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Self-harming behaviors among forensic psychiatric patients living with intellectual disability

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Abstract

Background Individuals with intellectual disabilities (ID) are frequently involved in the criminal justice system, and many subsequently enter the forensic psychiatric system. While individuals with ID in forensic psychiatric settings are known to have a high burden of engaging in self-harming behaviors, limited studies have explored self-harming behaviors among them.

Aim To determine the prevalence of ID and explore the burden of self-harming behaviors and the associated factors among forensic psychiatric patients with ID.

Methods This retrospective study utilized data on 155 patients diagnosed with ID under the Ontario Review Board during the reporting year 2014 to 2015. The primary outcome variable was engagement in physical self-harming behaviors. Factors associated with self-harm were identified using logistic regression analysis, performed with STATA-17.

Results The prevalence of ID among forensic psychiatric patients in Ontario was found to be 13.1%. Of these patients, 43.2% had their Full-Scale Intelligence Quotient (FSIQ) score included in the report used for the database. The prevalence of self-harming behaviors among patients with ID was 9.7%. The likelihood of self-harm was significantly lower in males (adjusted odds ratio [aOR] = 0.02, 95% confidence interval [CI] = 0.002–0.47, p-value = 0.013) and significantly higher in those with a previous history of self-harm (aOR = 28.21, 95% CI = 1.61–494.66, p-value = 0.022).

Conclusion This study found a high burden of both ID and self-harm, especially among females and those with prior history of self-harming. These findings highlight the need for relevant resources, targeted interventions, and specialized programs to mitigate self-harm in this vulnerable population.

Keywords Forensic psychiatry, Full-Scale intelligence quotient, Gender, Intellectual disability, Ontario, Self-harm

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Introduction

Self-harm is a major concern that can cause serious ramifications (including scars, severe injuries, infection, psychological trauma, and unintentional death) among individuals with intellectual disabilities (ID), particularly within forensic psychiatric settings [1–3]. In forensic psychiatric settings, individuals with intellectual impairments also experience severe mental health issues and other behavioral challenges that often result in additional layers of needs for them [1, 2, 4]. The prevalence of self-harm in people with ID is significantly higher compared to the general population and even higher among individuals with ID in forensic settings due to unique risk issues that stem from prevalent aggressive behaviors, loss of control, past offenses, and heightened emotional instability among them [1, 2, 5–8].

Recent literature underscores that self-harm behavior not only endangers patients' physical and psychological well-being but also complicates their care, rehabilitation, management, and recovery, placing a considerable strain on forensic psychiatric services and resources [3, 5, 9, 10]. Furthermore, self-harm is strongly associated with harm towards others, and this may be a great predictor of violence recidivism [11, 12]. Thus, making rehabilitation more complicated.

Several individual factors heighten the risk of self-harm in individuals with ID in the general population [5]. For example, individuals who engage in self-harm often share a history of early-life trauma, including child abuse, and frequently come from families with mental health issues [13, 14]. Research has consistently identified adverse childhood experiences—such as sexual abuse, family breakdown, bullying, and domestic violence—as contributing factors to later self-harm [15]. This is particularly pertinent in a forensic psychiatric setting, as many individuals in the forensic system have had adverse childhood experiences [9]. In addition, those with a history of offending behavior are particularly vulnerable due to social isolation and emotional instability, that can further heighten their risk for self-harm actions [16]. While evidence indicates that self-harm may be more common among women in community populations, it is a serious issue for both men and women in secure settings [17–19]. To effectively address these interrelated risk factors of self-harm among individuals with ID, a comprehensive, multi-faceted approach is essential for developing prevention and intervention strategies.

Self-harm presents significant long-term risks to patients and caregivers, placing a substantial burden on healthcare systems [20], particularly the forensic psychiatric system, with the mandate of managing individuals with diverse risk profiles and needs [3, 21, 22]. The incident of self-harm often triggers strong emotional reactions in caregivers and healthcare professionals,

including feelings of frustration, inadequacy, and guilt [23, 24]. Despite the high rates of self-harm in the forensic population, research focusing on individuals with ID in forensic psychiatry is limited. While studies have examined self-harm in the general population or among non-forensic individuals with ID [2], the specific dynamics of forensic settings—characterized by heightened supervision, control, and co-occurring behavioral issues—remain underexplored. This gap in understanding hampers evidence-informed advocacy for resources and targeted interventions that meet the unique needs of people with ID in the forensic system. Furthermore, research is needed to identify the specific drivers of self-harm in forensic settings for individuals with ID to guide comprehensive risk evaluation, develop assessment tools, and promote effective prevention and treatment approaches. Therefore, the current study seeks to understand self-harm among individuals with ID within the Ontario Review Board system (consisting of patients managed by forensic psychiatric hospitals in the province of Ontario) by using data from patients under review between 2014 and 15. With this, we seek to understand the following research questions.

Research question and hypothesis

Research questions

1. What is the prevalence of self-harm behaviors among individuals with ID in forensic psychiatry settings?
2. What are the associated risk factors of self-harm behaviors in this population?

Hypothesis

- 1) Individuals with ID within the forensic psychiatric system exhibit significantly higher odds of engaging in self-harming behaviors.
- 2) A history of self-harm is a strong predictor of repeated self-harming behavior in individuals with ID in forensic settings.

Methods

In this secondary data analysis, we utilized data captured from reports submitted to the Ontario Review Board (ORB) during the reporting years 2014 and 2015, which has already been described in previous studies conducted to better understand various aspects of forensic psychiatric patients in Ontario [3, 9, 12, 25, 26]. The study was conducted in accordance with the Declaration of Helsinki 2013 [27] and approved by the Hamilton Integrated Research Ethics Board (HiREB) -approval number #15,564. For the present study, we analyzed the data from the database, focusing on variables needed to answer the study's research questions on individuals with ID.

Explicitly, our study included only individuals with documented information on the ID diagnosis (i.e., diagnosed with ID or not). The necessary details on the study variables and the individuals diagnosed with ID are included below.

Study variables

Outcome

Self-harming behaviors during the reporting year were captured as “yes” for the presence and “no” for the absence of physical self-harming behaviors (intentional self-harm and suicide attempts) in the reporting period. Self-harming behaviors from the year prior to the reporting year were also documented as a history of self-harming behaviors (Yes vs. No).

Covariates

These include demographic variables (age, gender, and level of education) and clinical characteristics (status in the forensic psychiatry system, inpatient vs. outpatient, history of substance misuse, and history of self-harming before the reporting year). Additionally, other covariates encompass forensic psychiatry system-related variables (duration of stay within the forensic system in months, ORB status as Not Criminally Responsible on account of mental disorder [NCR] vs. Unfit to Stand Trial [UST]), and other factors commonly associated with self-harming among individuals with ID, such as a history of child abuse, number of previous convictions, number of previous offenses and nature of index offense and a family history of mental illness.

Intellectual disability-related variables

Intellectual disability is characterized by significant limitations both in intellectual functioning (reasoning, learning, problem solving) and in adaptive behavior, which covers a range of everyday social and practical skills. It was captured as “Yes” for individuals with ID diagnosis or “No” for those not diagnosed. Those identified with ID were based on clinical diagnosis made by clinicians during the reporting year or past history of such a diagnosis. A diagnosis of ID is made via clinical assessment and standardized testing. The severity of impairment is based primarily on the level of adaptive functioning (i.e. the impact of the deficit in general mental abilities on functioning needed for everyday life). Although IQ tests are used for assessment, they are no longer the sole determinant of a diagnosis of ID based on DSM-5-TR.

For IQ testing, the objective measure used in determining the level of IQ included the Full-Scale Intelligence Quotient (FSIQ) measure. The FSIQ is a composite score derived from various subtests of intelligence tests, such as the Wechsler Adult Intelligence Scale (WAIS) or the Wechsler Intelligence Scale for Children (WISC) [28,

29]. This is a common measure used among forensic programs in Ontario and has been widely used in various international forensic settings such as the UK, Belgium, Kosovo, Netherland, among others [30–34]. The subtests cover a broad range of cognitive abilities, ensuring comprehensive assessment and content validity. The FSIQ scores are comparable across different populations and age groups, having been standardized using large representative international samples [19–23]. It is sensitive to differences in cognitive abilities, accurately identifying intellectual disabilities or giftedness. In forensic populations specifically, studies have shown that the FSIQ retains strong internal consistency and predictive validity when used to assess cognitive functioning, although factors such as mental illness or substance use may influence the interpretation of the results [30, 35, 36].

Statistical analysis

Data analysis was conducted using STATA version 17. Descriptive statistics, including frequencies and percentages, were used to present categorical variables. For continuous variables, means and standard deviations were reported for normally distributed data, while medians and interquartile ranges were used for non-parametric data.

Inferential statistics were employed to examine differences in self-harming behaviors among individuals with ID and those without. Chi-square tests were used to test statistical differences for categorical variables, while Student's t-tests were applied to test mean differences for normally distributed continuous variables. For non-parametric continuous variables, the two-sample Wilcoxon test was utilized.

Bivariate logistic regression was conducted to assess the association between recent incidents of self-harm behavior and a history of self-harm in relation to having a diagnosis of intellectual disability. Ordinal logistic regression was used to examine the relationship between the level of FSIQ score and recent self-harm, as well as the history of self-harm.

To further explore the association between self-harming behaviors and various factors among individuals with ID, variables with a p-value below 0.05 in univariate analysis were included in the logistic regression model, in addition to social demographic characteristics, including age, gender, and level of education. The results were presented as odds ratios (OR) with 95% confidence intervals (CI) and p-values. Collinearity among variables was assessed using the Variance Inflation Factor (VIF) before inclusion in the multivariate model. Model fit and goodness-of-fit were evaluated using the Hosmer-Lemeshow test and Nagelkerke R-squared. Statistical significance was set at a p-value < 0.05 with a 95% confidence interval.

Results

Among the 1240 individuals in the database, 57 were dropped due to missing information on their past year’s self-harming behaviors and intellectual disability diagnostic status. For details, see Fig. 1.

Prevalence of ID and self-harm among patients with intellectual disability

The prevalence of ID was 13.1% ($n = 155$ out of 1183) among the forensic psychiatric patients in Ontario during the reporting year 2014–2015. Past 12-month self-harming behaviors were statistically more common among individuals diagnosed with ID than those without (9.7% vs. 2.5%, $\chi^2 = 20.57$, $p\text{-value} < 0.001$). Involvement in self-harming behaviors before the reporting year was more common among individuals diagnosed with ID than those without (21.3% vs. 14.5%, $\chi^2 = 5.87$, $p\text{ value} = 0.031$). For details, see Table 1.

Disaggregation of self-harming behaviors by the characteristics of individuals with a diagnosis of intellectual disability

The prevalence of past-12-month self-harm among individuals diagnosed with ID was 9.7% ($n = 15$). Notably, the estimated power at a 95% confidence interval and effect size of 0.5 was 97,02% [37]. The prevalence was greater among patients with ID with no history of substance misuse compared to those with a history of substance misuse (16.4% vs. 4.8%, $\chi^2 = 6.23$, $p\text{-value} = 0.017$). The prevalence of past-12-month self-harm was also higher among patients with a past history of self-harm than those without (31.2% vs. 4.2%, $\chi^2 = 20.42$, $p\text{-value} < 0.001$). For details, see Table 2.

Distribution of FSIQ scores among individuals with intellectual disability

Among the individuals with ID, only 67 had records of their FSIQ scores in the report used for the database. Of

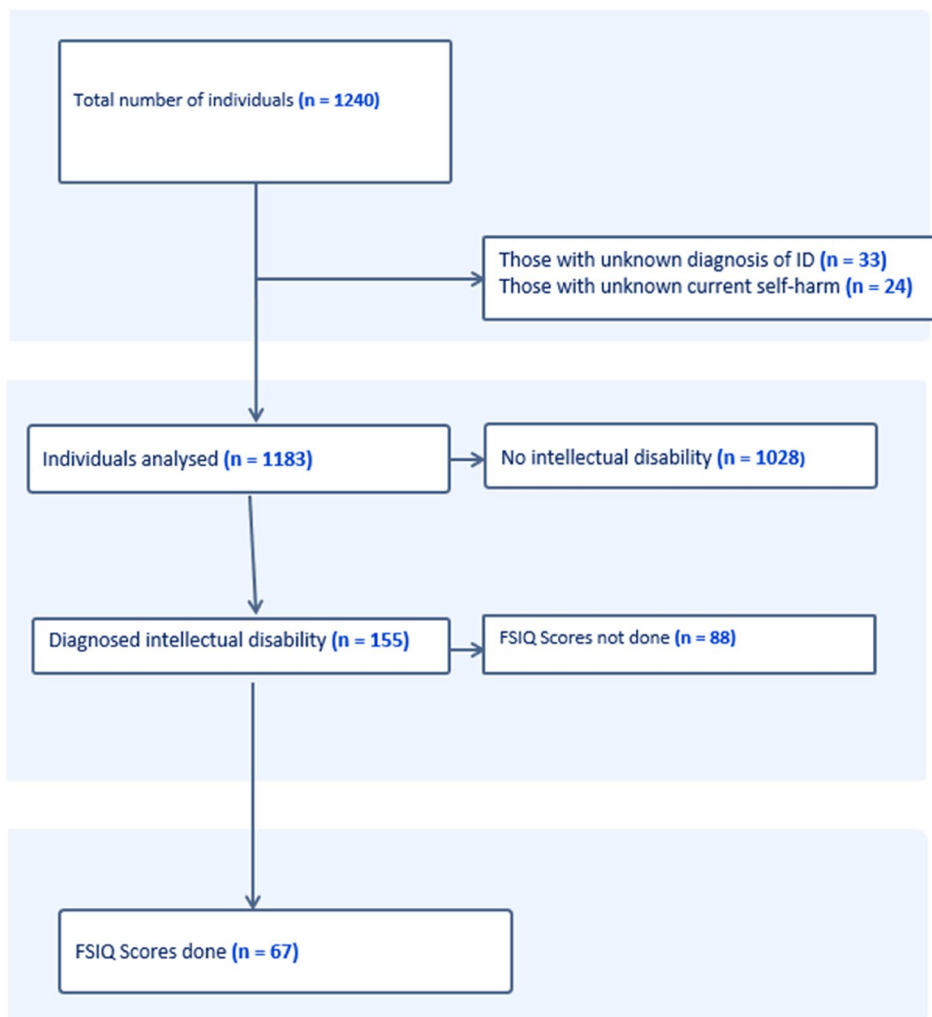


Fig. 1 Flow chart of patients’ selection for the study

Table 1 Cross-tabulation of self-harming behaviors by diagnosis of intellectual disability

Variable	n (%) 1183	Diagnosis of intellectual disability		χ^2 (p-value)	Diagnosis of intellectual disability	
		No	Yes		Bivariate analysis	
		1028 (86.9)	155 (13.1)		Crude odds ratio (95% confidence interval)	p-value
Self-harming behaviors						
No	1142 (96.5)	1002 (97.5)	140 (90.3)	20.57 (<0.001)	1 (reference)	
Yes	41 (3.5)	26 (2.5)	15 (9.7)		4.13 (2.13–7.89) <0.001	
History of self-harming behaviors (n = 1150)						
No	973 (84.6)	855 (85.5)	118 (78.7)	5.87 (0.031)	1 (reference)	
Yes	177 (15.4)	145 (14.5)	32 (21.3)		1.60 (1.04–2.45) 0.032	

Table 2 Cross-tabulation of the characteristics of individuals with a diagnosis of intellectual disability by self-harming behaviors

Variable	n (%)	Self-harming behaviors		F/t/ χ^2 (p-value)	Self-harming behaviors	
		No	Yes		Bivariate analysis	
		140 (90.3)	15 (9.7)		Crude odds ratio (95% confidence interval)	p-value
Age [mean (Standard deviation)] in years	45 (14.7)	47 (15.0)	46 (12.8)	-0.29 (0.768)	1.00 (0.97–1.04) 0.767	
Sex						
Female	19 (12.3)	15 (79.0)	4 (21.0)	3.20 (0.073)	1 (reference)	
Male	136 (87.7)	125 (91.9)	11 (8.1)		0.33 (0.09–1.96) 0.085	
Level of education (n = 128)						
Below secondary	111 (86.7)	103 (92.8)	8 (7.2)	5.92 (0.052)	1 (reference)	
Secondary to post-secondary	17 (13.3)	16 (94.1)	1 (5.9)		0.80 (0.09–6.87) 0.843	
Clinical/hospital Status						
Out-patient	62 (40.0)	59 (95.2)	3 (4.8)	2.77 (0.096)	1 (reference)	
In-patient	93 (60.0)	81 (87.1)	12 (12.9)		2.91 (0.78–10.79) 0.109	
History of substance misuse (n = 151)						
No	67 (44.4)	56 (83.6)	11 (16.4)	5.66 (0.017)	1 (reference)	
Yes	84 (55.6)	80 (95.2)	4 (4.8)		0.25 (0.77–0.84) 0.025	
History of self-harm						
No	118 (78.7)	113 (95.8)	5 (4.2)	20.41 (<0.001)	1 (reference)	
Yes	32 (21.3)	22 (68.8)	10 (31.2)		10.27 (3.20–32.99) <0.001	
Review board status						
Unfit to stand trial (UST)	52 (33.5)	45 (86.5)	7 (13.5)	1.28 (0.258)	1 (reference)	
Not criminally responsible (NCR)	103 (66.5)	95 (92.2)	8 (7.8)		0.54 (0.18–1.59) 0.263	
Length in the psychiatric system [median (Interquartile Range)]	60 (26–123)	58 (25–122)	70 (33–123)	0.511	1.00 (0.99–1.01) 0.231	
History of child abuse (n = 134)						
No	84 (62.6)	76 (90.5)	7 (9.5)	0.10 (0.749)	1 (reference)	
Yes	50 (37.4)	45 (90.0)	5 (10.0)		1.05 (0.33–3.42) 0.928	
Family history of mental illness (n = 119)						
No	67 (55.4)	63 (94.0)	4 (6.0)	1.99 (0.166)	1 (reference)	
Yes	52 (44.6)	46 (88.5)	6 (11.5)		2.05 (0.54–7.70) 0.285	
Nature of Index offence						
Violent offence	93 (60.0)	81 (87.1)	12 (12.9)	2.82 (0.244)	1 (reference)	
Non-violent offence	26 (16.8)	25 (96.1)	1 (3.9)		2.52 (0.53–11.86) 0.243	
Sexual offence	36 (23.2)	34 (94.4)	2 (5.6)		0.68 (0.06–7.92) 0.758	
Number of previous convictions [median (IQR)]	2 (0–6)	2 (0–6)	0 (0–12)	1.00 (0.322)	0.92 (0.80–1.07) 0.290	

Table 3 Cross tabulation of self-harming behaviors by categories of individuals diagnosed with intellectual disability based on FSIQ scores

Variable	n (%)	FSIQ score categories			χ^2 p-value	FSIQ score	
		Average (80–109)	Borderline (79–70)	Impaired (Below 70)		Bivariate analysis	
		12 (17.1)	15 (17.9)	40 (59.7)		Crude odds ratio (95% confidence interval)	p-value
Self-harming behaviors							
No	63 (94.0)	119 (17.5)	146 (22.2)	388 (60.3)	0.20 (0.905)	1 (reference)	
Yes	4 (6.0)	1 (25.0)	1 (25.0)	2 (50.0)		0.65 (0.09–4.41)	0.660
History of self-harming behaviors							
No	50 (76.9)	10 (20.0)	10 (20.0)	30 (60.0)	1.25 (0.534)	1 (reference)	
Yes	15 (23.1)	2 (13.3)	5 (33.3)	8 (53.3)		0.91 (0.30–2.71)	0.863

Table 4 Logistic analysis for factors associated with self-harming behaviors

Variable	Multivariate analysis	
	Adjusted odds ratio (95% confidence interval)	p-value
Age	1.04 (0.98–1.11)	0.209
Sex		
Female	1 (reference)	
Male	0.06 (0.01–0.44)	0.006
Level of education		
Below secondary	1 (reference)	
Secondary to post-secondary	94.12 (0.22–77.82)	0.344
History of substance misuse		
No	1 (reference)	
Yes	0.26 (0.04–1.56)	0.141
History of self-harm		
No	1 (reference)	
Yes	28.09 (3.39–232.29)	0.002

these patients, only four engaged in self-harming behavior. There was no statistical difference between the categories of the FSIQ and self-harming behaviors. For details, see Table 3.

Factors associated with self-harming behavior among individuals with intellectual disability

The odds ratios of variables with a p-value less than 0.2 in univariate analysis (i.e., chi-square and t-test) were included in the logistic regression analysis. All variables were tested for collinearity before being included in the final model, with a mean VIF of 1.07 and all VIFs below 2.0. The final model accounted for 121 individuals, with a sensitivity of 22.2%, specificity of 99.1%, positive predictive value of 66.7%, negative predictive value of 96.5%, and correctly classified 93.4% of those with current self-harm.

The likelihood of self-harm decreased with being male (adjusted odds ratio [aOR]=0.06, 95% confidence interval [CI]=0.01–0.44, p-value=0.006) and increased with a previous history of self-harm (aOR=28.09, 95% CI=3.39–232.29, p-value=0.002). While prior substance misuse was associated with a lower prevalence of

self-harm in bivariate analysis, the reduction in the likelihood was not statistically significant in the logistic analysis (aOR=0.26, 95% CI=0.04–1.56, p-value=0.141). See Table 4.

Discussion

Prevalence of ID among forensic patients

The prevalence of ID among forensic psychiatric patients in Ontario was found to be 13.1%. This is significantly higher than the prevalence of ID in the general population, typically around 1%, and also higher than the estimated levels in the Canadian population, which are below 0.5% [38, 39]. An Ontario study conducted among individuals in federal correctional institutions found that the rate of intellectual and developmental disabilities (IDD) was 2.1% [40]. This rate is higher than that of the Canadian general population, indicating an overrepresentation of IDD within various sectors of the criminal justice system. However, this prevalence is significantly lower than the 13.1% identified in the current study. This discrepancy suggests that IDD is more prevalent among patients in forensic psychiatric facilities compared to those in correctional institutions and the general population in Ontario. Even within the forensic psychiatry population, the current study reports a higher prevalence than a previous study conducted at one facility in Ontario, which found a prevalence of 9.2% among patients under the ORB between 1990 and 2012 [1]. Compared to other international studies, the prevalence in this study is lower than the 40% reported in a Dutch study of 414 forensic patients in a maximum-security setting who were convicted of either violent or sexual offenses [34]. This difference may be related to the specific population selected, as many individuals with ID commit sexual and violent offenses, leading to a higher prevalence in the Dutch study [41]. Additionally, the prevalence in the current study is lower than the 16.5% found among 401 forensic psychiatry patients with long stays (over 10 years) within the forensic system in England [2]. The duration of stay for forensic patients often depends on risk reduction or mitigation, which is closely linked to learning

institutional rules and modifying behaviors to mitigate risk. Unfortunately, many individuals with ID struggle with learning complex adaptive skills or behaviors, resulting in longer stays.

It is important to note that the prevalence rates of ID can vary widely due to several factors, including the setting (inpatient vs. outpatient, rural vs. urban, etc.), national policies, access to care and assessment or care modalities, and cultural practices [42]. As various studies across the globe have shown [42–44], these factors may lead to different prevalences. These aspects may also lead to differences observed in the prevalence of self-harm among these individuals.

Prevalence of self-harming among individuals with ID

In our study, the prevalence of past-12-month self-harm among individuals diagnosed with intellectual disability (ID) was 9.7%, a rate that was significantly ($p < 0.001$) higher than the 2.5% prevalence of self-harm among patients without ID. Patients with ID similarly had a higher prevalence of previous self-harm behavior than those without ID (21.3% vs. 14.5%, $p = 0.031$). These results align with existing literature, which indicates that individuals with ID are at a higher risk of self-harming behaviors compared to the general population [5]. The prevalence of self-harm among forensic patients with ID was lower in our study than in a previous study of forensic patients in Ontario, which found an 11% (3 out of 47) prevalence of self-harm among ID patients [1]. However, contrary to our study, this cited study found no statistically significant difference in self-harm rates between patients with and without ID.

Previous research has suggested that increased severity of ID correlates with a higher likelihood of self-injurious behavior [27, 28]. However, when subdividing ID patients by FSIQ scores, we found there was no statistically significant difference in either current or past self-harm behavior between ID patients with average, borderline, or impaired FSIQ scores. This lack of a significant result was likely due to our analysis of FSIQ being underrepresented, as only 67 of the 155 patients with ID had FSIQ scores on record, and only 4 of the 155 ID patients who engaged in current self-harm had FSIQ scores on record.

Factors associated with self-harming among individuals with ID

Gender

The observation that males with ID were less likely to engage in self-harm is consistent with the trend in some studies among the general population. In the general literature on self-harm, particularly within community settings, women are typically found to engage in self-harming behaviors more frequently than men [17–19]. In broader populations, men generally are more inclined to

manifest distress through externalizing behaviors such as aggression, whereas women are more prone to internalizing behaviors like self-harm [45, 46]. This pattern might be more pronounced among individuals with ID, where men may display frustration or emotional dysregulation through outward behaviors such as aggression or non-compliance rather than resorting to self-harm.

History of self-harming behaviors

The finding that a history of self-harm was linked to an increased risk of current self-harm aligns with global trends [47, 48]. Just like in general populations, having a prior history of self-harm among forensic psychiatry patients is frequently seen as a strong indicator of future self-harming behavior [3, 9, 47–49]. Research consistently shows that those with a history of self-harm face a higher risk of repeating these behaviors, primarily due to ongoing psychological distress, maladaptive coping style, emotional dysregulation, or unresolved trauma [50]. These studies generally predict that individuals who have previously engaged in self-harm are more likely to continue such behaviors due to the persistent nature of their underlying issues.

Study limitations and strength

This study has several limitations. The cross-sectional study design limits inferences on the causal relationship. Assessing the impacts of the severity of ID on self-harming behaviors proved challenging. First, the relatively small sample size of individuals with FSIQ scores ($n = 67$) limits the generalizability of this study's findings and complicates the application of regression analysis. Secondly, some individuals diagnosed with ID exhibited average intellectual functioning. This could be attributed to the fact that testing alone does not definitively diagnose ID. Additionally, those with average intellectual functioning may still face significant challenges in their daily and adaptive functioning. Thirdly, the reliability of the FSIQ measurement is impacted by the presence of comorbid mental health issues, which are prevalent among individuals in forensic psychiatric systems. Lastly, it is crucial to mention that this retrospective records review focuses on ORB reports that may contain selective information about the forensic population, primarily highlighting risk. Consequently, aspects related to FSIQ scores and other ID measures might be missing from these reports due to selective reporting, rendering them unavailable for the team's analysis. We recommend that future researchers conduct a prospective study and capture comprehensive information about ID from the patients' electronic medical records. Another limitation worth mentioning is that the type of self-harming event was not recorded in the database. Self-harm can range in severity, and the limited information in the dataset

means that we could not explore for factors that were more pertinent among individuals with severe forms of self-harm, limiting the study conclusions. Similarly, it is uncertain what proportion of individuals with self-harm in this sample represents those with non-suicidal self-injury versus suicidal attempts, given that patients' reasons for self-harming were not identified. All in all, prospective studies with robust information and methodology with active tracking of variables are warranted to generate more generalizable findings in the future.

Conclusion

In conclusion, the present study reveals a notably high prevalence of intellectual disabilities (ID) and self-harming behaviors among forensic psychiatric patients in Ontario, emphasizing the urgent need for specialized care, tailored interventions, and adequate resource allocation to support this high-risk population. The implementation of gender-sensitive and trauma-informed approaches holds considerable potential in further enhancing the outcomes of care. Future research should prioritize longitudinal and multi-center studies to comprehensively identify risk and protective factors, validate specialized assessment tools, and inform the development of targeted, evidence-based prevention and intervention programs that address the complex needs of individuals with ID in forensic psychiatric settings.

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Authors' contributions

M.M.K. and A.T.O. were involved in conceptualizing the research idea. GAC was vital in the data the collection process. M.M.K., J.A., and A.T.O. were involved in the data analysis process. M.M.K. and J.A. drafted the initial manuscript and G.A.C., A.D., L.B., M.K., J.B., and A.T.O. provided substantial intellectual contribution in the subsequent revisions. ATO and MMK supervised the various stages involved in this current manuscript writing. A.T.O., J.A., A.D., and M.M.K. were involved in the visualization of the current manuscript. All authors gave final approval of the version to be published and agreed to be accountable for all aspects of the work.

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Data availability

Due to the sensitivity of the population being explored, the datasets will be made available to appropriate academic parties on request from the corresponding author after approval by GAC.

Declarations

Ethics approval and consent to participate

The study was conducted under the Declaration of Helsinki. The present study was approved by Hamilton Integrated Research Ethics Board (HiREB), reference number #15564. The need for informed consent was waived by the ethics committee/institutional review board of Hamilton, Ontario institutions, i.e., the Hamilton Integrated Research Ethics Board (HiREB) since the study involved de-identified retrospective data and individual consents could not practically be fully obtained.

Consent for publication

Not applicable since retrospective data extracted from existing hospital records.

Competing interests

The authors declare no competing interests.

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