

Factors Affecting Readmission to a Drug Rehabilitation Center in Brunei Darussalam

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Abstract

The objective of this study is to examine the sociodemographic factors contributing to the readmission to a drug rehabilitation center among drug addicts in Brunei Darussalam. This retrospective study used de-identified data obtained from the Al-Islah Rehabilitation Center for the period 1 January 2010 to 31 December 2017. Univariate and multiple logistic regression analyses with a stepwise variable selection method were used to estimate and determine significant factors associated with readmission to the center. A total of 92 out of 705 subjects (13%) were readmitted to the rehabilitation center within the study period, with ages ranging from 20 to 59 years ($M = 36.1$, $SD = 8.6$ years). Multiple logistic regression found that subjects who were in the age group of 40 to 49 ($OR = 2.24$, 95% CI [1.16, 4.37]) resided in the Belait district ($OR = 1.94$, 95% CI [1.00, 3.63]), divorced or widowed ($OR = 2.14$, 95% CI [1.19, 3.82]), had committed other criminal offenses ($OR = 1.91$, 95% CI [1.16, 3.11]), and voluntarily admitted ($OR = 2.33$, 95% CI [1.34, 4.01]), were found to be significantly more likely to get readmitted to the rehabilitation center. This study provides evidence of sociodemographic factors in relation to readmission to the rehabilitation center in Brunei Darussalam.

Keywords

Brunei Darussalam; drug abuse; drug rehabilitation; logistic regression; readmission

Introduction

Globally, it has been noted that many drug addicts get readmitted to a drug treatment or rehabilitation center after being discharged from successful treatment and rehabilitation programs. Drug addiction is considered to be a chronic, relapsing disorder in which compulsive drug-seeking and drug-taking behavior persist despite serious negative consequences (Camí & Farré, 2003). Arning (2017) reported that 29.9% of participants who entered a detoxification program were readmitted to the program after being followed up for at least one year. According to Robbins et al. (2007), the 18-month follow-up statistic for the percentage of women re-arrested following their release from drug treatment centers was 27.9%. In another study by Wolfe et al. (2002), the authors reported that 39% of drug court participants got re-arrested within three years of following up.

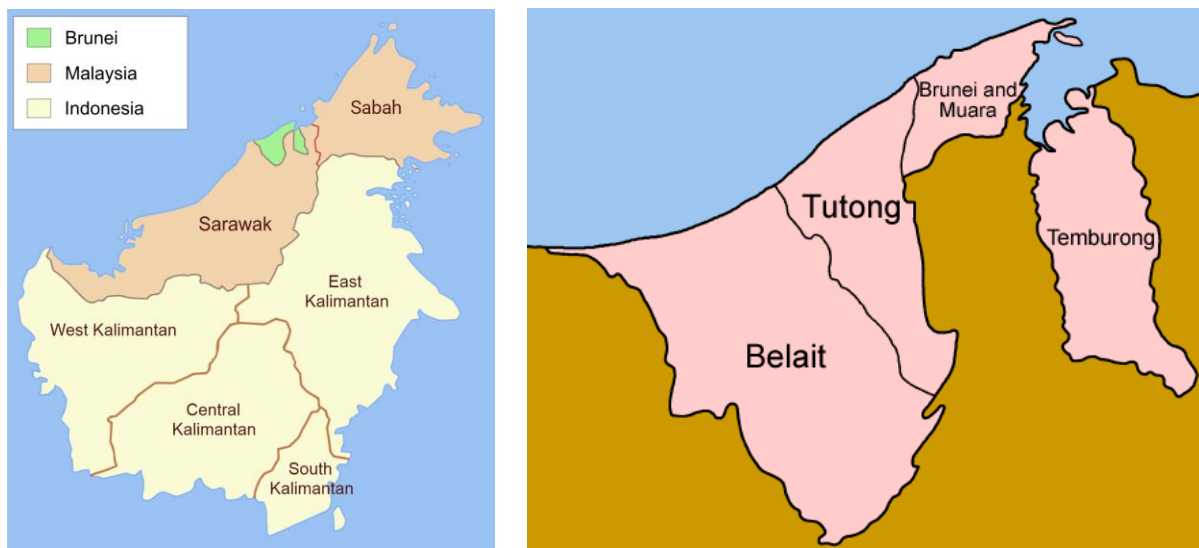
Many international studies have investigated factors affecting readmission to a drug rehabilitation center or detoxification program. In a study by Ferri et al. (2002), they found that age, the severity of dependence upon cocaine, being involved in both acquisitive and other crimes, and having social support, significantly increased the odds ratio for drug treatment re-entry while being a female and being a problematic drinker significantly decreased the odds at the 10% significance level. Robbins et al. (2009) found that women who completed therapeutic community programs were significantly less likely to be arrested than women who did not complete the program. In addition, the study by Wolfe et al. (2002) on predicting re-arrest among drug court participants and non-participants revealed that having a prior conviction increased the likelihood of re-arrest while being older and being female decreased the chance of getting re-arrested.

Wolfe et al. (2002) also did an analysis to predict re-arrest among graduates and non-graduates of drug court. They found that graduation lowers the likelihood of re-arrest while being older and having a prior conviction were consistently associated with a decrease and increase in the likelihood of re-arrest, respectively. Polenberg (2015) found that age and marijuana use were also significant in predicting re-arrest, who determined that older individuals have lower odds of re-arrest than younger individuals, while marijuana users have higher odds of re-arrest compared to non-marijuana users. Factors associated with readmission are significant for treatment procedures and could help ascertain whether a treatment setting is suitable for the individual (Melnick et al., 2001; Walters, 2002). Hence, the treatment implemented will be more effective, and thus, readmission rates can be reduced.

Brunei Darussalam has a drug rehabilitation center, *Pusat Al-Islah* or Al-Islah Rehabilitation Center for drug offenders, provided under the control of the Narcotics Control Bureau (NCB), Prime Minister's Office, Brunei Darussalam. According to Kanato et al. (2018), NCB had made 772 drug arrests in the year 2017, which was an increase of 20.4% compared to the total arrests in 2016. Approximately 47% of the total arrests made in 2017 were repeat offenders. Furthermore, in a report by AIPA Advisory Council on Drug Dangerous (2019), 689 individuals were arrested in 2018, of which 44.7% were repeat offenders. Drug consumption, reported to be the leading drug offense, was found to be 95% of the reasons for arrests (AIPACODD, 2019).

Brunei Darussalam is a country located on the Borneo Island in Southeast Asia, with an estimated population of 459,500 (Figure 1). The Department of Economic Planning and Statistics (2019) reported that the major ethnic groups are Malay (65.8%) and Chinese (10.3%), while the remaining group (24.0%) consists of various other ethnicities. Brunei Darussalam is divided into four districts, consisting of Brunei-Muara (69.5%), Tutong (11.5%), Belait (16.5%), and Temburong (2.5%). The main objective of this study is to examine sociodemographic factors contributing to readmission to Al-Islah Rehabilitation Center amongst drug addicts in Brunei Darussalam.

Figure 1: Location of Brunei Darussalam on Borneo Island (Left) and the Division of the Four Districts of Brunei Darussalam (Right)



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Materials and Methods

The de-identified data for this study was obtained retrospectively from the Al-Islah Rehabilitation Center itself under permission from Narcotics Control Bureau, Prime Minister's Office, Brunei Darussalam (Ref: (72) BKN(C)/38PT.1). All available information was extracted from the rehabilitation center for the period 1 January 2010 to 31 December 2017, consisting of local and permanent residents of Brunei Darussalam. Foreign nationals were excluded from the study.

Ethical approval for this study was obtained from the Faculty Research Ethics Committee of the Faculty of Science, Universiti Brunei Darussalam (Ref: UBD/FOS/E2(g)).

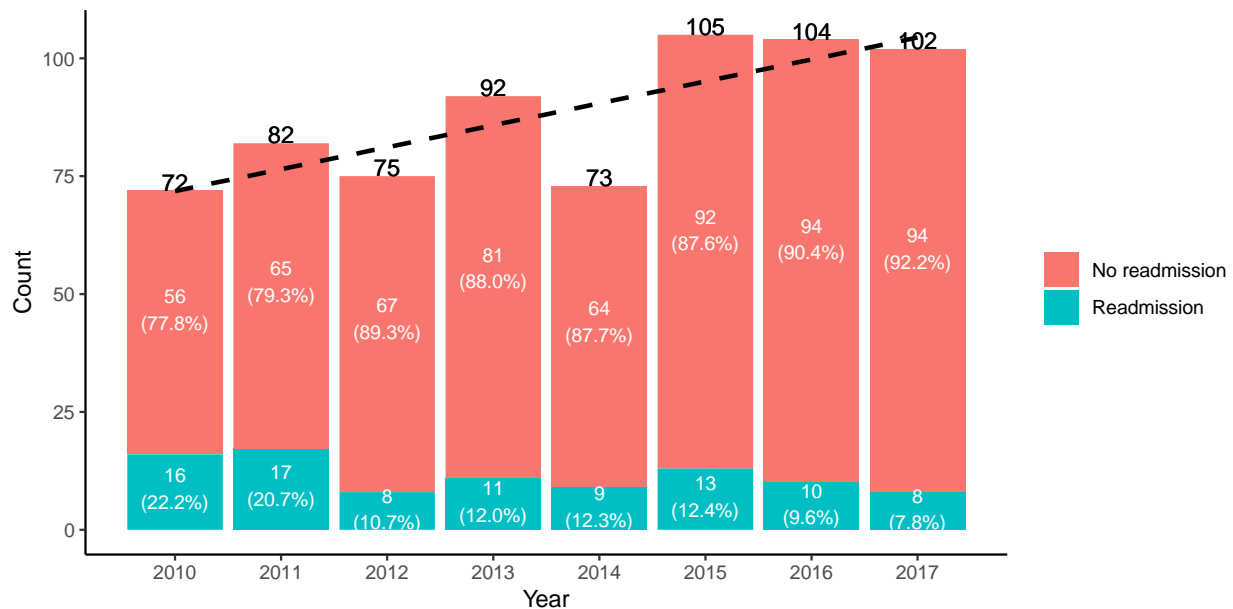
The variables used in this study were sociodemographic factors, including the age of onset (< 20, 20–29, 30–39, 40–49, ≥ 50), gender (Female or Male), ethnicity (Malay, Chinese, or Others), district (Brunei-Muara, Belait, Temburong, and Tutong), marital status (Married, Divorced/Widowed, or Single) and job status (Employed or Unemployed). Education level (Primary and below, Secondary, Technical and Vocational, or Tertiary) was classified according to the Brunei Darussalam Standard Classification of Education 2011 (Department of Statistics, 2017). The types

of drugs in this study were Methamphetamine (also known as Syabu), Marijuana (also known as Cannabis or Weed), and Others (Codeine, Inhalant, or other pill types of drugs such as Nimetazepam or Ketamine). Study subjects were also categorized according to whether individuals had committed criminal offenses other than using drugs (Yes or No). Other criminal offenses include theft, traffic offenses, rape, weapon, religion, prostitution, vandalism, contempt of court, robbing, and breach of trust. Subjects were grouped into two categories; voluntarily admitted (Yes) or not (No). Types of admission to Al-Islah Rehabilitation Center were grouped into three categories: by Minister order, court order, or voluntary basis. 'By Minister order' means by the command of the Minister of Home Affairs, Brunei Darussalam. Residents admitted by Minister's order were those who failed their urine tests while undergoing a supervision scheme (Narcotics Control Bureau, 2015). Re-arrests do not always lead to readmission. On the other hand, admission by court order is usually for repeated offenders. Those who were not voluntarily admitted were individuals who were admitted through the Minister's order or court order. The voluntary basis is when a drug addict volunteers to undergo treatment at the rehabilitation center or when an approved institution admits any drug addict for voluntary treatment and rehabilitation. They were admitted when they were tested positive for drug use.

Data were downloaded in Microsoft Excel format, and all analyses were performed using **R** 4.0.5 statistical software. Data were checked, organized, and categorized, as necessary. Descriptive analyses, such as the mean (M) and standard deviation (SD), were used to describe the subjects' characteristics or background. The frequency of cases and readmission were described using count and percentage for each year. Both univariate and multiple logistic regression with stepwise variable selection method was performed to determine significant factors associated with readmission to Al-Islah Rehabilitation Center. The dependent variable in this analysis was whether individuals were admitted to Al-Islah Rehabilitation Center for the first time ("no readmission") or were readmitted to the rehabilitation center ("readmission"). The Hosmer-Lemeshow test was also carried out to observe how well the final model fitted. The odds ratio is calculated as the odds of readmission of a group divided by the odds of readmission among comparison group members. The results were interpreted based on the odds ratio (OR), 95% confidence interval (CI), and *p* value of each significant variable from the multiple logistic regression model. For all analyses, the level of statistical significance was set at 5%.

Results

Our data comprised 705 subjects admitted to the rehabilitation center within the study period (1 January 2010 until 31 December 2017). The subjects' age ranged from 14 to 59 years, with a mean age of 32.6 years (SD = 8.5 years). A total of 13% (*n* = 92) out of the total admitted to the rehabilitation center were readmitted within the study period, ranging from 20 to 59 years (M = 36.1, SD = 8.6 years).

Figure 2: Readmission Cases by Year

Note: The total count for cases is given in black font, and the dashed line indicates a linear trend line of total cases by year. The percentages in the respective readmission/no readmission groups are based on the number of cases in the current year.

Figure 2 shows the number of cases (individuals) that entered Al-Islah Rehabilitation Center from 2010 to 2017. The lowest number of cases was in 2010 ($n = 72$), while the highest number of cases was found in 2015 ($n = 105$). There is fluctuation in the number of readmissions each year, but the general trend seems to be a rise in the yearly number of cases. The highest number of readmissions was found in the year 2011 ($n = 17$), while the lowest was in 2012 and 2017 ($n = 8$). However, the highest number of readmissions based on the number of the cases in the current year was in 2010 (22.2%), while the lowest was in 2017 with 7.8% (Figure 2).

The majority of the subjects who got readmitted to the rehabilitation center were in the 30 to 39 age group (40.2%), as shown in Table 1. Furthermore, the majority of subjects were also male (88.0%), of Malay ethnicity (95.7%), resided in the Belait district (75%), married (37%), unemployed (70.7%), had secondary level education (72.8%), took Methamphetamine drug (94.6%), had not committed criminal offenses (59.8%), and voluntarily admitted themselves (70.7%). A total of 426 subjects were released from the rehabilitation center within the study period, where the mean length of stay in the rehabilitation center for those who were voluntarily admitted and involuntarily admitted was 18.5 months ($SD = 7.1$ months) and 27.4 months ($SD = 5.2$ months), respectively.

Univariate logistic regression analysis from Table 2 showed a significant association between readmission and subjects who were in the age group of 40 to 49 (OR = 2.42, 95% CI [1.32, 4.45]), resided in the Belait district (OR = 1.89, 95% CI [1.00, 3.42]), divorced or widowed (OR = 2.54, 95% CI [1.45, 4.45]), and had committed other criminal offenses (OR = 2.06, 95% CI [1.29, 3.23]).

Table 1: Frequency and Percentage of Subjects' Characteristics or Background for Readmission Cases Only

Variable	No. of subjects (%)	No. of readmission (%)
Age of onset		
< 20	30 (4.3)	0 (0.0)
20–29	246 (34.9)	23 (25.0)
30–39	276 (39.1)	37 (40.2)
40–49	131 (18.6)	27 (29.3)
≥ 50	22 (3.1)	5 (5.4)
Gender		
Male	614 (87.1)	81 (88.0)
Female	91 (12.9)	11 (12.0)
Ethnicity		
Malay	662 (93.9)	88 (95.7)
Chinese	13 (1.8)	0 (0.0)
Others	30 (4.3)	4 (4.3)
District		
Brunei Muara	534 (75.7)	16 (17.4)
Belait	74 (10.5)	69 (75.0)
Temburong	21 (3.0)	2 (2.2)
Tutong	76 (10.8)	5 (5.4)
Marital status		
Married	293 (41.6)	34 (37.0)
Divorced/Widowed	112 (15.9)	28 (30.4)
Single	300 (42.6)	30 (32.6)
Job-status		
Employed	246 (34.9)	27 (29.3)
Unemployed	459 (65.1)	65 (70.7)
Education level		
Primary and below	118 (16.7)	22 (23.9)
Secondary	530 (75.2)	67 (72.8)
Technical and vocational	50 (7.1)	3 (3.3)
Tertiary	7 (1.0)	0 (0.0)
Types of drugs		
Methamphetamine	672 (95.3)	87 (94.6)
Marijuana	19 (2.7)	3 (3.3)
Others	14 (2.0)	2 (2.2)
Committed other criminal offenses		
Yes	187 (26.5)	37 (40.2)
No	518 (73.5)	55 (59.8)
Voluntary admission		
Yes	538 (76.3)	65 (70.7)
No	167 (23.7)	27 (29.3)

Table 2: Association Between Readmission and Other Variables Using Univariate and Multiple Logistic Regression Analyses

Variable	ULR ^a		MLR ^b	
	OR [95% CI]	<i>p</i> value	OR [95% CI]	<i>p</i> value
Age of onset				
< 20	2.15×10 ⁻⁷ [0, ∞]	0.983	2.00 ×10 ⁻⁷ [0, ∞]	0.983
20–29 ^r	1.00	-	1.00	-
30–39	1.45 [0.84, 2.55]	0.188	1.37 [0.76, 2.48]	0.299
40–49	2.42 [1.32, 4.45]	0.004*	2.24 [1.16, 4.37]	0.017*
≥ 50	2.69 [0.82, 7.54]	0.075	2.09 [0.60, 6.34]	0.215
Gender				
Female ^r	1.00	-	-	-
Male	1.08 [0.57, 2.24]	0.813	-	-
Ethnicity				
Malay ^r	1.00	-	-	-
Chinese	4.02×10 ⁻⁷ [0, ∞]	0.982	-	-
Others	0.97 [0.28, 2.55]	0.951	-	-
District				
Brunei Muara ^r	1.00	-	1.00	-
Belait	1.89 [1.00, 3.42]	0.042*	1.94 [1.00, 3.63]	0.044*
Temburong	0.68 [0.11, 2.42]	0.614	0.63 [0.10, 2.40]	0.559
Tutong	0.46 [0.16, 1.08]	0.110	0.50 [0.17, 1.21]	0.163
Marital status				
Married ^r	1.00	-	1.00	-
Divorced/Widowed	2.54 [1.45, 4.45]	0.001*	2.14 [1.19, 3.82]	0.011*
Single	0.85 [0.50, 1.42]	0.527	0.92 [0.53, 1.60]	0.778
Job-status				
Employed ^r	1.00	-	-	-
Unemployed	1.38 [0.87, 2.26]	0.185	-	-
Education level				
Primary and below	1.60 [0.92, 2.68]	0.083	-	-
Secondary ^r	1.00	-	-	-
Technical and vocational	0.45 [0.11, 1.26]	0.186	-	-
Tertiary	1.16×10 ⁻⁶ [0, ∞]	0.980	-	-
Type of drug				
Methamphetamine ^r	1.00	-	-	-
Marijuana	1.51 [0.34, 4.80]	0.527	-	-
Others	1.31 [0.20, 5.07]	0.732	-	-
Committed other criminal offenses				
No ^r	1.00	-	1.00	-
Yes	2.06 [1.29, 3.23]	0.002*	1.91 [1.16, 3.11]	0.010*
Voluntary admission				
No ^r	1.00	-	1.00	-
Yes	1.49 [0.90, 2.41]	0.110	2.33 [1.34, 4.01]	0.002*

Note: OR = Odds Ratio; CI = Confidence Interval; *statistically significant ($p < 0.05$); ^aUnivariate Logistic Regression; ^bMultiple Logistic Regression; ^rReference level

Using multiple logistic regression analysis, subjects who were in the age group of 40 to 49 (OR = 2.24, 95% CI [1.16, 4.37]), resided in the Belait district (OR = 1.94, 95% CI [1.00, 3.63]), divorced or widowed (OR = 2.14, 95% CI [1.19, 3.82]), had committed other criminal offenses (OR = 1.91, 95% CI [1.16, 3.11]), and voluntarily admitted (OR = 2.33, 95% CI [1.34, 4.01]) were significantly associated with readmission to Al-Islah Rehabilitation Center. The model appeared to fit well according to the Hosmer-Lemeshow test ($p = 0.310$).

Discussion

This is the first study looking at sociodemographic factors associated with readmission to a drug rehabilitation center in Brunei Darussalam. There were 13% readmission cases of the total number of cases within the study period of 2010 until 2017.

Al-Islah Rehabilitation Center's treatment concept is a therapeutic community configured to follow Brunei's socio-political philosophy, which is the Malay Islamic Monarchy (Sharbawi & Mabud, 2021). The treatment program in the rehabilitation center is comprised of four components: the first component focuses on behavior management; the second component emphasizes psychological and emotional treatment through counseling sessions; the third component is an intellectual and spiritual treatment, where Muslim residents receive intensive religious classes for six months, while non-Muslims are given other duties to fill their time; and the fourth component emphasizes on vocational and life skills training that is tailored to everyone (AIPACODD, 2019; Masli, 2010).

There was a significant relationship between age of onset and readmission ($p = 0.017$), which agrees with the results of some studies (Ferri et al., 2002; Polenber, 2015; Robbins et al., 2009; Wolfe et al., 2002). Our study found that subjects in their forties were more likely to be readmitted to the rehabilitation center compared to subjects in their twenties. Consistent with studies by Chi et al. (2014) and Ferri et al. (2002), the odds of treatment re-entry from substance use disorders were higher for those who entered at an older age. Prior research found that their younger offenders viewed their substance use problems as a function of poor behavioral choices or a developmental/social lifestyle phase rather than an illness in need of continuing care (Gonzales et al., 2012).

This study found that subjects residing in the Belait district tend to get readmitted more than subjects from Brunei Muara (OR = 1.94, $p = 0.044$). The Belait District is located in the westernmost district in Brunei Darussalam, close to the Sungai Tujoh border control checkpoint, where the highest drug-related arrests were made from 2014 until 2018 (AIPACODD, 2019), which might be the reason for the high readmission.

Factors associated with relapse are related to factors associated with readmission because relapse is one of the main reasons for a person to be readmitted to a drug treatment center. According to Sau et al. (2013), the higher relapse rate in singles and divorced or separated persons compared to married people could be due to a lack of family support and financial security, which are critical for recovery and social rehabilitation. This is in line with our study where being divorced or widowed significantly contributed to readmission and was more likely to be readmitted to the

rehabilitation center compared to those who were married. However, a study by Arning (2017) reported that marital status was not significantly associated with readmission.

This study found that having a prior history of committing criminal offenses other than drug-related crimes were more likely to be readmitted. Similar studies were reported by Wolfe et al. (2002). They found that having a prior conviction increased the likelihood of re-arrest. Ferri et al. (2002) found that being involved in crimes and having social support increased the odds ratio for treatment re-entry. Furthermore, this study found that the mean duration of stay in the rehabilitation center for those admitted voluntarily to the rehabilitation center was shorter than those who did not. According to Ball et al. (1970), the longer the addicts stayed at the treatment center, the fewer readmission occurred for individuals under 21 or over 30 years old. Also, Moos et al. (1995) reported that substance abuse patients who had longer episodes of community residential facility care were improbable to be readmitted. These are in line with our study where subjects who were involuntarily admitted (longer length of stay) decreased the likelihood of getting readmitted.

There was no significant association between gender and readmission, which agrees with a study by Polenberg (2015). In that study, gender was not a significant factor in relapse and re-arrest. However, studies by Ferri et al. (2002) and Wolfe et al. (2002) found that gender was indeed a significant factor associated with readmission. Our findings may be related to the imbalance proportion of gender in the data set where the number of male subjects was more than females due to the gender gap in crime (Steffensmeier & Allan, 1996). Another reason was that there are more males than females in Brunei Darussalam. According to the Department of Statistics (2018), the sex ratio was 112 males to 100 females in 2017, averaged across all ages.

Ethnicity, education level, job status, and type of drugs were not significantly associated with readmission to Al-Islah Rehabilitation Center in this study. These results are comparable with those reported in previous international studies (Ferri et al., 2002; Polenberg, 2015; Robbins et al., 2009). However, Arning (2017) and Polenberg (2015) reported that the type of drug was a significant factor for readmission in their studies. Arning (2017) found that heroin addiction and polydrug use were significantly associated with readmission but not cocaine addiction. The discrepancies in the results might be due to the unevenness of the proportion of the type of drugs used, where the majority of the subjects in this study consumed Methamphetamine.

There are some limitations to this study. First, the variables and data requested before 2010 were not available as data were obtained and collected retrospectively. Reliance on administrative datasets limited this study to control the selection of variables. Other significant factors associated with readmission to a rehabilitation center that have been studied include mental health problems (Luchansky & He, 1999), route of drug administration and reason for discharge (Trujols et al., 2007), polydrug use, mood disorders and problems related to the social environment (Arning, 2017), whether or not treatment was completed (Robbins et al., 2009), the severity of dependence, and social support received (Ferri et al., 2002). Unfortunately, these factors were not available in the data used in this study. Future researchers should consider doing a prospective study by looking at significant factors for readmission in previous studies, which were not included in this study. The second limitation is the presence of missing data, commonly seen in all retrospective studies. Also, with any retrospective study, care should be taken when drawing conclusions, as the data may not necessarily align with the study's interests. Thirdly, most of the studied subjects

were not susceptible to readmission, which leads to highly imbalanced classes in logistic regression analysis that might decrease accuracy and increase error. It is recommended for future researchers to approach resampling or algorithmic ensemble techniques in handling highly imbalanced classes. The fourth limitation is that using logistic regression could provide misleading results as, among other things, those who entered the study in a later year may be counted as those who have never been readmitted. However, some of them would possibly have been readmitted if the data for analysis covered the year 2018 and later.

This study provides evidence of sociodemographic factors in relation to readmission to the rehabilitation center in Brunei Darussalam. Furthermore, this study has never been done in Brunei Darussalam before, as reports and previous studies were either qualitative or only looked at descriptive statistics. This study focused on the Al-Islah Rehabilitation Center, while other reports in Brunei Darussalam considered drug re-arrests in general. It is recommended for future researchers to explore other statistical methods such as survival analysis or mixed methods research combining both qualitative and quantitative research to compare the findings of the study.

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