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Observational study

Chronic disruptive pain in emerging adults with and without chronic health conditions and the moderating role of psychiatric disorders: Evidence from a population-based cross-sectional survey in Canada

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HIGHLIGHTS

- In emerging adults, chronic conditions are associated with chronic disruptive pain.
- Alcohol and drug abuse/dependence disorder moderate this association.
- Integration of services to manage disruptive pain among emerging adults is required.

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ABSTRACT

Background and aims: There has been a growth in the proportion of emerging adults vulnerable to pain-related sequelae of chronic health conditions (CHCs). Given the paucity of research during this important developmental period, this study investigated the association between CHCs and chronic disruptive pain among emerging adults and the extent to which psychiatric disorders moderate this association.
Methods: Data come from the 2012 Canadian Community Health Survey – Mental Health (CCHS-MH). This cross-sectional survey included 5987 participants that were 15–30 years of age and self-reported their CHCs ($n = 2460$, 41%) and the extent to which pain impacted daily functioning using items from the Health Utilities Index Mark 3 (HUI 3). Group comparisons between respondents with CHCs and healthy controls were made using chi-square tests. Odds ratios (OR) and 95% confidence intervals (CI) were computed from ordinal logistic regression models adjusting for sociodemographic covariates. Product-term interactions between CHCs and psychiatric disorders were included in the models to explore moderating effects. All analyses were weighted to maintain representativeness of the study sample to the Canadian population.
Results: The mean age of participants was 23.5 (SE 0.1) years and 48% were female. Compared to healthy controls, a greater proportion of participants with CHCs reported having chronic pain (20.3% vs. 4.5%, $p < 0.001$). Among those with chronic pain, respondents with CHCs reported a greater number of activities prevented because of chronic disruptive pain ($\chi^2 = 222.28$, $p < 0.001$). Similarly, in logistic regression models, participants with CHCs had greater odds of reporting chronic disruptive pain (OR = 4.94, 95% CI = 4.08–5.99). Alcohol ($\beta = -0.66$; $p = 0.025$) and drug abuse/dependence disorders ($\beta = -1.24$; $p = 0.012$) were found to moderate the association between CHCs and chronic disruptive pain. Specifically, the probability of chronic disruptive pain was higher for emerging adults without CHCs and with alcohol or drug disorders; however, among participants with CHCs, probability was higher for those without these disorders.

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Conclusions: There is a robust association between CHCs and chronic disruptive pain. The moderating effects suggest that alcohol or drug disorders are especially harmful for emerging adults without CHCs and contribute to higher levels of chronic disruptive pain; however, among those with CHCs, alcohol and illicit drugs may be used as a numbing agent to blunt chronic disruptive pain.

Implications: Findings from this study have implications for the integration and coordination of services to design strategies aimed at managing chronic disruptive pain and preventing pain-related disabilities later in life. Within the health system, healthcare providers should engage in dialogues about mental health and substance use regularly with emerging adults, be proactive in screening for psychiatric disorders, and continue to monitor the impact of pain on daily functioning. Given the age range of emerging adults, there is tremendous opportunity for clinicians to work cooperatively with colleagues in the education system to support emerging adults with and without CHCs. Overall, clinicians, researchers, educators, and those in social services should continue to be mindful of the complex interrelationships between physical and mental health and chronic disruptive pain and work cooperatively to optimize health outcomes and prevent pain-related disabilities among emerging adults.

1. Introduction

It is well-established that chronic health conditions (CHCs), defined as those expected to last at least 6 months and result in at least one of the following sequelae: functional limitations, dependencies to overcome limitations, and health care above usual care for individuals of a similar age (e.g., asthma, diabetes, haemophilia) [1], and chronic pain are highly comorbid [2–9]. For instance, a Canadian study demonstrated that chronic non-cancer pain was significantly associated with certain medical conditions such as epilepsy, chronic obstructive pulmonary disease (COPD), and thyroid disease [6]. Likewise, Lunardi et al. reported the significant increase in the prevalence of chronic pain among patients with asthma as compared to patients without asthma [5]. Although there has been considerable research on the association between CHCs and chronic pain, there is a paucity of research that specifically examines this association in emerging adulthood, a critical developmental period that refers to individuals between the ages of 15 and 30 years [10–12]. The small number of studies that have studied the association between CHCs and chronic pain in young adults have produced similar results [13,14]. However, these existing studies do not encompass the full spectrum of emerging adulthood, are usually limited to a single CHC, and do not include validated assessment tools to measure chronic pain or its impact on functioning.

Among emerging adults with CHCs, chronic pain is of particular concern because: (1) The incidence rate of CHCs among emerging adults is increasing [15] and due to advances in health care, the number of children with CHCs that survive into adulthood is also increasing [16]; (2) Among emerging adults, chronic pain, especially chronic disruptive pain that limits usual activities such as personal care, work and family roles, and leisure and social pursuits, is associated with decreased quality of life, fatigue and disrupted sleep quality, psychological distress, poor peer and family relations, and school and work absenteeism [17,18]; (3) The lifetime prevalence of psychiatric disorders is significantly higher for emerging adults with CHCs compared to their healthy peers [19]; and (4) Emerging adulthood represents a unique developmental period due to the considerable physical, emotional, and social changes that occur during this period [11,10]. Moreover, this critical period involves a transition from the paediatric to the adult health care system and, as compared to children, emerging adults are expected to assume a greater responsibility for managing their chronic pain. As such, chronic pain, especially chronic disruptive pain, limits productivity and achievements, presents unique challenges for individuals navigating this dynamic developmental period, and holds potential adverse long-term consequences for the afflicted individual, their family, and society [12,17,20]. Understanding the interrelationship among CHCs, psychiatric disorder, and chronic pain is critical for developing strategies to facilitate the prevention and reduction of chronic pain, and prevent future pain-related disabilities in this population [17].

Consequently, given the growth of emerging adults as a large section of the population vulnerable to pain-related sequelae of CHCs and the dearth of research in this population, we investigated: (1) The association between having a CHC and chronic disruptive pain; and (2) The potential moderating effects of psychiatric disorders on this relationship. We hypothesized that individuals with CHCs would report more chronic disruptive pain compared to healthy controls; and, that psychiatric disorders would moderate this association such that individuals with comorbid CHCs and psychiatric disorder would report the greatest levels of chronic disruptive pain.

2. Methods

2.1. Data and sample

Data were obtained from the 2012 Canadian Community Health Survey – Mental Health (CCHS-MH). The CCHS-MH, conducted by Statistics Canada, is a cross-sectional survey that employed a multistage stratified cluster sampling design to interview a nationally representative sample of Canadians (≥15 years of age) residing in the Canadian provinces [21]. A three-stage sampling design was used to select the sample of respondents. First, clusters or geographical areas within the ten provinces were selected. Second, households (i.e., an individual or a group of related or unrelated individuals residing in the same collective or private dwelling) within the sampled clusters were chosen. Third, one respondent per selected household was randomly selected. Responses were obtained from 25,113 individuals. Canadians residing in the territories, persons living on reserves and other Aboriginal settlements, full-time members of the Canadian Forces, and the institutionalized population were excluded. Overall, the excluded population comprised 3% of the target population [21].

Data were collected directly from the selected survey respondents by decentralized field interviewers using computer-assisted personal interviewing. The majority of the interviews (87%) were conducted in-person and the remainder by telephone. For the CCHS-MH, the household-level response rate was 80%, the person-level response rate was 86%, and the combined (household and person) response rate was 69% [21]. For this study, the sample was restricted to participants aged 15–30 years ($n = 5987$). Respondents were made aware that participation in the CCHS-MH is voluntary and that confidentiality and privacy were guaranteed by Statistics Canada. Analyses were approved by the Hamilton Integrated Research Ethics Board.

2.2. Measures

2.2.1. Chronic disruptive pain

Based on the Health Utilities Index Mark 3 (HUI 3), a reliable, valid, responsive, and comprehensive health classification system for measuring health status and quality of life [22], chronic disruptive pain was assessed using responses from the following two items that captured the chronicity (question one) and disruptiveness (question two) of the pain: (1) "Are you usually free of pain or discomfort?" and (2) "How many activities does your pain or discomfort prevent?" If the respondents answered "no" to the first question, they were asked to quantify the number of activities prevented: "none", "a few", "some", or "most" (question two). Respondents who answered "yes" to question one were classified as having no pain. Higher scores on the chronic disruptive pain measure represented pain that prevented a larger number of activities of daily life and work such as personal care, work and family roles, and leisure and social pursuits. The pain attribute of the HUI 3 has been used in other studies assessing chronic disruptive pain among individuals with or without CHCs [18,23,24]. Furthermore, this attribute has shown a high degree of correlation with other validated pain measurement scales such as the numerical 11-point Box Scale [25].

2.2.2. CHCs

CHCs were assessed by presenting a list of long-term health conditions (had lasted or were expected to last for at least 6 months) to respondents who were then asked to endorse whether or not a health professional had ever diagnosed them with any of these conditions. The CHCs included in the CCHS-MH were: asthma, arthritis, back problems (not including fibromyalgia or arthritis), high blood pressure, migraine headache, chronic bronchitis/emphysema/chronic obstructive pulmonary disease, diabetes, epilepsy, heart disease, cancer, effects of a stroke, bowel disease (inflammatory bowel disease, Crohn's disease or ulcerative colitis), Alzheimer's disease/other dementia, chronic fatigue syndrome, multiple chemical sensitivities, and any other long-term conditions [21]. Respondents that did not endorse a diagnosis of any CHC were operationally defined as healthy controls. Based on this categorization, there were $n = 2460$ emerging adults with a CHC and $n = 3527$ healthy controls. Rules surrounding the export of Statistics Canada data, as well as the potential for sparse data in moderation analyses with psychiatric disorders, prevented the examination of CHC-specific associations with chronic disruptive pain. Instead, CHCs were aggregated using a validated non-categorical approach [1].

2.2.3. Psychiatric disorders

Assessment of psychiatric disorders was based on the World Health Organization Composite International Diagnostic Interview 3.0 (WHO–CIDI). The WHO–CIDI is a standardized, valid, and reliable instrument that is widely used in population surveys to assess mood and substance use disorders [26–29]. The WHO–CIDI consists of a comprehensive, fully-structured interview and employs computerized algorithms to provide diagnoses for mood and substance use disorders based on the Diagnostic and Statistical Manual of Mental Disorders version IV (DSM-IV) and the International Classification of Diseases version 10 (ICD-10). Beginning with a screening and lifetime review module, the WHO–CIDI determines the number of diagnostic sections to be completed based on predetermined skip patterns [26,30]. Psychiatric disorders derived in the CCHS-MH were based on 12-month prevalence of symptoms and categorized into two major categories: (1) mood disorders [major depressive, generalized anxiety, bipolar disorder, suicidal behaviour (thought, plan, or attempt; based on the Suicide subblock of the WHO–CIDI)]; and (2) substance use disorders [i.e., alcohol, cannabis, and other drugs abuse/dependence disorders]. Cannabis disorder was assessed independently from other drugs disorder. Respondents could meet criteria for multiple psychiatric disorders.

2.2.4. Covariates

Sociodemographic covariates were included in the analyses to provide unbiased estimates of the association between CHCs and chronic disruptive pain. These were: participant age, sex, immigrant status (born or not born in Canada), residence (urban or rural), educational attainment (primary school, secondary school graduate, some post-secondary school, or post-secondary graduate), and annual household income (from ≤$19,999 to ≥$120,000 in $20,000 increments).

3. Analysis

Group comparisons between participants with CHCs and healthy controls were made using χ^2 tests. Odds ratios (ORs) and associated 95% confidence intervals (CI) were computed from ordinal logistic regression models to quantify the associations between CHCs and psychiatric disorders with chronic disruptive pain, adjusting for the sociodemographic covariates. Independent models were computed for each psychiatric disorder and relative changes in the ORs were calculated. Product-term interactions between CHCs and psychiatric disorders were included in the ordinal logistic regression models to explore the potential moderating effects on chronic disruptive pain. Based on the probabilities of selection and participation, sample weights developed by Statistics Canada were applied to the analyses to ensure comparability between the CCHS-MH sample and the Canadian population. Because of the complex design of the CCHS-MH, Taylor Series Linearization was used to ensure the variance of estimates were unbiased. A total of $n = 2$ (0.03%) participants had missing data for the outcome variable (chronic disruptive pain). A total of $n = 123$ (2.1%) had missing data for any other covariate. There was no differential missingness by health status (CHC or healthy control) or psychiatric disorder (present or absent). Analyses were conducted with SAS 9.4 (SAS Institute Inc.).

4. Results

4.1. Sample characteristics

The mean age of participants was 23.5 (SE 0.1) years and 48% were female. Approximately 43% had completed post-secondary education, 19% were immigrants, and 87% resided in an urban area. As measured by the WHO–CIDI, 16% of the participants had a mood disorder and 13% had a substance use disorder. Compared to healthy controls, individuals with CHCs included significantly fewer males and immigrants, had lower income and educational attainment, and more major depressive, generalized anxiety, bipolar, suicidal behaviour, cannabis abuse/dependence, and other drugs abuse/dependence disorders. Detailed sample characteristics and group comparisons among participants with CHCs and healthy controls are shown in Table 1.

4.2. Associations of CHCs and psychiatric disorders with chronic disruptive pain

Compared to healthy controls, a greater proportion of participants with CHCs reported having chronic pain (20.3% vs. 4.5%, $p < 0.001$). Among those with chronic pain, respondents with CHCs reported a greater number of activities prevented because of chronic disruptive pain ($\chi^2 = 222.28$, $p < 0.001$; Fig. 1). This

Table 1
Characteristics of the study sample.

	Chronic health condition	Healthy control	χ^2 (p-value)
N	2460	3527	
Age			1.30 (0.522)
15–19 years	761 (30.9)	1150 (32.6)	
20–24 years	732 (29.8)	1069 (30.3)	
25–30 years	967 (39.3)	1308 (37.1)	
Female	1274 (51.8)	1580 (44.8)	10.56 (0.001)
Immigrant	294 (12.1)	839 (23.9)	38.04 (<0.001)
Urban residence	2129 (86.5)	3068 (87.0)	0.13 (0.720)
Educational attainment			9.51 (0.023)
Primary school	620 (25.5)	800 (22.7)	
Secondary school graduate	439 (18.1)	640 (18.2)	
Some post-secondary school	392 (16.1)	464 (13.2)	
Post-secondary graduate	979 (40.3)	1613 (45.9)	
Household income			26.40 (0.003)
≤$19,999	277 (11.3)	270 (7.6)	
$20,000–$39,999	453 (18.4)	535 (15.2)	
$40,000–$59,999	429 (17.4)	593 (16.8)	
$60,000–$79,999	367 (14.9)	597 (16.9)	
$80,000–$99,999	273 (11.1)	445 (12.6)	
$100,000–$119,999	392 (15.9)	628 (17.8)	
≥$120,000	269 (10.9)	459 (13.0)	
Mood disorder			
Major depressive	291 (11.9)	94 (2.7)	100.21 (<0.001)
Generalized anxiety	129 (5.3)	18 (0.5)	96.42 (<0.001)
Bipolar	112 (4.6)	27 (0.8)	44.73 (<0.001)
Suicidal behaviour	223 (9.1)	93 (2.6)	62.30 (<0.001)
Substance use disorder			
Alcohol	190 (7.8)	231 (6.6)	1.55 (0.214)
Cannabis	129 (5.3)	102 (2.9)	11.31 (0.001)
Other drugs	71 (2.9)	27 (0.8)	22.90 (<0.001)

Results are reported as *n* (percentage).

translated to an unadjusted odds ratio of 5.39 (95% CI = 4.47–6.50). Adjusting for sociodemographic factors, emerging adults with CHCs had increased odds of reporting chronic disruptive pain (OR = 4.94, 95% CI = 4.08–5.99) compared to healthy controls.

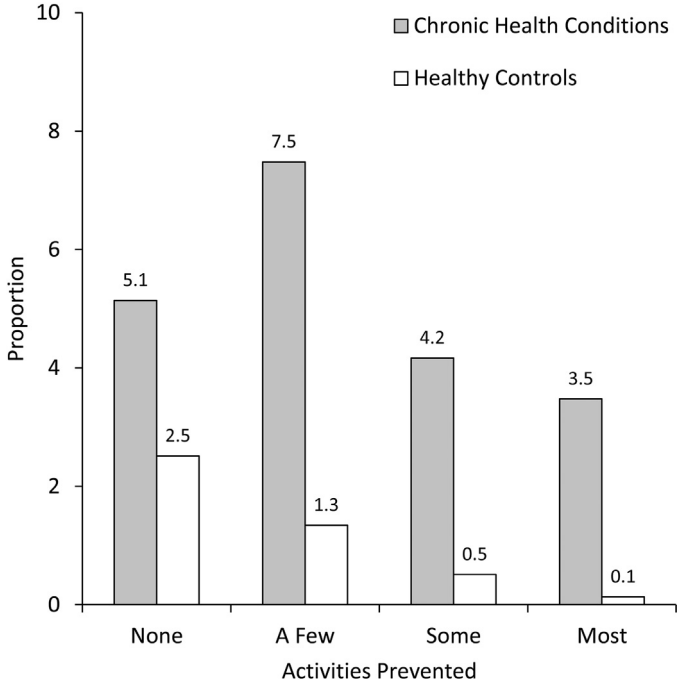

Fig. 1. Distribution of the impact of chronic disruptive pain. Results show the number of activities prevented because of pain for young people with and without chronic health conditions.

All psychiatric disorders had a significant independent effect on chronic disruptive pain (Table 2). For mood disorders, the ORs for the association between CHCs and chronic disruptive pain ranged from 4.30 (95% CI = 3.54–5.23) when controlling for major depressive disorder to 4.54 (95% CI = 3.74–5.51) when controlling for suicidal behaviour disorder. This represented a relative change in the OR from −13.0% to −8.1%. These changes in effect were not statistically significant and, based on established guidelines, were substantively very small [31]. For substance use disorders, the ORs ranged from 4.74 (95% CI = 3.90–5.75) when controlling for other drugs abuse/dependence disorder to 5.02 (95% CI = 4.14–6.10) when controlling for alcohol abuse/dependence disorder. Again, relative changes in effect were statistically not significant and very small in magnitude, ranging from −4.0% to +1.6% (Table 2).

4.3. Moderating effects of comorbid psychiatric disorders

As shown in Table 3, alcohol abuse/dependence disorder and other drugs abuse/dependence disorder were found to moderate the association between having a CHC and experiencing chronic disruptive pain (OR = 0.52, 95% CI = 0.29–0.92 and OR = 0.29, 95%

Table 2
Associations of chronic health conditions and psychiatric disorders with chronic disruptive pain.

	Measure of association with pain			Change in odds ratio, %
	Chronic health condition	Mood disorders	Substance use disorders	
Baseline model	4.94 (4.08, 5.99)			
Major depressive	4.30 (3.54, 5.23)	3.76 (2.97, 4.75)		−13.0
Generalized anxiety	4.50 (3.70, 5.47)	5.36 (3.87, 7.41)		−8.9
Bipolar	4.52 (3.72, 5.50)	6.04 (4.30, 8.50)		−8.5
Suicidal behaviour	4.54 (3.74, 5.51)	3.55 (2.74, 4.60)		−8.1
Alcohol	5.02 (4.14, 6.10)		1.81 (1.37, 2.40)	+1.6
Cannabis	4.76 (3.93, 5.78)		2.34 (1.67, 3.26)	−3.6
Other drugs	4.74 (3.90, 5.75)		3.52 (2.29, 5.41)	−4.0

Results are reported as odds ratio (95% confidence interval) based on ordinal logistic regressions. Independent models were computed for each mood and substance use disorder and, with the exception of the baseline model, adjusted for the effects of age, sex, immigrant status, residence, educational attainment, and household income. Changes in the odds ratios were calculated in relation to the baseline model to assess potential attenuation of effects.

Table 3
Influence of comorbid psychiatric disorder on chronic disruptive pain.

	Interaction beta (SE)	Odds ratio (95% CI)	*p*-value
Major depressive	−0.30 (0.32)	0.74 (0.40, 1.39)	0.354
Generalized anxiety	−0.24 (0.58)	0.79 (0.26, 2.43)	0.676
Bipolar	−0.07 (0.52)	0.93 (0.34, 2.59)	0.895
Suicidal behaviour	0.55 (0.40)	1.74 (0.79, 3.83)	0.169
Alcohol	−0.66 (0.29)	0.52 (0.29, 0.92)	0.025
Cannabis	0.21 (0.42)	1.24 (0.54, 2.83)	0.616
Other drugs	−1.24 (0.50)	0.29 (0.11, 0.76)	0.012

Product-term interactions between having a chronic health condition and mood or substance use disorder were included in ordinal logistic regression models. All models include chronic health condition and mood or substance use main effects and adjusted for the effects of age, sex, immigrant status, residence, educational attainment, and household income. CI, confidence interval; SE, standard error.

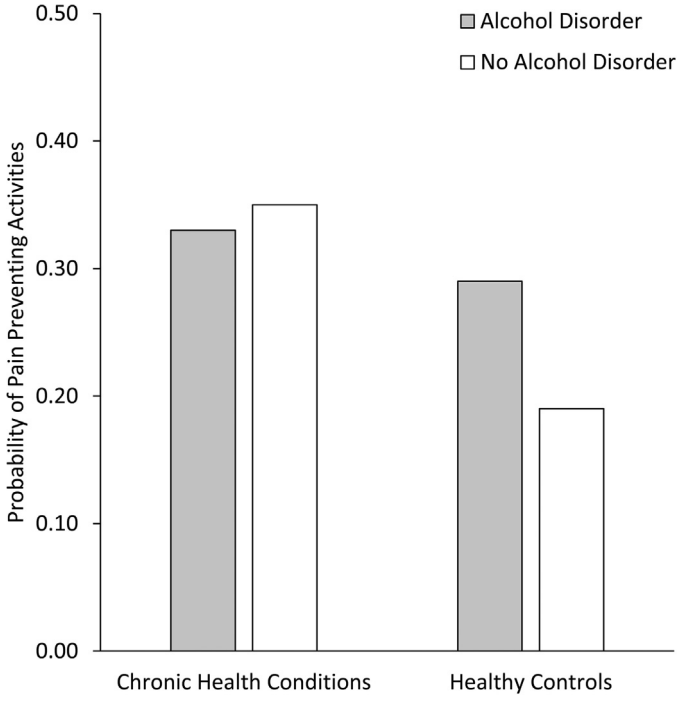

Fig. 2. Moderating effect of comorbid alcohol disorder on the association between having a chronic health condition and pain.

CI = 0.11–0.76, respectively). Results showed that among healthy controls, the odds of reporting chronic disruptive pain were higher for emerging adults with alcohol abuse/dependence disorder; however, among participants with CHCs, odds were higher for respondents without alcohol abuse/dependence disorder. Similar results were obtained for other drugs abuse/dependence disorder. Illustrations of these interactions are shown in Figs. 2 and 3. None of the models suggested that other psychiatric disorders moderated the association between CHCs and chronic disruptive pain.

5. Discussion

5.1. Summary of findings

Using recent data from a large, representative study of the Canadian population, findings provided evidence to suggest that the odds of chronic disruptive pain were higher among emerging adults aged 15–30 years with CHCs as compared to healthy controls. After adjusting for relevant sociodemographic factors, psychiatric disorders had a significant independent effect on chronic disruptive pain. Moreover, evidence suggested that alcohol abuse/dependence disorder and other drugs abuse/dependence disorder moderated

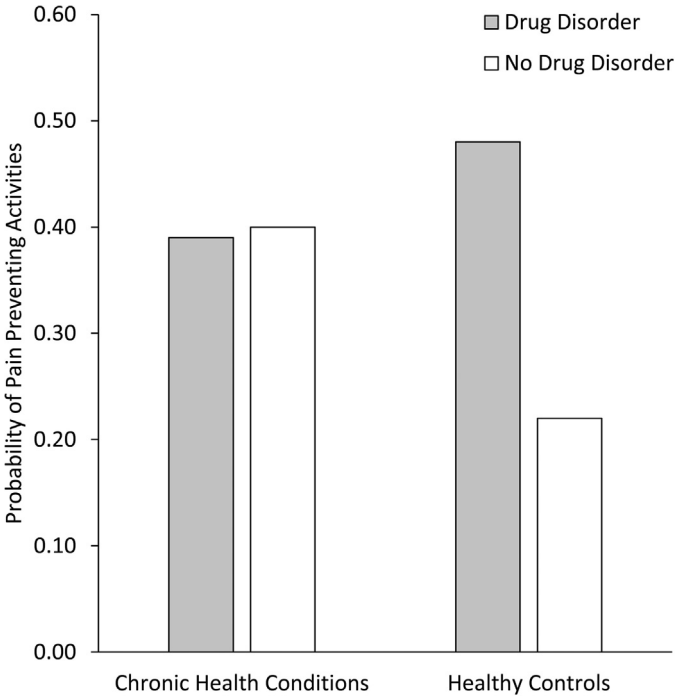

Fig. 3. Moderating effect of comorbid drug disorder on the association between having a chronic health condition and pain.

the association between having a CHC and experiencing chronic disruptive pain.

These results supported our hypothesis and confirmed findings from previous epidemiological and clinical studies assessing individuals with complex CHCs such as diabetes, arthritis, migraines, heart failure, and respiratory disorders that have continuously demonstrated strong associations with chronic pain across the life span [2–9,17,32–37]. However, the measures of association from our study were higher than those reported previously. For instance, Hoff et al. reported that individuals with diabetes were 1.6 times more likely to report chronic musculoskeletal stiffness or pain than those without diabetes [35]. Likewise, Ryan et al. reported that adults (≥65 years old) with cardiovascular diseases were 1.8 times more likely to have chronic musculoskeletal pain [34]. These differences are likely attributable to methodological differences across studies—other studies sampled an older study population, did not include a variety of CHCs, and assessed chronic pain, rather than chronic disruptive pain (i.e., the extent to which pain impacts daily functioning).

Previous studies have also demonstrated a strong independent effect of mood and substance use disorders on chronic pain. This well-established positive association between psychiatric disorders and chronic pain (disruptive or non-disruptive) appears to be robust across samples and CHCs [18,24,38]. For example, in a community sample of Canadians, including those with CHCs, the odds of reporting chronic pain were 2–4 times larger among individuals with psychiatric disorders (e.g., depression, generalized anxiety disorder) compared to those without these disorders [39]. The activity restriction model has often been used to explain the association between chronic disruptive pain and psychiatric disorders. According to the activity restriction model, health-related stressors (e.g., chronic pain) are strongly positively associated with psychiatric disorder and activity restriction has been shown to mediate the relationship between health-related stressors and psychiatric disorder [40].

Findings also suggested that alcohol and drug abuse/dependence disorders moderated the association between having

a CHC and experiencing chronic disruptive pain. Specifically, in the presence versus absence of substance use disorders, the odds for chronic disruptive pain were lower among emerging adults with CHCs compared to healthy controls. This finding was opposite to our hypothesis that chronic disruptive pain would be greater among individuals with comorbid CHCs and psychiatric disorders. We speculate that alcohol and illicit drugs may be used by emerging adults with CHCs as a numbing agent in which to blunt chronic pain and reduce limitations in daily functioning. Recent empirical evidence suggests that many individuals with chronic disruptive pain report using illicit drugs (e.g., cocaine, heroin) and alcohol to self-medicate in an attempt to manage their pain [41]. Although there is no clear evidence that suggests a decrease in pain levels with substance use, research suggests a robust association between alcohol consumption and reduced likelihood of reporting pain [42,43]. There was no evidence to suggest cannabis abuse/dependence had a similar moderating effect. Given the widespread usage of cannabis in managing chronic disruptive pain [44], this finding was unexpected. To our knowledge, this is the first study to report the association between CHCs and psychiatric disorders with chronic disruptive pain. We encourage additional study of the interrelationships between CHCs, psychiatric disorder, and chronic disruptive pain among emerging adults in an effort to replicate these findings.

6. Implications

Findings from this study have implications for the integration and coordination of services to design strategies aimed at improving chronic disruptive pain and preventing pain-related disabilities later in life [17,45]. Within the health system, clinicians should continue to monitor the impact of pain on daily functioning and continue to screen for and engage in dialogues about mental health and substance use regularly with emerging adults. For emerging adults with CHCs, this is critical during the transition from paediatric to adult health care services as evidence has shown dramatic health and social declines in the period after this transition [16,46]. Given the age range of emerging adults, there is tremendous opportunity for clinicians to work cooperatively with colleagues in the education system to support emerging adults with and without CHCs. The coverage of this population afforded by the education system facilitates broad screening for psychiatric disorder and delivery of self-management strategies [47], including guided self-help, exercise, and relaxation techniques for emerging adults with chronic disruptive pain [17,48,49]. Such public health strategies align with targets within the activity restriction model (i.e., positive mental health, participation) to reduce the impact of chronic disruptive pain on the daily functioning of emerging adults. These broad public health strategies have a large potential—often larger than specific targeted interventions—to improve the health of emerging adults [50].

7. Study strengths and limitations

This study has a number of strengths including the inclusion of a variety of CHCs, a large representative sample with minimal missing data, assessment of chronic disruptive pain (as opposed to chronic pain only), and in addition to the evaluation of the association between having a CHC and chronic disruptive pain, the investigation of the moderating effects of comorbid psychiatric disorders. These findings, however, should be interpreted in the context of the following limitations. First, due to small cell counts within each CHC and rules surrounding the export of data collected by Statistics Canada, condition-specific analyses could not be conducted. Instead, CHCs were aggregated using the validated non-categorical approach to understanding chronic disruptive pain [1]. Second, CHCs were self-reported and could not be validated with administrative health records. There is evidence suggesting discordance between self-reported diagnoses and administrative data for many CHCs, particularly those with low prevalence [51]. As such, there may be potential information bias resulting in non-differential misclassification and subsequently, an underestimate of the association between having a CHC and chronic disruptive pain. Third, the CCHS-MH employed a cross-sectional methodology, and therefore, precludes conclusions about temporal order of the interrelationships between CHCs, psychiatric disorders, and chronic disruptive pain. Within the confines of this secondary data analysis, we mitigated this limitation by using variables that best approximated a temporal sequence: CHCs were based on lifetime assessment; psychiatric disorders based on 12-month symptoms; and, chronic disruptive pain based on usual/recent experience of pain. Fourth, although we focused on chronic disruptive pain, this study did not include a measure of pain severity [i.e., pain visual analogue scale (VAS) or the numeric pain rating scale (NPRS)]. Fifth, some caution is warranted when interpreting the moderating effects of substance use disorders on the association between CHCs and chronic disruptive pain. There is the small potential that these moderating effects are a result of multiple testing. However, when applying the Benjamini–Hochberg correction to adjust for the false discovery rate [52], these moderating effects remain statistically significant. Nonetheless, future studies are needed to replicate these findings to determine if the findings are sample-dependent or are evidence of true effect modification.

8. Conclusions

Evidence from this study suggests that emerging adults with CHCs are at increased odds for chronic disruptive pain as compared to their healthy counterparts and alcohol and drug abuse/dependence disorders appear to moderate this association. Additional clinical and epidemiological research is needed to replicate and expand these findings to identify potential condition-specific patterns of association and elucidate not only moderating, but also potential mediating factors, in the pathways between having a CHC and the onset of chronic disruptive pain. Clinicians, researchers, educators, and those in social services should continue to be mindful of the complex interrelationships between physical and mental health and chronic disruptive pain and work cooperatively to optimize health outcomes and prevent pain-related disabilities among emerging adults.

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Ethical issues

All participants were informed of the purpose of research and gave their informed consent. Confidentiality of participants was guaranteed by Statistics Canada and data was accessed at a secure Research Data Centre (RDC) at McMaster University. All analyses were approved by the Hamilton Integrated Research Ethics Board.

Conflicts of interest

The authors declare that there are no conflicts of interest associated with this manuscript.

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