resulting in 1439 participants at both data collection points. Depressive symptoms were measured by a validated self-reported scale, The Short Mood and Feelings Questionnaire (SMFQ).
Results: The results indicate that the point-prevalence was just under 10% in 6th to 10th grade with a 12-month prevalence at almost 3%. The results also indicate an incidence rate of 4.5% over 12-months. This study confirms that girls report a higher range of point prevalence, 12- month-prevalence, and 12-month incidence compared to boys.
Conclusions: The results indicate that depressive symptoms among children and young adolescents is a serious health challenge. The results demonstrate substantial gender differences even at an early age (11-14 years), where girls report significantly higher point prevalence, 12-month-prevalence, and 12-month incidence compared to boys. Results from this study suggest that depressive symptoms are an important problem that young adolescents face, and the study underlines the need for more intervention tailored to gender at the middle-school level, especially with respect to those children and adolescents who experience persistent depressive symptoms.

Keywords: adolescents; depression; mental health; prevalence

Introduction

Depression in the population is a public health concern due to high prevalence rates, early onset and its impact on children and adolescents, families, and communities (1, 2). Depression in adulthood is a debilitating mental illness with clear developmental patterns from childhood through adolescence (3). Moreover, depression in childhood increases the risk of future episodes during adolescence (4, 5), and it adversely affects quality of life, motivation and learning (6-8). Depression among adults is associated with problems regarding interpersonal relationships (4), substance misuse (9), self-harm and suicide (10). Furthermore, major depressive disorder among youth has the greatest impact of any disorder, with more than 40% of young people experiencing a severe negative impact on their life (11).

Common symptoms of depression in adults are decreased energy, loss of motivation and initiative, increased degree of irritation, impaired concentration and memory, poorer self-esteem, guilt, shame and worthlessness, poor night's sleep, weight gain or weight loss, and suicidal thoughts and actions (12). Equal diagnostic criteria are employed to define major depressive disorder in children/adolescents and adults. The one exception to this is that DSM-IV and 5 (12, 13) allow for irritable rather than depressed mood as a core diagnostic mood symptom for children/adolescents. In systematically comparing adolescent and adult major depression symptoms profiles, Rice et al. (2019) demonstrated that appetite, weight change, energy loss and insomnia were more common in adolescents, while loss of interest, anhedonia and concentration

problems were more common in adults. Further, the results were similar for depressive symptom count and major depressive disorder (14).

The diagnostic criteria for depressive disorders are the same for children and adults, but children's depression will be characterised by their cognitive development and developmental age. Among young children, emotional disturbances, aggression, passivity, anxiety, behavioural difficulties, instability and restlessness, hyperactivity, isolation and various physical disorders, such as abdominal pain, can be symptoms of depression. Among depressed 3-6-year-olds, it was found that the depression was strongly characterised by guilt and extreme fatigue (15).

A comorbid relationship has been found between depressive disorders among older children/ young adolescents and bulimia nervosa (16), anxiety and behavioural disorders (17), neuropsychiatric disorders such as ADHD (18), obsessive-compulsive disorder (19) and language disorders (20).

Prevalence

The prevalence of depression has been reported to be rather low, 0.08 % among children 3-5 years of age and 1.7 % between the ages 6–11 (21). An increase in the prevalence rate has been demonstrated in the transition period from childhood to adolescence; for example, the prevalence among adolescents between ages 12–17 is reportedly 6.1 % and 7.7% (11). A meta-analysis including 26 studies indicated a lower prevalence among children compared to adolescents: 2.8% for those under age 13 and 5.6% between the ages of 13–18 (22). Reported prevalence of depression and depressive symptoms in adolescents varies across studies. Wartberg and colleagues reported an estimated point prevalence of depressive symptoms at 8.2% among adolescents 12 to 17 years of age (23), compared to Saluja and colleagues, who reported that nearly 20% of young adolescents in grades 6, 8, and 10 in the US report symptoms consistent with depression (24).

Many children and adolescents struggle with depression or anxiety throughout adolescence. However, only a small percentage of these children will have such severe symptoms that require treatment (25).

Incidence

The incidence of depression is reported as significantly lower than point-prevalence. Garrison et al. noted a 12-month incidence of 3.3% for major depression in adolescents aged 11–16 years of age, based on structured interviews about symptoms and impairment and having identified dates of onset and duration. In addition, Lewinsohn et al. recorded an annual first incidence rate of 5.7% for major depressive disorder among high school students.

Gender differences

Before puberty, boys and girls appear to have similar rates of depression (22, 28). However, gender differences have been reported to emerge between the ages of 13 and 15 years, and the point prevalence of depression after puberty is preponderant in girls (about 2:1) (29, 30). Gender differences in a 12-month prevalence was found among older adolescents in a study of adolescents 15–19 years of age. For DSM-III-R major depressive episode, Haarasiltaet al. reported a 12-month prevalence of 6.0% among girls and 4.4% among boys, and observed in their study that 17.3% of girls between 12 to 17 years of age met the criteria for 12-month major depressive episode compared to 5.7% among boys.

Methodological challenges

Most studies investigate the occurrence of depressive symptoms among teenagers (23, 33, 34). In contrast, there is a lack of population-based studies examining depressive symptoms among the younger age groups. Furthermore, most studies report results based on only one assessment. A point-prevalence often provides merely a "snapshot" of how adolescents perceive their mood. Adolescence is a period characterised by transitions and shifting relationships and emotions (35-37) and have demonstrated that adolescents often report transitory depressive symptoms. Thus, to explore and evaluate the difference between point-prevalence and time-point prevalence, a study is warranted to examine the same sample repeatedly. Moreover, to our knowledge, no study has examined point prevalence, 12-month prevalence, and 12-month incidence among a representative sample of adolescents aged 11 to 14.

The aim of this study is to assess potential gender differences in point prevalence, 12-month prevalence, and 12-month incidence rates among children in 6th to 10th grade (age 11–14 years) by administering an established and robust self-report questionnaire twice within a twelve-month interval.

Method
Participants and procedure

All pupils in 6th –10th grade from 27 schools in two municipalities were invited to participate in the study. These two municipalities function as a representative sample of Norway in terms of geography, industry, income level, age distribution, morbidity and mortality, thereby making them appropriate for an epidemiological investigation (38).

A total of 2148 pupils were invited to participate in this study, and 1748 pupils and at least one

parent/guardian provided informed consent. The population was assessed twice within one 12-month period resulting in 1439 participants at both data collection points. The data collection was carried out as part of the project "Health and Well-being", which specifically examined the prevalence and effect of a universal preventive programme aimed at reducing social anxiety (39).

Teachers responsible for each class were given instructions on how to distribute consent forms and conduct the assessments. Written information about the study "Health and well-being" and consent forms were distributed to pupils by a teacher during a class session and were taken home to parents/guardians. The questionnaire forms were handed out by a teacher in the classroom and completed in the presence of the teacher. Almost all pupils completed the questionnaires in one session and within the 45-minute period allocated. In addition to the SMFQ, the booklet also included various scales assessing anxiety, stressful life events, resilience and quality of life. The schools in Norway are highly integrated containing severe intellectually and physically handicapped children and adolescents. Six pupils with severe mental retardation and extensive reading comprehension difficulties were excluded from the study.

Measurement

A self-reporting questionnaire was used in this population study. Depressive symptoms were measured by The Short Mood and Feelings Questionnaire (SMFQ) (40, 41). SMFQ is a 13-item self-report questionnaire designed to measure core depressive symptomatology in children and adolescents aged 6–17 years old. SMFQ assesses symptoms of depression during the past 2 weeks. All 13 items are negatively phrased and rated on a 3-point Likert scale with response categories ranging from 0 (Not true) to 2 (True). Example items include "I felt miserable or unhappy", "I did everything wrong" and "I cried a lot". Total scores range from 0 to 26, and high sum scores indicate high levels of depression symptomatology. SMFQ has been found to differentiate between depressed adolescents and non-depressed adolescents in the general population (42, 43), and there is good evidence of SMFQ's psychometric properties such as conceptual validity, convergent validity and reliability (44). The SMFQ is a unifactorial measure with a high reliability score of $a = 0.90$ in Cronbach's alpha (45). Cronbach's alphas for the 13 depression items in this study was ($a = 0.88$) at assessment point 1 and ($a = 0.86$) at assessment point 2.

In a large population-based study that surveyed 10,220 adolescents 16–18 years of age, assessing both sleep and depression, the 90th percentile has been used as a cut-off score for SMFQ (46). A 90th percentile in our population is a total score of 10 for SMFQ at assessment point 1. We used a total score of 11 or higher for SMFQ to classify high levels of depressive symptoms and avoid over-reporting.

Ethical consideration

The Regional Committee for Medical and Health Research Ethics approved the re-use of data to investigate depressive symptoms among children and adolescents (REK) 2015/2315. Written information about this new project was sent by regular mail to the participants in the "Health and well-being" survey. The informants were given the opportunity to decline data reuse. One participant gave written feedback expressing that they did not want to attend the new study. All data obtained regarding this written information was deleted.

Data is stored anonymously and separately from identifiable name lists. Consent declarations and name lists are kept secure and locked away in line with recommendations from the Regional Committee for Medical and Health Research Ethics.

Statistics

Statistical analyses were conducted using the SPSS, Version 23.0 software (47). We present the specific point prevalence rates assessed across gender at both assessment points, the 12-month prevalence and 12-month incidence rates. In keeping with previous research, we defined depression cases at 12 months as having an SMFQ score of 11 or greater at each assessment point (48). Moreover, the 12-month incidence rates include those who scored above ≥ 11 at the second but not the first assessment point. Chi-squared analyses were used to investigate potential gender differences in point prevalence, 12-month prevalence and 12-month incidence. Effect sizes are defined as follows: Cramer's V (49), no effect (0–0.099), low (0.100–0.299), moderate (0.300–0.499) and strong effect (≥ 0.5) (50). The significance level is set at 5% (51).

Results

A total of 2,148 pupils were invited to the study. A total of 1748 (81.6%) children and adolescents aged 11-14, 892 girls (51%) and 856 boys (49%), participated at assessment point. Further, 1439 participated at both assessment points. The average age of those who participated at both assessment points was 12.6 year (*SD*=1.09*).

Point prevalence

The point prevalence among adolescents aged 11-14 was 9.3% at the first assessment point and 7.9% at the second assessment point. An independent chi-squared analysis confirmed a significant reduction in

TABLE 1. Point prevalence, 12-month prevalence and 12-month incidence among the total population, and separately among girls and boys at age 11-14 years

	Total			Girls 746 (51.9%)			Boys 691 (48.1 %)		
Total	**N**	**%**	**CI**	**n**	**%**	**CI**	**n**	**%**	**CI**
Point prev. 1	133	9.3	7.80 - 10.80	91	12.2	9.85 - 14.55	42	6.1	4.31 - 7.89
Point prev. 2	113	7.9	6.50 - 9.30	80	10.8	8.57 - 13.03	33	4.8	3.20 - 6.40
12-month Prevalence	42	2.9	2.03 - 3.77	33	4.5	3.01 - 5.99	9	1.3	.45 - 2.15
12-month Incidence	69	4.8	3.69 - 5.92	45	6.1	4.38 -7.82	24	3.5	2.13 - 4.87

Notes. CI = 95 % Confidence interval, Point prev.1 and 2 at assessment points 1 and 2.
Point prevalence (SMFQ ≥ 11) at first and second assessment point, 12-month prevalence (SMFQ ≥ 11) at assessment point 1 and 2),
12-month incidence rate (new cases with SMFQ ≥ 11 from assessment point 1 to assessment point 2) by gender

point prevalence differences between assessment point 1 (9.3%) and assessment point 2 (7.9%), χ^2 (1) = 117.180 p < .000. At the first assessment point, 12.2 % of the girls and 6.1 % of the boys reported a high level of depressive symptoms (SMFQ ≥ 11). An independent chi-squared analysis indicated significant gender differences in point prevalence at the first assessment point, χ^2 (1) = 15.993 p < .001, Cramer`s $V$ = .106. At the second assessment point, 10.8% of girls and 4.8% of the boys reported high levels of depressive symptoms (SMFQ ≥ 11), and an independent chi-squared analysis revealed significant gender differences $\chi^2$ (1) = 17.509 $p$ < .001, Cramer`s V = .110.

12-month prevalence
The 12-month prevalence among the population was 2.9 %, and an independent chi-squared analysis also indicated significant gender differences in 12-month prevalence, 4.5 % for girls and 1.3 % for boys, χ^2 (1) = 12.307 p < .05, Cramer's V= .093.

12-month incidence
The 12-month incidence is 4.8% in the population, and an independent chi-squared analysis indicated significant gender differences in 12-month incidence, 6.1 % for girls and 3.5 % for boys, χ^2 (1) = 7.518 p < .05, Cramer's V= .073.

Discussion
The results from this study show that almost 10 % of pupils in 6th to 10th grade report high levels of depressive symptoms. In contrast, only 3% report a 12-month prevalence. Moreover, nearly 5% of the sample report a 12-month incidence. Our results demonstrate that girls are twice as likely as boys to experience a high range of point prevalence and 12-month incidence. Further, girls are three times as likely as boys to report persistent depressive symptoms.

Point prevalence
Point prevalence is the proportion of a population with a disease or particular condition at a specific point in time (52). The point prevalence across the entire sample was 9.3% at the first assessment point and 7.9% at the second assessment point. At both assessment points, girls (12.2 % and 10.8%) report a point prevalence twice as high compared to boys (6.1% and 4.8%). These results demonstrate a gender difference in point prevalence even at an early age (11-14 years). Gender differences have also previously been reported among older adolescents (53, 54), whereas Bakken and colleagues (2017), assessing an older sample of adolescents (13-19 years old), reported a point prevalence of 29.3% and 10.8 % for female and males, respectively.

The discrepancies in point prevalence across reported studies may be dependent on several factors. The SMFQ has been employed in a variety of studies, and discrepancies in prevalence is reported depending on the cut-off score utilised for SMFQ. Recommended clinical cut-offs vary between ≥4 (55), ≥6 (56), ≥8 (42, 57, 58), ≥10 (59), ≥11 (40, 48) and ≥12 (60). The SMFQ should not be used to make a definitive diagnosis of depression. It has usefulness as a screening tool for situations where depression is suspected, and as an aid toward following a child's symptom severity and treatment response over time. Employing a cut off score of 8 or higher is considered significant, and has revealed a 60% sensitivity and 85% specificity for the SMFQ (42).

In accordance with previous research, and to reduce type II error, we defined "depression" by employing a stringent SMFQ score of 11 or greater (48).

Further, the discrepancies in prevalence may also be due to differences in means of assessment. For instance, in our study we ask about the presence of depressive symptoms over the past two weeks using a validated self-report questionnaire specifically

aimed at assessing depression and depressive symptoms among children and young adolescents (44). In contrast, Saluja and colleagues examined the presence of depressive symptoms during the past 12 months employing two items to assess levels of depression.

Based on previous research, we expected an increase in point prevalence from the first assessment point to the second assessment point. However, and contrary to our expectations, the results show a significant reduction in point prevalence between the assessment points. We expected an increase in the point prevalence because the population had become one year older at assessment point II, and previous research has strongly suggested an escalation in depressive symptoms when pupils, and specifically girls, go from childhood to adolescence (3, 22, 48, 61-63). Puberty is a transitional phase that involves development in many aspects: brains mature, bodies change, independence in identity evolves, the development of their social environment expands. Moreover, increased awareness of appearance and comparison to others in e.g., social media increases, as well as interaction with the available social context they are part of (64-66). Another potential explanation for this may be a re-test effect. Arrindell (67) has shown that when samples are assessed on two occasions, using the same self-report inventory, a mean change in scores towards less psychopathology is often observed. The re-test effect has been demonstrated in such widely-employed state measures as the Beck Depression and Anxiety Inventory, the Depression Adjective Check Lists, the Profile of Mood States and the Symptom Checklist-90 (67), but not for the SMFQ yet. Despite a possible re-test effect, the benefits of employing the same instrument in a longitudinal study is preferable (68).

A second explanation may be that the level of depressive symptoms typically varies over time (69), so the reduction may also be part of natural fluctuations of depressive symptoms in a sample of youth.

12-month prevalence

Our study shows a 12-month prevalence of 2.9% for the entire sample, and 4.5 % and 1.3 % rate for girls and boys, respectively. Our findings are in accordance with a reported 12-month prevalence of 2.7% assessed through clinical interviews using a sample of children and young adolescents between 8 to15 years of age. Moreover, Haarasilta et al. reported a 12-month prevalence of DSM-III-R major depressive episode of 6% for girls and 4.4% for boys among 15 to19-year-olds. Although the results from this study indicate an overall smaller 12-month prevalence compared to Haarasilta et al. (71), who assessed an older sample, the results are noteworthy.

The results show a 3 to 1, 12-month preponderance rate among girls compared to boys, whereas the point prevalence results show a 2-1 preponderance between girls and boys. A reasonable interpretation of this finding is that depressive symptoms among girls are more prevalent and fluctuate less compared to boys. Thus, the results demonstrate the importance of having a specific focus on girls in this age group.

Incidence

The present study found a 12-month total incidence rate at 4.8%, more specifically 6.1% among girls and 3.5% among boys. These results are somewhat smaller compared to what (27) reported. Assessing a sample of 1508 high school students (in 9th to 12th grade), they documented a 12-month incidence of 10.4% and 4.8% for girls and boys, respectively. Further, in assessing 4,175 youths aged 11–17 (72), they reported a 12 month incidence of 1.5 % DSM-IV mood disorder. Discrepancies in the incidence rate may be due to differences in the age range of the samples used. Our sample consisted of pupils in 6th to 10th grade compared to Lewisohn's sample, which was comprised of high school students in 9th to 12th grade.

Our study shows that a relatively high number of children aged 11-14 experience significant depressive symptoms, which is in contrast to previous research reporting that the proportion of children and adolescents who struggle with a high depressive symptom load remains relatively low until young adolescence and then increases until the age of 17-18 (33, 73, 74). Previous studies have indicated that depression and depressive symptoms have both a genetic anchoring and are partly influenced by the environment (75, 76). Environmental risk-factors like experiences of stress (77) and debut with alcohol become an increased focus on appearance among adolescents at 15 years of age (78). Moreover, with increasing age, school is perceived as more achievement oriented (79), and the level of interpersonal stressors are perceived as more prominent (35, 80) and are thus associated with depression (81).

Most children and young people go through adolescence without insurmountable difficulties, but many also experience mental health problems. How children and young people experience adolescence is different; for most children and young people adolescence provides experiences and strains that lead to healthy development, while for others the same strains can lead to perceived stress and mental illness (82).

The results from this study cannot provide evidence that older children and young adolescents experience overall more chronic stress compared to

same-aged youth who grew up decades earlier. Nevertheless, the results from this study clearly demonstrate that older children and young adolescents report substantial depressive symptoms at an early age. Moreover, the results also demonstrate that many young girls suffer significant depressive symptoms. In that regard, Rudolph (80) has shown that an increase in perceived stress related to interpersonal stressors, specifically in adolescent girls, was found to be associated with a greater extent of depression in girls compared to boys (83, 84).

Another interesting, and to a certain extent surprising, finding is the relatively large discrepancies in point prevalence, nearly 10% compared to a 12-month prevalence of almost 3%. This may indicate that the level of depressive symptoms fluctuate in adolescents, as previously reported (37, 85). The gender difference in point prevalence was found to be 2:1, with about twice as many girls as boys reporting high levels of depressive symptoms. Further, three times as many girls as boys report persistent depressive symptoms. This indicates that depressive symptoms tend to persist to a greater extent in girls compared to boys. In our study, about 1 in 3 adolescents with depressive symptoms have symptoms for one year or longer. Birmaher et al. (86) recorded that 1 out of 5 adolescents with depression show depressive symptoms for two years or longer. Discrepancies in persistent depressive symptoms between genders are likely to have many causes, both biological and social, and factors such as rumination. Rumination is most prevalent in women and an important factor in predicting variance in depressive symptoms over time (87, 88). Thus, further research has to explore if girls ruminate more extensively than boys even at a young age.

Reporting bias can also be an explanation for the gender difference in depression. Boys and girls are socialised differently, which can affect the incidence of depression. Girls are socialised to express more sadness and to be more comfortable and familiar with talking about sadness and negative emotions, while boys are socialised to inhibit sadness. By boys hiding that they are sad and not telling about it, it can contribute to the gender difference in depression (89). In general, men are less likely to seek help for mental health problems, which may be due to expectations related to masculinity, gender roles and norms (90).

Further studies should also explore the extent of the difference in depressive symptoms, comorbidity and functionality between those who report point prevalence and those who report 12-month prevalence. More specifically, future studies ought to examine the extent to which these two groups differ in other areas vital to healthy adaptation into adulthood, for instance, areas like quality of life,

resilience, interpersonal relationships, anxiety and self-efficacy. It is also important to examine the extent to which these two groups differ in prognosing persistence, relapse and deterioration. Such information would be crucial to depression prevention and intervention research, and scientifically very interesting.

Results from this study demonstrate that many older children and young adolescents experience depressive symptoms at a level that is alarming. Moreover, the finding that 3% of the population show a one-year consistency of substantial depressive symptoms highlights the need for more intervention tailored specifically for the middle-school level and especially aimed at children and adolescents who experience persistent depressive symptoms.

Methodological strengths and limitations
This study has several strengths and some limitations. The study presents results from a longitudinal population-based survey among older children and young adolescents. Moreover, a recognised self-report instrument has been used. However, in order to verify a clinical depression diagnosis, diagnostic interviews are needed, which is also the case in assessing comorbid disorders.

In this study we use data from pupils who answered the questionnaire at both measurement points, with a drop out-rate of 17.7 % from assessment point 1.

Conclusion
The aim of this study is to assess point prevalence, 12-month prevalence and 12-month incidence regarding depressive symptoms in a population-based sample of older children and young adolescents in 6th through 10th grade. To our knowledge, this is the first study reporting the prevalence of depressive symptoms at point-prevalence, 12-month prevalence and 12-month incidence by assessing the same sample of older children and young adolescents aged 11-14 twice during a one-year period. Overall, the results demonstrate high rates of depressive symptoms at an early age and substantial gender differences, where girls report significantly higher prevalence compared to boys.

The transition into adulthood is a critical period in life, with important implications for subsequent achievements and behaviour, and the emergence of depressive symptoms in young adulthood may have even more serious and long-lasting consequences than at other stages of life. Results from this study suggest that depressive symptoms are highly prevalent, and the study highlights the need for more intervention tailored to gender at the middle-school

level especially aimed at older children and young adolescents who experience persistent depressive symptoms. Depressive symptoms are likely to coexist with other adolescent problem behaviours, such as bullying and substance use (91). Teachers or practitioners, who work with youths who have such symptoms/behaviours, should be aware of such depression; successful treatment of depression could lead to many other positive health and behavioural outcomes for these youths. Increased awareness of depression among this age group is the first step toward implementing effective intervention.

Conflicts of interest
The authors declare no conflicts of interest.

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