

Childhood Sexual Abuse, Girls' Genitourinary Diseases, and Psychiatric Comorbidity: A Matched-Cohort Study

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Objective: The present study aimed to determine whether psychiatric comorbidity (i.e., diagnostic comorbidity in eight categories of mental and behavioral disorders) mediates the relationship between childhood sexual abuse (CSA) and diseases of the genitourinary system (*International Statistical Classification of Diseases and Related Health Problems*, 10th revision) among girls. **Method:** Using a prospective matched-cohort design, we documented diagnoses given by a physician after a medical consultation or hospitalization for diseases of the genitourinary system, for 661 sexually abused girls and 661 matched controls via administrative databases covering the period between January 1996 and March 2013. Path analyses using negative binomial regressions with CSA as independent variable, psychiatric comorbidity as mediator and genitourinary diseases diagnoses as dependent variables were performed. **Results:** After controlling for socioeconomic level, prior genitourinary diseases and number of years of medical data, the mediation effect for the path from CSA to genitourinary diseases through psychiatric comorbidity was significant for the urinary system ($b = .125$, 95% confidence interval [0.057, 0.192]) as well as for the genital system ($b = .213$, 95% confidence interval [0.141, 0.285]). Psychiatric comorbidity carried 62% of the sexual abuse total effect on the number of diagnoses received for genital diseases, whereas it carried 23% of the sexual abuse total effect on the number of diagnoses received for urinary diseases. **Conclusions:** Findings suggest that CSA may have an indirect effect on girls' diagnosed genitourinary diseases during a medical consultation or hospitalization through the increased risk for psychiatric comorbidity. Early interventions aimed at addressing psychological distress among sexually abused girls might prevent the emergence of genitourinary diseases years after the abuse.

Keywords: childhood sexual abuse, genitourinary diseases female, psychiatric comorbidity, cohort study

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Childhood sexual abuse (CSA) has well documented deleterious effects on victims' psychological functioning in adulthood (Afifi et al., 2014; Fergusson, McLeod, & Horwood, 2013; Hillberg, Hamilton-Giachritsis, & Dixon, 2011). It has only recently been more widely recognized that sexual abuse in childhood could also have long-term consequences on survivors' physical health. In-

deed, adult survivors of CSA are more at risk of having poorer general health, as well as to suffer from a host of physical symptoms including arthritis, back problems, chronic bronchitis, cancer, diabetes, bowel disease, endometriosis, chronic fatigue syndrome, obesity, as well as gastrointestinal and cardiopulmonary symptoms (Afifi et al., 2016; Harris et al., 2018; Irish, Kobayashi, & Delahanty, 2010).

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Psychological, behavioral, and biological mechanisms have been proposed to explain how adverse childhood experiences, such as sexual abuse, neglect or family upheaval could contribute to the development of physical health problems in adulthood (Kendall-Tackett, 2013; Miller, Chen, & Parker, 2011; Min, Minnes, Kim, & Singer, 2013). At the behavioral level, it is suggested that stress resulting from CSA entails greater psychological distress, leading to a higher risk of developing mental health problems and engaging in health risk behaviors (e.g., alcohol and substance abuse, smoking, risky sexual behaviors). In turn, mental health problems and health risk behaviors could increase the risk for poorer physical health in adulthood (Beck, Palic, Andersen, & Roenholt, 2014; Chartier, Walker, & Naimark, 2009). At the biological level, some studies have shown dysregulation in the hypothalamic–pituitary–adrenocortical axis and changes in inflammatory marker levels among adults with a CSA history (D’Elia et al., 2018; Heim et al., 2000), which in turn have been associated with proinflammatory responses that ultimately foster chronic diseases (Miller et al., 2011). Still, the majority of studies on physical health consequences of CSA and their underlying mechanisms have been conducted among adult populations, which relied on self-reports of the participant’s physical health status and abuse history, potentially leading to recall bias (Beck et al., 2014; Chartier et al., 2009; Sachs-Ericsson, Blazer, Plant, & Arnow, 2005). Yet, conducting research among children and adolescents with substantiated sexual abuse is critical to identify relevant intermediate variables that lie in the causal path between CSA and physical health problems. By studying these mechanisms closer to the occurrence of CSA, critical targets could be identified to foster efficient prevention efforts aimed at reducing the lifelong burden of CSA.

Associations of CSA and Diseases of the Genitourinary System

Among all physical health problems, those related to genitourinary health such as urinary tract infections, vaginitis, and dyspareunia (painful intercourse) can be particularly important to document in adolescence among girls, when sexual activity begins for a majority (Finer & Philbin, 2013), and knowledge about sexuality and habits develop (contraception use, genital hygiene, etc.)

Cross-sectional studies among children or adult women have shown associations between a history of CSA and genitourinary diseases such as vulvodynia (Harlow & Stewart, 2005; Khandker, Brady, Stewart, & Harlow, 2014), dyspareunia or other pelvic floor dysfunctions/pain (Landry & Bergeron, 2011; Lathe, Mignini, Gray, Hills, & Khan, 2006; Mark, Bitzker, Klapp, & Rauchfuss, 2008), vulvovaginitis or pathologic vaginal discharge (Anderson et al., 2014; Champion et al., 2005), and urinary problems such as enuresis (Anderson et al., 2014; Frothingham et al., 2000) or urinary frequency, urgency, and nocturia (Link, Lutfey, Steers, & McKinlay, 2007). Only one matched-cohort study among a pediatric population revealed that up to 12 years after substantiation, girls with a history of CSA had 2.1 and 1.4 times more diagnoses for urinary and genital health problems when compared to girls from the general population, whereas the number of medical consultations for sexually transmitted infections (STIs) did not differ (Vézina-Gagnon, Bergeron, Frappier, & Daigneault, 2018). However, the process through which CSA could exert its detrimental effect on the genitourinary system remains to be elucidated.

One of the mechanisms proposed by Kendall-Tackett (2013) as to how abuse might influence health is through the development of psychological distress such as depression and posttraumatic stress disorder (PTSD). Empirically, two population-based studies showed that mental health problems mediated the relationship between CSA and varied physical health indicators (global health, stomach and headache symptoms), underscoring the importance of this pathway (Beck et al., 2014; Chartier et al., 2009). However, cross-sectional designs used in these studies prevented the examination of the temporal relationships among these variables, and only broad dimensions of health were retrospectively assessed.

Associations Between Mental and Behavioral Disorders and Diseases of the Genitourinary System

In the general pediatric population, there is growing evidence of associations between mental health problems and different genitourinary symptoms. Using administrative health care data, a study conducted among more than 400,000 children living in Alberta, Canada, revealed that girls (aged 6 through 17 years) who had menstrual problems or diseases of the genitourinary system were up to three times more at risk of also receiving a diagnosis for either behavioral, emotional or psychotic psychiatric disorders (Spady, Schopflocher, Svenson, & Thompson, 2005).

For disorders of the genital system specifically, such as menstrual cycle irregularity, dysmenorrhea (i.e., painful menstruation) or amenorrhea (i.e., absence of menstruation), cross-sectional and longitudinal studies among adolescent girls indicated associations with depression, anxiety, higher stress levels or somatic complaints (Ambresin, Belanger, Chamay, Berchtold, & Narring, 2012; Beal et al., 2014; Gagua, Tkeshelashvili, Gagua, & McHedlishvili, 2013; Yu, Han, & Nam, 2017). Anxiety, depression and PTSD have also been identified as risk factors for the development of genitopelvic pain/penetration disorder (e.g., dyspareunia, vaginismus, vulvodynia) in women and adolescents (Iglesias-Rios, Harlow, & Reed, 2015; Khandker et al., 2011; Landry & Bergeron, 2011). For disorders of the urinary system specifically, the majority of studies have focused on bladder pain syndrome/interstitial cystitis. Studies showed strong associations between this condition and mental health problems such as anxiety disorders or depression (or varying between 2.0 and 4.6; Chung, Liu, Lin, & Chung, 2014; Clemens, Meenan, O’Keeffe Rosetti, Kimes, & Calhoun, 2008).

Although previous research has demonstrated associations between CSA, psychiatric problems, and diseases of the genitourinary system separately, only one study to our knowledge has tested a psychological mechanism among a small sample of sexually active adolescent girls (Santerre-Baillargeon, Vézina-Gagnon, Daigneault, Landry, & Bergeron, 2017). Although results revealed that anxiety might be one of the mechanisms by which CSA leads to increased risk of developing genitopelvic pain, the study’s cross-sectional design limited its conclusions. Furthermore, only genitopelvic pain and anxiety were studied, while other psychiatric disorders such as depression or PTSD have also been linked to diverse genitourinary diseases. Moreover, given that an increasing number of mental disorders experienced by an individual has been associated with heightened odds of a diagnosis of different medical conditions (Scott et al., 2016), psychiatric comorbidity appears to be a crucial variable to consider. Indeed, the co-occurrence of

mental and behavioral disorders may be a more robust indicator of psychological distress. In sum, longitudinal designs documenting a wider range of diseases of the genitourinary health system and psychiatric disorders are needed for a more comprehensive understanding of the temporal sequence via which CSA, the onset of psychiatric problems and genitourinary health problems occur.

Aims

The present study aimed to determine whether psychiatric comorbidity mediates the relationship between CSA and diseases of the genitourinary system among girls using a matched-cohort design. We hypothesized that girls with a substantiated CSA would have greater psychiatric comorbidity following the first CSA report compared to girls from the general population, which in turn would be associated with more genitourinary disease diagnoses during a medical consultation or hospitalization following the first psychiatric diagnosis.

Method

This matched-cohort study was part of a larger study in which mental and physical health problems of abused children were compared with those from a general population group over a 12-year period following the sexual abuse report, using administrative databases from the public health care system and from a large Canadian city's Child Protection Agency (CPA; Daigneault, Vézina-Gagnon, Bourgeois, Esposito, & Hébert, 2017). Administrative databases from the health insurance agency, the ministry of health and social services and the CPA were merged to obtain the final database for the present study. Required authorization certificates for obtaining administrative data have been granted by the institutional review boards of the CPA, the information access commissioner's office, the health insurance agency, and the first author's university. Administrative databases were transmitted denominated and encrypted to the research team and the health insurance agency and the participating CPA have waived the necessity to obtain individual participants' consent.

Participants

To reach sufficient sample size and to have access to sufficient medical data pre- and postsexual abuse report, participants were selected over 1 decade for a total sample of 955 abused participants, 92% of whom were matched for access to their medical data. For the present study, the final sample comprised 661 girls with a substantiated report of sexual abuse corroborated between January 1, 2001, and December 31, 2010, at the CPA and 661 girls from the general population. These 1322 girls represent 75% of the original sample (25% were boys—for more details on initial sample characteristics, see Daigneault et al., 2017). Using the public health insurance agency's administrative databank, which covers all Canadian citizens and foreign nationals authorized to stay within the province for more than 6 months, girls were matched by year of sexual abuse report (2001 through 2010), birth year and month, administrative region at the time of the substantiated report of sexual abuse, and admissibility to public drug insurance coverage versus private insurances (socioeconomic proxy). The average age for girls at the first corroborated sexual abuse report was 11.4 years ($SD = 4.2$ years) and varied from 1 to 17 years.

Measures

Sexual abuse. Sexual abuse is a two-level independent variable: (a) CSA group and (b) general population group. The corroborated sexual abuse may include sexual touching/fondling, oral sex, penetration or attempted penetration, voyeurism, exhibitionism, sexual incitation made orally or in writing and sexual exploitation (e.g., prostitution; Hélie, Turcotte, Trocmé, & Tourigny, 2012). Characteristics of the abuse (e.g., nature, frequency) were not available in our CPA database but a provincial incidence study of child abuse and neglect revealed that among all cases of corroborated sexual abuse, sexual fondling was the most common type (50%) followed by penetrative sex and oral sex in respectively 14% and 11% of the cases (Hélie, Collin-Vézina, Turcotte, Trocmé, & Girouard, 2017). Once the sexual abuse is reported to the Director of Youth Protection, the situation is summarily analyzed considering different factors (e.g., nature, gravity, the capacity and the will of the parents to put an end to the situation) to determine whether it should be retained for further evaluation. If the report is retained for evaluation, a social worker determines the level of corroboration of the sexual abuse reports as either (a) founded/substantiated (sufficient evidence that sexual abuse has occurred), (b) suspected (suspicion of sexual abuse but insufficient evidence to substantiate the presence or absence of abuse), or (c) unfounded/unsubstantiated (sufficient evidence to the absence of sexual abuse; Ministry of Health and Social Services, 2016). For the current study, only girls whose sexual abuse was substantiated between 2001 and 2010 at the CPA were selected and comprised of the sexually abused group. Girls from the general population could be matched only once to a sexually abused girl and formed the comparison group with no substantiated report of sexual abuse at the same CPA between 2001 and 2010.

Medical data. Diagnoses from the 10th version of the *International Statistical Classification of Diseases and Related Health Problems (ICD-10; World Health Organization, 2008)* were used to document psychiatric comorbidity and genitourinary diseases. All mental or behavioral disorders and genitourinary disease diagnoses given by a practitioner or physician following each medical consultation or hospitalization between January 1, 1996, and March 31, 2013, were included.

Comorbid mental and behavioral disorders categories. A psychiatric comorbidity variable was created using the eight mental and behavioral disorders categories from the *ICD-10* (listed in Table 1 in the [online supplemental materials; World Health Organization, 2008](#)). First, for each of the eight categories, a dichotomous score was created according to whether a participant had at least one diagnosis in this category; 1 = yes, 0 = no. Then, these eight scores were summed to create a psychiatric comorbidity total score ranging from 0 = *no diagnosis in any of the categories* to 8 = *at least one diagnosis in the eight categories*. This score was divided in two distinct variables representing the number of mental and behavioral disorders categories according to the following periods: (a) postreport date until the end of study (mediator variable) and (b) from the beginning of the study until the report date (control variable). Each of these variables' score varies from 0 to 8.

Diseases of the genitourinary system. Diseases of the genitourinary system were documented using the diagnostic categories from the *ICD-10 (World Health Organization, 2008)* listed in

Table 1 in the [online supplemental materials](#). A continuous score was created adding all diagnoses received during a medical consultation or hospitalization during the study period, which was divided in three distinct variables for each of the urinary system and genital system according to each of the following time periods: (a) after the first psychiatric diagnosis post report date until the end of study (dependent variable), (b) prereport date (control variable), and (c) between the report date and the first psychiatric diagnosis (second control variable). If there was no psychiatric diagnosis post report date, then the second control variable = 0.

Other Confounding Factors

Socioeconomic level. Socioeconomic level was measured by the material and social deprivation index that consists of six socioeconomic indicators, all derived from Canadian censuses, based on a small geostatic unit (200 to 400 people) derived from postal codes (Pampalon, Gamache, & Hamel, 2011). The six socioeconomic indicators are divided in two categories: (a) material deprivation, which includes the proportion of people aged 15 years and older with no high school diploma, the population–employment ratio of people aged 15 years and older, and the average income of people aged 15 years and older, and (b) social deprivation, which includes the proportion of individuals aged 15 years and older living alone, the proportion of individuals aged 15 years and older whose marital status is either separated and divorced or widowed, and the proportion of single-parent families (Pampalon et al., 2011). Material and social deprivation indexes were calculated as percentiles for all participants and were based on participants' postal code at the report date.

Number of years of medical data. Participants entered the study at different times between 2001 and 2010 according to the report date. Because psychiatric and genitourinary diagnoses after the report date were documented until 2013, the number of years of medical data varied from 3 to 12 years. Hence, the number of years of access to medical data after the report date for each participant was controlled for the analyses.

Statistical Analyses

Using SPSS Version 25.0, descriptive statistics (mean, standard deviation) were obtained for genitourinary diseases and psychiatric comorbidity. Even though each girl from the CSA group was matched to a girl from the general population during recruitment (forming 661 dyads), intraclass correlations (mixed model) revealed independence of scores for urinary diseases diagnoses (intraclass correlation coefficient = $-.023$, 95% confidence interval [CI] [-0.219 , 0.102]) and a small association for genital diseases diagnoses (intraclass correlation coefficient = $.14$, 95% CI [0.064 , 0.214]), indicating mediation analyses could proceed without being conditioned on pairing (Kenny, Kashy, Cook, & Simpson, 2006). To test the hypothesized model, with CSA as independent variable, psychiatric comorbidity as mediator and genital and urinary diseases diagnoses as dependent variables, path analyses using negative binomial regressions were performed with MPlus Version 8.2 (Muthén & Muthén, 1998-2015). All control variables described previously were included in the model. As outcomes are count variables, 95% CI for total, direct, and indirect effects were created with robust standard errors. Regressions were considered statistically significant when zero was not within the confidence interval.

Results

Descriptive Findings

The proportions of girls with a substantiated sexual abuse and of girls from the general population with at least one psychiatric diagnosis after the report date in each mental and behavioral disorders category are presented in Table 1. For all categories, the proportion of participants with at least one diagnosis was greater among the exposed group (CSA) than the general population group. Proportions varied from 2% for organic disorders to 46% for neurotic, stress-related and somatoform disorders among girls with substantiated sexual abuse, whereas for girls from the general

Table 1

Proportions of Girls With a Substantiated Sexual Abuse (n = 661) and Girls From the General Population (GP; n = 661) With at Least One Psychiatric Diagnosis After Date of Report in Each Mental and Behavioral Disorders Category (International Statistical Classification of Diseases and Related Health Problems, 10th Revision [ICD-10])

Mental and behavioral disorders categories (ICD-10)	CSA		GP	
	n	%	n	%
(1) Organic, including symptomatic, mental disorders	13	2.0	—	—
(2) Mental and behavioral disorders due to psychoactive substance use	69	10.4	16	2.4
(3) Schizophrenia, schizotypal, and delusional disorders	15	2.3	—	—
(4) Mood (affective) disorders	116	17.5	39	5.9
(5) Neurotic, stress-related, and somatoform disorders	303	45.8	137	20.7
(6) Behavioral syndromes associated with physiological disturbances and physical factors	30	4.5	13	2
(7) Disorders of adult personality and behavior	73	11.0	11	1.7
(8) Behavioral and emotional disorders with onset usually occurring in childhood and adolescence	188	28.4	76	11.5
0 - No diagnosis in any categories	254	38.4	469	71.0
1 - At least one diagnosis in one of the categories	200	30.3	118	17.9
2 - At least one diagnosis in two of the categories	101	15.3	51	7.7
3 - At least one diagnosis in three of the categories	48	7.3	17	2.6
4 - At least one diagnosis in four or more of the categories	58	8.8	6	0.9

Note. CSA = childhood sexual abuse; — = too few observations ($n < 5$) to report the prevalence.

population, proportions varied from 0.5% for organic disorders and schizophrenia, schizotypal and delusional disorders to 21% for neurotic, stress-related and somatoform disorders. Among girls with a substantiated sexual abuse, only 40% had no diagnosis in any categories whereas this proportion was 70% among girls from the general population. On average, girls with a substantiated sexual abuse had 1.22 categories ($SD = 1.38$, range = 0–7) with at least one psychiatric diagnosis, whereas girls from the general population had 0.45 categories ($SD = 0.84$, range = 0–6) with at least one diagnosis.

For diseases of the genitourinary system, girls with substantiated sexual abuse received on average 0.9 urinary disease diagnoses ($SD = 2.3$, range = 0–22), 1.1 genital disease diagnoses ($SD = 2.4$, range = 0–19), and 71% and 66% of them received no diagnosis for the urinary and genital health system respectively after the first psychiatric diagnosis, if present. For girls from the general population, they received on average 0.4 urinary diagnoses ($SD = 1.3$, range = 0–19), 0.6 genital diagnoses ($SD = 1.7$, range = 0–21), and 81% and 76% of them received no diagnosis for diseases of the urinary and genital system respectively for the same study period.

Main Results

Figures 1 and 2 illustrate mediation models and results for urinary (see Figure 1) and genital (see Figure 2) diseases, while controlling for socioeconomic level, number of years of medical data, psychiatric disorders and urinary or genital diseases (according to the model) that could have occurred before the first substantiated report of CSA, and between the report date and the first psychiatric diagnosis.

Results revealed that CSA predicted greater psychiatric comorbidity, which in turn predicted more diagnoses for diseases of the urinary system received after the report date and first psychiatric diagnosis (see Figure 1). The mediation effect for the path from CSA to urinary diseases through psychiatric comorbidity was significant ($b = .125$ 95% CI [0.057, 0.192], $p < .001$), supporting the mediator role of psychiatric comorbidity. In the full model, the direct association between CSA and urinary diseases remained significant. The ratio of indirect to total effect of CSA on diseases of the urinary system indicates that psychiatric comorbidity carried 23% of the sexual abuse total effect on urinary diseases.

Similarly, for the genital system, results revealed that CSA predicted greater psychiatric comorbidity, which in turn predicted more diagnoses for diseases of the genital system received after the report date and first psychiatric diagnosis (see Figure 2). The mediation effect from CSA to diseases of the genital system through psychiatric comorbidity was significant ($b = .213$ 95% CI [0.141, 0.285], $p < .001$), supporting the mediator role of psychiatric comorbidity. In the full model, the direct association between CSA and genital diseases was not significant ($b = .132$ 95% CI [−0.151, 0.414], $p = .316$). The ratio of indirect to total effect of CSA on diseases of the genital system indicates that psychiatric comorbidity carried 62% of the sexual abuse total effect on genital diseases.

Discussion

The goal of the current study was to determine whether psychiatric comorbidity mediated the relationship between CSA and subsequent diseases for diseases of the genitourinary system given in the context of a medical consultation or hospitalization following the first corroborated report of CSA among a population of children and adolescent girls. In accordance with the study's hypotheses, psychiatric comorbidity (i.e., number of mental and behavioral disorders categories with at least one diagnostic) after sexual abuse reports partly explained the relationship between CSA and later diagnoses for diseases of the urinary and genital system. Indeed, even after controlling for confounding variables (e.g., socioeconomic level, prior genitourinary diagnoses, number of years of medical data), girls with substantiated sexual abuse had more psychiatric comorbidity post CSA report than their matched controls, which in turn predicted their subsequent higher occurrence of urinary and genital diagnoses. These results suggest that CSA may be indirectly related to diseases of the genitourinary system through the increased risk for psychiatric comorbidity. Furthermore, even though some girls may be more likely to have more genitourinary diseases stemming from external reasons (e.g., genetics, hygiene practices), this study indirectly considered those factors by controlling all genitourinary diagnoses prior to the report date for girls from the sexual abuse and general population groups.

Results corroborate previous findings concerning psychological distress or lifetime psychiatric diagnoses as mediating the relation-

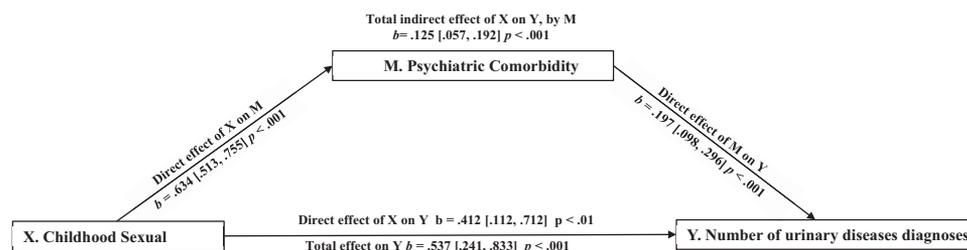


Figure 1. Results of mediation analysis testing the link between childhood sexual abuse and number of urinary diseases diagnoses through psychiatric comorbidity, while controlling for socioeconomic level, number of years of medical data, psychiatric disorders, and urinary diseases that could have occurred before the first substantiated report of sexual, as well as urinary diseases that could have occurred between the report date and the first psychiatric diagnosis. The b represents the unstandardized regression coefficient. The 95% confidence intervals for total, direct, and indirect effects were created with robust standard errors as our outcome is a count variable.

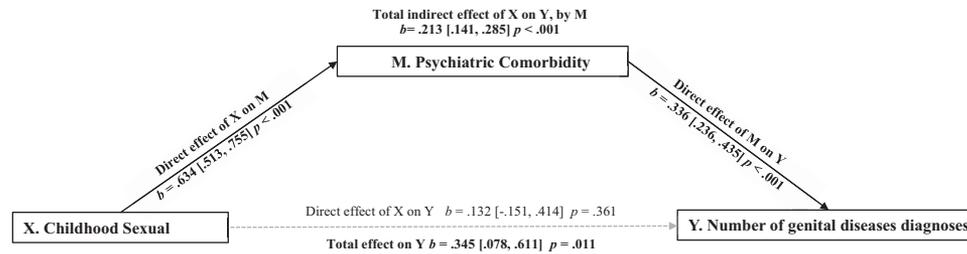


Figure 2. Results of mediation analysis testing the link between childhood sexual abuse and number of genital diseases diagnoses through psychiatric comorbidity, while controlling for socioeconomic level, number of years of medical data, psychiatric disorders, and genital diseases that could have occurred before the first substantiated report of sexual, as well as controlling for genital diseases that could have occurred between the report date and the first psychiatric diagnosis. The b represents the unstandardized regression coefficient. The 95% confidence intervals for total, direct, and indirect effects were created with robust standard errors as our outcome is a count variable.

ship between CSA and different physical health problem indicators (e.g., serious physical health problems, health care utilization, self-rated general physical health; Beck et al., 2014; Chartier et al., 2009; Sachs-Ericsson et al., 2005). Regarding genitourinary diseases specifically, our findings are also consistent with those of Santerre-Baillargeon et al. (2017), which showed that higher levels of trait anxiety may be one of the mechanisms by which CSA could lead to an increased risk of developing genitopelvic pain. In contrast to past studies relying on cross-sectional designs, the present longitudinal study clarified the temporal sequence between CSA, psychological distress, and subsequent medical consultations for diseases of the genitourinary system. Findings indicate that CSA is associated with later medical consultation or hospitalization for psychiatric disorders and that in turn, these medical consultations for psychiatric disorders are associated with later medical consultations or hospitalizations for diseases of the genitourinary system while controlling for prior genitourinary diseases, ensuring that the effect of CSA goes beyond preexisting genitourinary diseases and psychiatric disorders.

Results indicated that psychiatric comorbidity carried 62% of the sexual abuse total effect on diseases of the genital system, whereas it carried 23% of the sexual abuse total effect on diseases of the urinary system. These findings suggest that psychiatric comorbidity could be a stronger mediator for diseases of the genital system than for the urinary system and that other factors not tested in the model may be more important in explaining urinary disorders after CSA. However, further studies are needed to determine why this may be the case as well as which specific psychiatric conditions (e.g., anxiety or mood or psychotic disorders) may have a greater functional impact on the genitourinary system.

The trajectory leading from adverse childhood experiences such as sexual abuse to subsequent physical health problems is complex and has been conceptualized as multidetermined with different mechanisms influencing one another (i.e., biological, behavioral, cognitive, emotional and social; Kendall-Tackett, 2013; Miller et al., 2011). In light of the present study's results, more specific hypotheses related to CSA and genitourinary diseases may be advanced.

On a biological level, recent research on childhood trauma and early life adversities has suggested chronic activation of the

hypothalamic–pituitary–adrenocortical axis (stress response) and subsequent dysregulation of the immune system as potential physiological pathways explaining an increased vulnerability for later physical health problems (Baumeister, Akhtar, Ciufolini, Pariante, & Mondelli, 2016; Danese & McEwen, 2012; Slopen, Kubzansky, McLaughlin, & Koenen, 2013). However, a recent systematic review on the associations between CSA, co-occurring child maltreatment and an increase of inflammatory activity during adult life (e.g., levels of proinflammatory cytokines interleukin-6, interleukin-1 β , tumor necrosis factor- α , C-reactive protein), revealed that the specific effect of CSA was not significant (D'Elia et al., 2018). To explain this, the authors speculate some confounders such as the duration of abuse and the presence of psychiatric disorder comorbidity; especially because immune system alterations have also been observed in different mental disorders such as mood disorders and schizophrenia (Réus et al., 2015). Specifically applied to our study's results, this suggests that a girl with a history of CSA who would also develop greater psychiatric comorbidity as indicated by, for example, more than four different psychiatric diagnoses in a short period of time (about 9% of our sample), may have an even greater dysregulation of her stress response and immune system. In turn, a deregulated immune system could lead to a greater vulnerability to contract infections in the genital area, such as acute cystitis or vulvovaginitis. This immunological pathway could indirectly explain dyspareunia (painful intercourse) because cyclical vulvovaginitis and interstitial cystitis are associated with the development of dyspareunia (Meana & Binik, 2011). However, it would not explain menstrual disorders (e.g., dysmenorrhea, oligomenorrhea, amenorrhea), which has been associated with endocrine abnormalities (hypothalamic-pituitary-gonadal axis; Lee, Oh, Yoon, & Choi, 2012; Rajiwade, Sagili, Soundravally, & Subitha, 2018).

On the emotional and behavioral levels, two opposite pathways may be advanced to explain how girls with a history of sexual abuse who also developed greater psychiatric comorbidity may receive more genitourinary diagnoses than girls from the general population. The first pathway is related to a hypervigilance response; among CSA victims, those with greater psychiatric comorbidity, such as anxiety, depression or PTSD, may also become hypervigilant or more alert to any symptoms related to their genitalia, leading them to consult a physician more often for

purported genitourinary diseases. In contrast, the second pathway is related to behavioral avoidance, whereby CSA victims would delay or avoid seeking help and consultation with a physician for genitourinary diseases, risking deterioration and/or chronicization of these problems. Indeed, gynecological care can be reminiscent of the abuse situation (i.e., disparity in power between physician and patient, removal of clothing, vulnerability and potential pain) and can be particularly distressing for women exposed to CSA (Leeners et al., 2007). Also, in response to social stigma following sexual abuse, negative connotations such as self-blame, shame and guilt can become incorporated into the victim's self-image and the individual may feel deeply unworthy, defective or debased in comparison to others (Kennedy & Prock, 2018). As a result, victimized girls may believe that they must endure genital pain and might initially dismiss symptoms of gynecological disease. In both of these cases of heightened fear or shame, consultation with a physician may be avoided or sought only at a more advanced or acute stage of the disease, which may, in turn, require more interventions.

This study is unique in that it is the first time that diseases of the genitourinary system problems are studied in association with CSA and psychiatric disorders, among a large sample of girls with a substantiated report of sexual abuse and a comparison group, using longitudinal administrative data. This study design allows the documentation of a temporal sequence of all variables of interest, while also allowing controlling for preexisting genitourinary and psychiatric diagnoses, therefore controlling for the propensity of some individuals to develop these health problems under circumstances unrelated to sexual abuse.

Findings should nonetheless be interpreted in light of some of the study's limitations. First, because only 10% of all victims of CSA may have had contact with child protection organizations in Canada (Afifi et al., 2015), our results can only be generalized to girls who disclosed the abuse, came into contact with CPA services, and whose sexual abuse was substantiated. Second, characteristics of the abuse (e.g., nature, frequency), that may have shed some light on associations between severity of abuse (acute vs. chronic), psychiatric comorbidity and genitourinary diseases, were not available in CPA databases and, thus, could not be described or included in analyses. Also, other forms of maltreatment (e.g., physical abuse, neglect, exposure to intimate partner violence) that may co-occur with CSA (Finkelhor, Ormrod, & Turner, 2009) were not taken into consideration in our analyses because these data were not accessible for girls from the general population. Because co-occurring childhood maltreatment or other maladaptive family functioning (e.g., parental mental illness, substance abuse, criminality) contribute to subsequent psychopathology during childhood, adolescence and young adulthood (Kessler et al., 2010), these factors could also explain part of the genitourinary health problems throughout girls' development. To understand the specific influence of CSA on genitourinary diseases, it is important that future research document co-occurring childhood adversities. Third, as only substantiated reports at the participating CPA were documented in this study, it is possible that some girls from the general population were sexually abused without it being known. Consequently, the differences observed in our results could be underestimated. Also, even though previous studies have also documented health risk behaviors such as alcohol abuse and drug use as a potential mechanism linking CSA to physical health

problems (Beck et al., 2014; Chartier et al., 2009), such health risk behaviors were not examined in this study. Finally, in regard to genitourinary diseases specifically, sexual risk behaviors such as unprotected sex or early initiation of sexual activity, and subsequent STIs could be risk factors for the development of some genitourinary diseases (Trigg, Kerndt, & Aynalem, 2008). Even though sexual risk behaviors were not documented in this study, a previous study using the same database revealed that when controlling for diseases prior to the abuse report and socioeconomic level, girls with a substantiated sexual abuse had similar numbers of STIs diagnoses when compared to the group from the general population (Vézina-Gagnon et al., 2018). Therefore, it could not explain the variance in genitourinary diseases. However, sexual risk behaviors and STIs should be taken into account for future research, as our participants may have been too young and not sexually active yet, explaining this lack of association between CSA and STIs.

The present study results have several implications for researchers. Our findings revealed that CSA may have an indirect effect on diseases of the genitourinary system through the increased risk for psychiatric comorbidity. Perhaps, by preventing mental health problems and addressing psychological distress among sexually abused girls, it might prevent subsequent genitourinary disease years after the abuse. As for scientific implications, it is now crucial to have a better understanding of the complex web of mechanisms connecting CSA to genitourinary health conditions so that efficient interventions can be applied before these health problems become chronic in adulthood. It is only by addressing all of the underlying causes (psychological, physiological, behavioral, social) that we can hope to improve the genitourinary health of girls who have been sexually abused.

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