Investigating Health Correlates of Adolescent Depression in Canada

Tracie O. Afifi, MSc[1]
Murray W. Enns, MD[2]
Brian J. Cox, PhD[2]
Patricia J. Martens, PhD[1]

ABSTRACT

Background: The prevalence of depression rises sharply during adolescence.[1,2] Understanding health correlates of adolescent depression may provide descriptive information with regard to which adolescents are more likely to be depressed. Health determinants have been found to have associations with depression in adult populations, but have never been investigated concurrently with depression in a national sample of adolescents in Canada. Therefore, the aim of the present investigation was to understand which health determinants would be significantly associated with adolescent depression.

Methods: A sample of 17,557 adolescents was used from the Canadian Community Health Survey (CCHS) 1.1 to determine the health correlates of adolescent depression among males and females. To understand the relationship between health determinants, logistic regressions were conducted.

Results: The survey had an 84.7% response rate. The past 12-month prevalence of depression among the sample of adolescents was 6.5% ± 0.4% (3.4% ± 0.27% for males and 9.8% ± 0.44% for females). Reporting fair/poor perceived health, smoking, alcohol dependence, food allergies, migraine headaches, chronic bronchitis, and having physical health conditions had positive associations with depression for males and females. However, gender differences in the relationship between health correlates and depression were found. Even after controlling for all variables, females were still more likely to be depressed.

Conclusions: Several health determinants were associated with depression in adolescents in Canada. However, the relationship between some health determinants and depression functioned differently for males and females.

MeSH terms: Adolescent; depression; health; Canada

Adolescence is a unique life stage that is vastly different from childhood. Research has shown that as children move into adolescence, depressive symptoms increase.[2] It has been estimated that depression is twice as common in adolescence compared to childhood.[1] The 12-month prevalence of adolescent depression in Canada in 1996 was estimated to be between 7 and 9%,[3] which was similar to the 12-month prevalence of depression among adults aged 25 to 44 years (4 to 9%).[4] A large body of research identifying multiple factors involved in adolescent depression exists. For example, such research has determined that female gender,[3,5,6] fair/poor general health,[5,7] school suspension,[5] poor family relationships,[5] alcohol problems,[8] low self-esteem,[7] and suicidal ideation[9] are associated with adolescent depression or depressive symptoms. However, research has not included several important health determinants concurrently when studying adolescent depression at a national level in Canada, even though health determinants have been found to have associations with mental health in adult populations.[10-16] A determinant of health is any factor that creates change in a health condition.[17] Health determinants in the current investigation included: physical activity, self-perceived general health, smoking, alcohol dependence, and numerous physical health conditions.

Understanding the health correlates of adolescent depression is important for several reasons. First, depressive disorders are one of the leading causes of disability worldwide.[18] It is important to understand adolescent depression since mental disorders in adolescence are likely to be accompanied by significant functional impairments, the development of other mental disorders, and are likely to continue into adulthood.[19] Identifying and treating depressed adolescents may have the potential to reduce or eliminate the burden of the disorder in current and later life stages.[20] Second, investigating health correlates of adolescent depression provides descriptive information with regard to which adolescents are more likely to be depressed. Gender differences in the prevalence of adolescent depression have been well established in the literature.[3,5,6,21] Females compared to males have been found to be three times more likely to suffer from depression in adolescence.[3] Males

and females were studied separately in the present investigation since the correlates of depression may be significantly different between genders. Significant findings would indicate how robust the gender effects are, and the importance of studying males and females separately.

The purpose of the present study was to understand health correlates of adolescent depression among males and females in Canada. Since females have a greater prevalence of depression, it was hypothesized that 1) females would have a higher prevalence of adverse health determinants compared to males, 2) significant positive associations between adverse health determinants and depression would be found among males and females, and 3) gender differences in depression would still exist even after controlling for all variables in the model.

METHODS

Sample

The Canadian Community Health Survey (CCHS) cycle 1.1 was used for the present analysis. The CCHS 1.1 data were collected in 2000-2001, using a three-frame, multistage, stratified sample design.[22] The response rate was 84.7%.[22] The individuals included in the present study were 12 to 19 years of age. The total sample size for the analysis was 17,557 (8,848 males; 8,709 females). Respondents were informed about the survey objectives and gave their consent to participate.[23]

Measures

Depression

The Composite International Diagnostic Interview-Short Form (CIDI-SF) was used to assess the number of depressive symptoms expressed by each respondent based on Diagnostic and Statistical Manual-IV (DSM-IV) criteria. Individuals with five symptoms or more had a 90% probability of having major depression in the past year.[15]

Health Determinants

Physical activity was measured using an index variable with three categories (active, moderate, and inactive), which was created by Statistics Canada. To create this index, the energy expenditure of participants was

TABLE I

Demographics and Health Determinants Stratified by Gender

	Males (n=8,848) Percent	Females (n=8,709) Percent
Demographics		
Income (Cdn dollars)*		
0-$14,999	6.4	8.5
$15,000-$29,999	12.4	13.6
$30,000-$49,999	20.3	20.5
$50,000-$79,999	29.2	30.5
$80,000 +	31.7	26.9
Race*		
White	81.6	83.4
Visible minority	18.4	16.6
Health Determinants		
Physical activity index*		
Active	52.5	36.2
Moderate	23.3	25.2
Inactive	24.2	38.6
Perceived general health*		
Excellent	32.2	27.4
Very good	41.0	40.6
Good	22.6	26.3
Fair/poor	4.2	5.7
Smoking*		
Not at all	82.5	80.3
Occasionally	5.6	6.2
Daily	11.9	13.5
Alcohol Dependence*	3.4	2.1
Depression*	3.4	9.8
Physical Health Conditions		
Number of conditions*		
0	56.6	50.0
1	28.1	29.3
2+	15.3	20.7

* Chi-square value significant at $p < 0.05$

TABLE II

Frequencies of Physical Health Conditions Separately for Male and Female Adolescents in Canada*

	Males (n=8,848)		Females (n=8,709)	
Chronic Condition	n (%)	Standard Error	n (%)	Standard Error
Food allergies	515 (5.2)	0.33	697 (8.0)	0.40
Allergies other than food	2307 (26.3)	0.65	2491 (28.4)	0.67
Asthma	1131 (12.4)	0.49	1141 (12.8)	0.49
Fibromyalgia	2 (0.0)	0.0	12 (0.1)	0.05
Arthritis/rheumatism	66 (0.7)	0.12	155 (1.5)	0.18
Back problems	469 (4.8)	0.32	733 (8.3)	0.41
High blood pressure	49 (0.7)	0.12	54 (0.6)	0.11
Migraine headaches	448 (4.5)	0.31	821 (9.2)	0.43
Chronic bronchitis	114 (1.2)	0.16	142 (1.3)	0.17
Diabetes	26 (0.3)	0.08	29 (0.3)	0.08
Epilepsy	40 (0.4)	0.09	39 (0.4)	0.09
Stomach/intestinal ulcers	35 (0.2)	0.07	82 (1.0)	0.15
Urinary incontinence	28 (0.3)	0.08	42 (0.5)	0.10
Bowel disorder	34 (0.3)	0.08	45 (0.5)	0.10
Thyroid condition	13 (0.2)	0.07	83 (1.0)	0.15
Chronic fatigue syndrome	11 (0.1)	0.05	26 (0.3)	0.08
Multiple chemical sensitivities	56 (0.6)	0.11	88 (1.1)	0.15

* Physical health conditions (e.g., heart disease, cancer and stroke) where the prevalence was expected to be very low were not included in the analysis.

calculated using the frequency and time per session of physical activity and the MET value (a value of metabolic energy cost expressed as kilocalories expended per kilogram of body weight per hour of activity).[24]

The respondents were asked to rate their general health as excellent, very good, good, fair, or poor. Due to small cell counts, the responses of fair and poor were combined. Smoking was assessed as occur-

ring daily, occasionally, or not at all. The CIDI-SF was used to assess alcohol use disorders based on the criteria of the DSM-IV, where three symptoms or more indicated alcohol dependence.[25]

Physical health conditions were defined as any health condition that had lasted or was expected to last at least 6 months and had been diagnosed by a health care professional. Numerous conditions were included in the CCHS 1.1. The number of

TABLE III

Logistic Regression Results for Health Determinants with Depression Among Male and Female Adolescents in Canada

	Males (n=8,848)		Females (n=8,709)	
	Odds Ratios*	95% CI	Odds Ratios*	95% CI
Physical activity index				
Active	1.00	–	1.00	–
Moderate	1.30†	(1.27-1.33)	0.92†	(0.90-0.93)
Inactive	1.03†	(1.00-1.05)	0.93†	(0.92-0.95)
Perceived general health				
Excellent	1.00	–	1.00	–
Very good	1.74†	(1.69-1.79)	1.47†	(1.44-1.50)
Good	2.34†	(2.27-2.41)	1.79†	(1.76-1.83)
Fair/poor	5.35†	(5.15-5.56)	3.80†	(3.70-3.89)
Smoking				
Not at all	1.00	–	1.00	–
Occasionally	2.06†	(2.00-2.13)	2.02†	(1.98-2.06)
Daily	1.59†	(1.55-1.63)	2.59†	(2.56-2.63)
Alcohol dependence	2.64†	(2.56-2.72)	2.93†	(2.84-3.01)
Food allergies	1.58†	(1.53-1.64)	1.15†	(1.13-1.18)
Allergies other than food	0.69†	(0.67-0.71)	0.64†	(0.62-0.65)
Asthma	0.92†	(0.89-0.94)	1.34†	(1.32-1.37)
Back problems	2.47†	(2.39-2.55)	1.01	(0.99-1.04)
Migraine headaches	1.47†	(1.41-1.52)	1.27†	(1.24-1.29)
Chronic bronchitis	1.73†	(1.62-1.83)	1.32†	(1.27-1.37)
Number of health conditions				
0	1.00	–	1.00	–
1	1.32†	(1.28-1.36)	1.86†	(1.82-1.89)
2+	2.02†	(1.93-2.12)	2.36†	(2.29-2.43)

* All variables were entered into one multiple regression. Separate logistic regressions were run for males and females. Odds ratios were adjusted for low income and race.
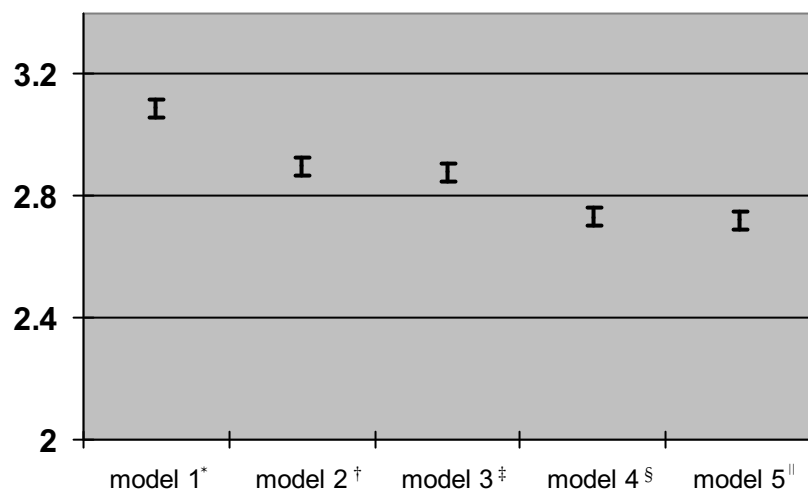
† $p \leq 0.05$

Figure 1. Plotted adjusted odds ratios and 95% confidence intervals for gender¶ from the sequential logistic regression models for depression

    * No control variables
    † Controlling for income and race
    ‡ Controlling for income, race, physical activity index, perceived general health, smoking, and alcohol dependence
    § Controlling for income, race, and number of chronic health conditions
    || Controlling for income, race, physical activity index, perceived general health, smoking, alcohol dependence, and number of chronic health conditions
    ¶ Male reference group

conditions of each respondent was divided into zero, one, and two or more.

Sociodemographic Variables
A dichotomous household income variable (low and middle to high) was created by Statistics Canada. Low-income households were defined as those who made less than $15,000 with 1 or 2 individuals within the household, those who made less than $20,000 with 3 or 4 people within the household, and those who made less than $30,000 with 5 or more people within the household. Race was measured by a variable created by Statistics Canada, which identified individuals who were White or a member of a visible minority.

Statistical procedure

To describe the study sample, frequencies were run on specific physical health conditions and crosstabulations were conducted on sociodemographic variables and health determinants by gender. Logistic regressions were run to understand the associations between health determinants and adolescent depression separately for males and females when all other variables in the model were controlled. Finally, a series of models were tested using logistic regressions to determine if gender differences existed after controlling for all variables in the analysis. The appropriate sampling weights were applied in all analyses.

RESULTS

The past 12-month prevalence of depression among the sample of adolescents was $6.5\% \pm 0.4\%$ ($3.4\% \pm 0.27\%$ for males and $9.8\% \pm 0.44\%$ for females). The descriptive information for sociodemographic variables and health determinants is presented in Table I. Significant differences between genders were found for sociodemographic variables and health determinants. Table II presents the prevalence of physical health conditions by gender. The prevalence of physical health conditions that usually manifest in adulthood was low, therefore these conditions were not included in the multivariate models. The odds ratios from the logistic regressions conducted separately for males and females are presented in Table III. With few exceptions, most health determinants had a significant positive relationship with depression for males and females. Figure 1 contains the odds ratios for gender and depression in five sequential models. The final model controlled for all variables and determined that females' likelihood of depression was still greater relative to males (Odds Ratio 2.72, CI = 2.69-2.75).

DISCUSSION

The purpose of this study was to examine the health correlates of male and female adolescent depression in a nationally representative sample. It was hypothesized that 1) females would have a higher prevalence of adverse health determinants compared to males, 2) significant positive associations between adverse health determinants and

depression would be found among males and females, and 3) gender differences in depression would still exist even after controlling for all variables in the model. In keeping with our prediction, the data indicated that females compared to males had a higher prevalence of physical inactivity and had more physical health conditions, lending support to hypothesis one. Significant associations between health determinants and depression were found in both males and females, supporting hypothesis two. Finally, the sequential logistic regressions comparing males and females determined that even after controlling for health determinants, females had higher odds of being depressed, supporting hypothesis three.

The current research determined that fair/poor perceived health, smoking, alcohol dependence, food allergies, migraine headaches, chronic bronchitis, and having physical health conditions had positive associations with depression among male and female adolescents, indicating the importance of these health determinants when attempting to identify which adolescents are more likely to be depressed. Additionally, it is important for health care professionals treating adolescents to be aware that certain physical health conditions or having more than one condition in adolescence is associated with depression.

Past clinical research has found that a positive association exists between adolescent depression and alcohol problems.[8] The current results extend our knowledge to the general population by determining that this relationship exists for males and females even after controlling for the effects of several health determinants. Similarly, past research has detected a positive association between smoking and adolescent depression.[26-28] The current research confirms the association between smoking and adolescent depression, while furthering our understanding by determining that the relationship exists for males and females when the effects of all other health determinants in the model are controlled.

Consistent with past research on physical health conditions and depression using adult samples, not all conditions in the current research were associated with depression.[11,15] Allergies other than food was the only health correlate that was neg-atively associated with depression for males and females. It may be that allergies other than food are less debilitating compared to other chronic conditions such as migraine headaches. Additionally, symptoms of allergies other than food compared to other physical health conditions may be easier to control and may not frequently interfere with one's lifestyle. Interestingly, the relationship between asthma and depression was different in male and female adolescents. A negative relationship between asthma and depression was found for male adolescents (OR = 0.92, 95% CI = 0.89-0.94), while a positive relationship existed for female adolescents (OR = 1.34, 95% CI = 1.32-1.37). Past research using child and adolescent samples have suggested that an association between depression and asthma exists, although these studies were not stratified by gender.[29-31] Asthma is a complex spectrum condition and further study is required to understand its relationship with depression and the different experiences reported by males and females.

Inconsistencies exist in past research on physical activity and adolescent depression with some research finding a significant negative association and other research finding no relationship.[27,32] The current research extends previous efforts by stratifying by gender rather than controlling for gender.[27,32] The current results indicate that moderate or inactive physical levels were positively associated with depression among males. However, a moderate or inactive physical level among females decreased the odds of being depressed. It is possible that physical activity could function differently for males and females as suggested by the current findings. A potential confounder in the relationship between actual levels of physical activity and depression may be self-perception of physical activity. It is possible that the self-perception that one is active may also be associated with a decrease in depression, regardless of the actual measured level of activity.[12] In addition, it is possible that depression could have an impact on physical activity. However, due to the nature of cross-sectional data, the direction of this relationship cannot be determined. Therefore, current physical activity results should be interpreted with caution since the effect is small and requires replication.

The sequential logistic regressions indicate that gender differences existed with females being more likely to be depressed even after controlling for all variables in the model. Although the health correlates have been shown to have significant associations with depression for males and females, they are unable to account for the gender differences in the odds of being depressed. These variables alone do not explain why females are more likely to experience depression.

A limitation of the present study was the cross-sectional nature of the data, which does not allow for inference of causation. Additionally, the sole reliance on self-report is a limitation of the study. Although this may be considered a weakness, self-reported physical health conditions have been proven to be a valid measure of diagnosis of such conditions.[21]

Many health correlates of adolescent depression were identified by the present investigation and all warrant attention in young populations. With few exceptions, endorsement of adverse health correlates was associated with depression for male and female adolescents, indicating an important relationship between physical health and depression among the young cohort. The present report addressed limitations noted in past research by evaluating several health correlates in the same investigation. Further research on health determinants is needed to advance our understanding and to fill knowledge gaps in the relationship between physical health and adolescent depression.

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RÉSUMÉ

Contexte : La prévalence de la dépression est plus élevée pendant l'adolescence. Il est donc important d'étudier les déterminants de la santé associés à la dépression pour pouvoir décrire quels adolescents sont les plus susceptibles d'être déprimés. On a constaté que certains déterminants de la santé sont associés à la dépression chez l'adulte, mais ce phénomène n'a pas été étudié auprès d'un échantillon d'adolescents canadiens. Le but de notre étude était d'identifier les déterminants de la santé associés de façon significative à la dépression chez les adolescents.

Méthode : Nous avons utilisé un échantillon de 17 557 adolescents tiré de l'Enquête sur la santé dans les collectivités canadiennes (ESCC) - Cycle 1.1 afin de dégager les déterminants de la santé associés à la dépression chez les adolescents. Nous avons procédé par régressions logistiques pour comprendre le rapport entre les déterminants de la santé et la dépression.

Résultats : Les résultats ont démontré que la perception d'avoir une santé mauvaise ou médiocre, le tabagisme, les problèmes d'alcool et les maladies chroniques (entre autres) étaient associés à la dépression chez les hommes et les femmes. Cependant, nous avons découvert des différences entre les sexes à cet égard. Même compte tenu de toutes les variables, le taux de dépression était plus élevé chez les femmes.

Conclusions : Plusieurs déterminants de la santé étaient associés à la dépression chez les adolescents canadiens, mais les liens entre certains déterminants de la santé et la dépression étaient différents selon le sexe.