THE RELATION BETWEEN ATTENTION DEFICIT HYPERACTIVE DISORDER AND SUBSTANCE USE DISORDER AMONG THE JUVENILE OFFENDERS IN A MALAYSIAN DETENTION CENTRE

By,

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CERTIFICATION

This is to certify that the candidate Dr. Suhana Bt. Muhamud@Kayat, had carried out this research project, and to the best of my knowledge, this dissertation is entirely her work.

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This work is dedicated to myself, my husband, my family AND my family in law.
I love you all very much….

ABSTRACT

THE RELATION BETWEEN ATTENTION DEFICIT HYPERACTIVE DISORDER AND SUBSTANCE USE DISORDER AMONG THE JUVENILE OFFENDERS IN A MALAYSIAN DETENTION CENTRE

Introduction:

Attention deficit hyperactivity disorder (ADHD) is one of the most common childhood disorder which affect 3-9% of adolescents and up to 5% of adult. Research has shown that children with ADHD are at risk of involvement in crime. Comorbidity among attention deficit hyperactivity disorder (ADHD) and substance use disorder (SUD) is highly present in which one-half of adolescents with SUDs have ADHD. At present, there is no study in relation with ADHD and SUD done locally in the Malaysian Detention Centre.

Objective:

To determine the prevalence and co-relation of ADHD and substance use disorder among the juvenile offenders in Malaysian Detention Centre. This study also hopes to examine the socio demographic profile, association regarding family background and type of offences committed by the offenders with ADHD and substance use.

Methods:

Juvenile offenders who were detained in Henry Gurney School, Telok Mas, Melaka was selected for this study. All juvenile ages below 18 years old were recruited. The socio-demographic data and family background was recorded using a questionnaire developed by the research team. Problem Orientated Screening Instrument for Teenager (POSIT) was given to screen subjects with substance use and at the same time measure any problem in physical health, mental health, family relations, peer relations, educational status, vocational status and social skills. Diagnosis of ADHD, Substance dependence and abuse and Alcohol dependence and abuse were made using Mini International Neuropsychiatric Interview for Children and Adolescents Version 6 (MINI-Kid).

Result:

There are total of 106 juvenile detainees who are less than 18 years old, 6 juveniles were excluded due to disciplinary problem. Therefore, only 100 subjects were recruited in the study. Majority of the subjects were male (90%), Malays (86%), had secondary level of education (84%) and employed (64%). 67% of the subjects had a diagnosis of ADHD with combined subtype is more prevalent and 77% of the subjects using substance. Chi square analysis showed 66.2% of subjects with ADHD have substance use disorder. However this result is not statistically significant ($p=0.77$). Most of the ADHD and substance use disorder subjects had family history of drugs, alcohol and criminality. However, it is shown to have statistically significant association between subjects with ADHD and family history of drugs ($p=0.04$) and alcohol ($p=0.04$). Student t-test analysis of POSIT score showed subjects with ADHD had statistically significant problem in

social skills domain in moderate impairment and SUD subjects had statistically significant high-risk problems in substance use/abuse domain and moderate problems in family relations, peer relations, education, social skills and aggressive domain. In term of type of offence, there was no statistically significant association between ADHD subjects but showed statistically significant association with sex related crime (p=0.00) and substance use disorder even though the non sexual crime was higher than those who committed sexual related crime.

Conclusion:

In this study, there was no statistically significant association between attention deficit hyperactive disorder (ADHD) and substance use disorder (SUD) among the juveniles in Henry Gurney School, Melaka. Though clinically the comorbidity is highly present and it has a significant impact on functioning of the juvenile.

ABSTRAK

PERHUBUNGAN ANTARA PENYAKIT KURANG DAYA TAHAN TUMPUAN DAN HIPERAKTIF (ADHD) DAN PENYALAHGUNAAN SUBSTANS (SUSBTANCE USE DISORDER) DI KALANGAN PESALAH JUVANA DI PUSAT TAHANAN MALAYSIA

Pengenalan:

Penyakit kurang daya tahan tumpuan dan hiperaktif (ADHD) adalah salah satu penyakit kanak-kanak yang kerap terjadi kepada 3-9% remaja dan sehingga 5% dewasa. Penyelidikan telah menunjukkan bahawa kanak-kanak ADHD adalah pada risiko penglibatan jenayah. Penyakit sampingan atau 'komorbid' di kalangan Penyakit kurang daya tahan tumpuan dan hiperaktif (ADHD) dan penggunaan substans (SUD) adalah sangat tinggi di mana separuh daripada remaja dengan SUD mempunyai ADHD. Pada masa ini, tiada kajian tempatan berhubung dengan ADHD dan SUD dilakukan di Pusat Tahanan Malaysia.

Objektif:

Untuk menentukan prevalens dan hubungan bersama Penyakit kurang daya tahan tumpuan dan hiperaktif (ADHD) dan penyalahgunana substans (SUD) di kalangan pesalah juvana di Pusat Tahanan Malaysia. Kajian ini juga berharap untuk memeriksa profil sosio demografi, latar belakang keluarga dan jenis kesalahan yang dilakukan oleh pesalah juvana dengan ADHD dan SUD.

Kaedah:

Pesalah juvana yang ditahan di Sekolah Henry Gurney, Telok Mas, Melaka telah dipilih untuk kajian ini. Semua pesalah juvana yang berumur di bawah 18 tahun telah dikaji. Data sosio-demografi dan latar belakang keluarga direkodkan dengan menggunakan borang soal selidik yang telah disediakan oleh pasukan penyelidik. Instrumen Pemeriksaan berorientasikan masalah untuk Remaja (POSIT) telah diberikan kepada subjek untuk mengetahui penggunaan substans dan pada masa yang sama mengkaji masalah-masalah lain seperti kesihatan fizikal, kesihatan mental, hubungan keluarga, hubungan rakan sebaya, taraf pendidikan, taraf vokasional dan sosial kemahiran. Diagnosa penyakit ADHD, Penyalahgunaan substans (SUD) telah dikenalpasti melalui "Mini International Neuropsychiatric Interview for Children and Adolescents Version 6" (MINI-Kid).

Keputusan:

Terdapat 106 tahanan juvana yang berumur kurang dari 18 tahun, 6 juvana telah dikecualikan kerana masalah disiplin. Oleh itu, hanya 100 pesalah juvana yang telah dipilih dalam kajian ini. Majoriti subjek adalah lelaki (90%), Melayu (86%), mempunyai pendidikan peringkat menengah (84%) dan bekerja (64%). 67% mempunyai diagnosa ADHD dengan subjenis gabungan "combined subtype" yang tinggi dan 77% daripada subjek mempunyai diagnosa SUD. Analisis chi square menunjukkan 66.2% subjek dengan ADHD mempunyai SUD. Walau bagaimanapun, keputusan ini tidak signifikan

dari segi statistik (p = 0.77). Kebanyakan subjek ADHD dan SUD mempunyai sejarah keluarga penggunaan dadah, alkohol dan jenayah. Walau bagaimanapun, ia menunjukkan statistik yang signifikan antara subjek dengan ADHD dan sejarah keluarga pengunaan dadah (p = 0.04) dan alkohol (p = 0.04). Analisis 'student t-test' untuk skor POSIT menunjukkan subjek dengan ADHD mempunyai masalah statistik yang signifikan dalam kemahiran sosial dengan masalah yang sederhana dan subjek SUD mempunyai masalah statistik yang signifikan berisiko tinggi dalam domain penggunaan substans dan masalah sederhana dalam hubungan keluarga, hubungan rakan sebaya, pendidikan , kemahiran sosial dan domain yang agresif. Dalam jenis kesalahan, tiada terdapat hubungan statistik yang signifikan antara subjek ADHD tetapi menunjukkan statistik yang signifikan dengan jenayah berkaitan seks (p = 0.00) dan SUD walaupun jenayah bukan seksual adalah lebih tinggi daripada mereka yang melakukan jenayah berkaitan seksual.

Kesimpulan:

Dalam kajian ini, terdapat tiada hubungan statistik yang signifikan antara penyakit kurang daya tumpuan dan hiperaktif ADHD) dan penyalahgunaan substans (SUD) di kalangan juvana di Sekolah Henry Gurney, Melaka. Walaupun di peringkat klinikal penyakit sampingan 'komorbid' ini adalah sangat tinggi dan ia mempunyai kesan yang ketara kepada salah laku juvana.

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1.0 INTRODUCTION

Not a day goes by without any crimes being reported in the media. What is more worrying is the involvement of juveniles as perpetrators of these crimes. Data from the Department of Social Welfare for the ten-year period between 1997 and 2006, revealed that children involved in crime control has remained fairly constant (1). An average of between 300-400 cases were brought to the attention of the Department of the Social Welfare, and boys (96%) outnumbered girls (4%). The majorities are from the age group of 16-17 years and the highest offences are property related crimes. Malaysia Crime Prevention Foundation (2009) however has noted that there was 3300 students aged between 13 and 18, arrested for various crimes in 2007, the numbers have increased steadily from then on. The author feels that the actual number of juvenile offenders is much higher than that is reported.

The interest in juvenile offenders has risen through the years. Social problems amongst adolescent are indicators of the strength or weakness of the community and nation. These adolescents are the future leaders of the country.

Around the world each year there has been noted an increasing trend of juvenile detention and this is indeed worrying. In Malaysia reports from the Royal Malaysian Police and Prison Department Malaysia, show an upward trend of juvenile offenders and it involves children as young as 7 years old until 18 years old. The other concern of the authorities is the rising trend of substance use among adolescents.

What can be done to reduce sending more and more to the pathway of social deviance or to at least rehabilitate those already in detention facilities? Many international studies concerning adolescents have focused on adolescents in juvenile care and institutions. The Prisons Department of Malaysia, looks at juvenile criminal misconduct among adolescent from the socio-economic aspects (2). Factors that put adolescents at risk of becoming delinquent such as parental monitoring, physical abuse and neglect, having delinquent friends and low school achievement have been identified (3, 4).Thus the rehabilitation module presently in prisons for these detainees are based on discipline building, character building and academic classes.

Interests in the field of adolescent health have shown that there is a high prevalence of mental disorders among these adolescents' especially disruptive behavior disorders. Studies conducted among prisoners in western countries have shown that about half of the imprisoned fulfilled the diagnoses of serious conduct disorder or antisocial personality disorder when incarcerated (5). Almost two-thirds of male and three-quarters of female juvenile detainees fulfilled criteria for one or more mental disorders (6). This is three to five times more than seen in adolescents in the general population (5, 7, 8). Attention Deficit Hyperactive Disorder (ADHD) has been found to be overrepresented in juvenile in detention centers, jails and prison (9, 10). Research has shown that children with ADHD are at risk of involvement in crime (9, 11) thus these children at significantly increased risk for later criminality (12-14). Children with ADHD especially the impulsive sub-type have been found to be more at risk, they are more likely to be involved in crime and become offender in adolescents (11, 15).

In Malaysia, in a study done in the prisons among juvenile detainees to look for presence of psychiatric disorder, Conduct Disorder (CD) was the commonest disorder found among the subjects (59.0%), followed by Substance use, anxiety disorder while ADHD was the fourth common disorder found among the detainees (16). Substance Use Diorder (SUD) was the most common co-morbidity present and there was a significant statistical difference between the with and without co-morbid CD with regards to using substance**.** A quarter of the offenders diagnosed with CD were found to have co-morbid ADHD, however there was no significant statistical difference found between these 2 groups with regards to substance use.

Attention deficit hyperactivity disorder (ADHD) is one of the most common childhood disorder which affect 3-9% of children and adolescents and up to 5% of adult (17-19). A number of authors have argued that childhood attention-deficit hyperactivity disorder (ADHD) is related to adult disorders characterized by antisocial behavior, in particular antisocial personality disorder (20). Research on the developmental course of children with ADHD have found these children are at risk of developing a wide range of co-morbid

conditions, ranging from behavioral (21, 22), emotional (21, 22), interactional and learning (23-25). Much of the development of psychopathology amongst children with ADHD is linked to problems with inhibition and emotion regulation (20). These problems start early and are chronic (21, 22).

Children with ADHD often fail at school and more likely to get suspended or expelled. They also have poor social skills that make it difficult for them to establish meaningful relationship with peer and family (26). ADHD symptom severity has been shown to be associated with higher levels of family dysfunction, low income, overcrowded living conditions and maternal history of psychiatric treatment (27). Learning difficulties and the secondary psychosocial characteristics explains why adolescents with learning disorder and with co-morbid ADHD more frequently engage in risk-taking behavior (28).

There have been contradictory reports about the association of ADHD with CD. Some reports have stated that ADHD alone is a predictor of criminality in males (12-14) while others have reported that individuals with a co-morbidity of conduct problems are at a higher risk than those having ADHD alone (29). Aida et al (2012) found a quarter of the offenders diagnosed in the Malaysian prison sample with CD were also found to have co-morbid ADHD (16).

There is increased risk of substance use disorder among individuals diagnosed with ADHD (18, 26, 30). In longitudinal studies of subjects with ADHD, the co-existence of externalizing disorders has been shown to increase the risk of substance use (31, 32). Research has found that substance use disorder usually begins in adolescence or early adulthood, and in the US, substance use affect 10% -30% of US adults (18, 19). According to Wilens et al, (2011) one-half of adolescents with SUDs have ADHD.

The association of disruptive behavior, and substance use in adolescents increase the risk for criminal behavior in adolescence and adulthood (12-14). Thus children with ADHD are at risk of continuing their disruptive behaviors and in some towards criminality into adulthood, as well as substance use and all these situations have grave consequences and higher economic cost to society.

Most of the studies about the relationship with ADHD and substance use disorder are done in the clinical settings and in the community (26). There were not many research studies in relation with ADHD and substance use disorders among juvenile in the prison. It would be interesting to see the relation of having ADHD and its association with substance use disorder amongst juveniles in prison and whether detection and intervention of their ADHD can reduce recidivism of their offending behavior.

Knowledge with regards to child psychiatric disorders preceding criminal behavior is detrimental to any community around the world. In the local setting, the detainees are not being screened for childhood disorders, especially ADHD, but are screened for drug used. It is also hoped that the relevant authorities be educated regarding the importance of recognizing these juveniles who have ADHD, be detected and recommended for treatment as early as possible.

In addition, ADHD has been found to be closely related to learning disorders (25, 33). Adults with ADHD show lower intellectual functioning than adults without ADHD (34). Again evidence suggests that learning disorders e.g., specific learning difficulties of scholastics skills (23, 25, 33) as well as low IQ scores (35) are positively related to criminal behavior and also to criminal recidivism (36). In recent years, rehabilitation in our juvenile justice system have focused on academic, i.e. giving the offenders a chance to finish their schooling. Thus without knowing the presence and impact of ADHD on learning, the rehabilitation process would not be as effective as these juvenile are taught in the same way as children without ADHD.

Furthermore, in view of the rising number in the juvenile offenders associated with substance use, this issue must not be neglected, as this will affect the future generation that is supposed to lead the country. Detection of the problems needs to be taken into serious consideration to facilitate the intervention process.

Identification of mental health care and needs of juvenile detainees in institutional care is important as effective preventive and treatment programs can be looked into to counter the recidivism risk. Detainees diagnosed with ADHD should be given more intensive treatment other than just academic intervention. It is also a possibility to consider specialist attention for these juvenile while in the justice system. None of the juvenile centers have regular and proper access to trained professional especially ones trained in child and adolescent psychiatry and neuropsychiatry to provide diagnostic evaluations, neurological examinations as well treatment to common mental health issues.

Chapter 2: Literature Review

2.1 Attention Deficit Hyperactivity Disorder (ADHD)

Attention Deficit Hyperactivity Disorder (ADHD) is a common psychiatric disorder affecting children and adolescent (37, 38). It is a clinically heterogeneous disorder that is associated with tremendous financial burden, stress to families, and adverse academic and vocational outcomes (38). It is characterize by developmentally inappropriate and impairing levels of inattention and hyperactivity-impulsivity and it is a major risk factor in the development of antisocial behavior (39, 40).

According to the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV), the diagnostic criteria of ADHD consists of at least six symptoms of inattention or six symptoms of hyperactive/impulsivity for six months or more and present before the age of seven years old. The impairment from the symptoms has to be present in two or more settings (e.g home and school) and ADHD comprised of three different subtypes (41) :

1) ADHD predominantly hyperactive-impulsive type
2) ADHD predominantly inattentive type
3) ADHD combined type

The prevalence of ADHD around the world is estimated to range from as low as 0.9% to as high as 20% (42, 43). However, according to Polanczyk et.al, (2007), the prevalence of ADHD is around 5.29% for children and adolescents and 4.4% in adulthood (37). It was found that the differences are secondary to the methodological characteristic of the different studies. In Malaysia, based on the community survey amongst Malaysian children and adolescents between the ages of 5-15 years showed a prevalence rate of 3.9% (44). Between gender, **t**he prevalence of ADHD is higher among boys rather than girls across all age groups (37, 44).

ADHD can cause devastating problems to an individual with ADHD and often results in impairments in major life activities, including social relations, education, family functioning, occupational functioning, self-sufficiency, and adherence to social rules, norms and laws (45). These often results in children with ADHD having chronic and severe problems at school and at home. This is significant as the first coherent description of the disorder by Still (1902) described children with ADHD as having ‘‘abnormal defect in moral control’’, which Still (1902) felt was much related to the capacity of ‘‘inhibitory volition.’(46). These children have little inhibitory volition, and unable to learn from the consequences of their own actions (47). The adolescent with ADHD is at risk for school failure, emotional difficulties, poor peer relationships, and certainly trouble with authorities and the law (48, 49).

The developmental course of children with ADHD is thought to be affected and varied by the presence of co-morbid disorders (20). More than half of children with ADHD have been found to have a co-morbid disorder (21, 22), and almost a third have two co-morbid disorders, while about one tenth of children with ADHD have been found to have three co-morbid disorders (50). Conduct disorder and oppositional defiant disorder are the most common co-morbid disorders found (26, 51). ADHD also frequently overlap with learning disabilities (25, 33) affective and anxiety disorders (26).

In a five years cohort study done by Langley , et al (2010), about 69.8% adolescents continued to meet the full criteria for ADHD and exhibited high levels of antisocial behavior, criminal activity and substance use problems (52). The core symptoms of ADHD should not by the only focus of concern but as the above literature has shown, early diagnosis and treatment is essential as the outcomes have been proven to be poor in undetected and unsuspected cases.

2.2 ADHD and criminality

There are now numerous studies that show the persistence of ADHD and the lifetime psychopathology outcome (53, 54). In a 10-year follow-up study, Biederman et al, (2006) found by the mean age of 21, children with ADHD in their adolescent years were at high risk for markedly elevated lifetime prevalence of antisocial, addictive, mood and anxiety disorders (54). The study also found higher prevalence of antisocial disorders and nicotine dependence. Other research have reveal similar impact of ADHD with substance use and criminality, and both conditions is high especially among the adolescent boys (30). According to Multisite Multimodal Treatment Study of children with ADHD (MTA), approximately 25%-30% of youth aged between 13-18 were in the spectrum of antisocial behavior, 26.8% were arrested at least once by 8 years, and 30% had engaged in moderate to serious delinquent behavior (55).

The relationship between ADHD and criminality is mediated by the development of antisocial disorder in adolescence (12). However, some reported that increase criminality in children with ADHD is comorbid with conduct disorder (9, 56, 57). The pathway theories of antisocial behavior commonly occurred with ADHD as a first step in the sequence, followed by oppositional defiant disorder (ODD), and later conduct disorder. However, ADHD is rejected as a direct developmental precursor to conduct disorder if prior ODD is taken into account (39). In the study done by Manuzza et al,(2008), found that children with ADHD and conduct disorder are at significantly increased risk for later criminality, but only if they develop an antisocial or substance use disorder in adolescence. While in other studies state the presence of CD increases the risk for and predicts later criminality (58).

2.3 ADHD and substance use disorder

Alcohol and illicit drug along with tobacco use are among the most worrying global public health problems, especially usage among adolescents (59). The uses of these substances have both short and long-term health consequences on adolescence (59). ADHD is one of the factors that have been found to be related to the development of substance use disorders (18). Substance use and abuse are the most feared consequences for children with ADHD (60). Low educational levels, unemployment and risky sexual behavior are associated with substance use disorders (61). SUD is also related to suicidal and violent behaviors among high school students (62).

Studies have shown that conduct disorder most strongly predict substance use disorder and the effect of ADHD are only partially predictors on SUD (26, 60). In the study by Gau et al (2007) showed the independent effect of ADHD on substance use (63). The same association between ADHD and SUD has been high-lighted in other studies (31, 54, 64). Biederman et al, (2006) found children with ADHD were two times more likely to develop substance use disorder than the matched control . This is supported by other studies which show the prevalence of childhood and adult ADHD in substance-abusing populations to be estimated three times higher than that in the general population (65-67). The prevalence of childhood and adult ADHD in substance-abusing populations has been estimated to be three times that in the general population (67).

The importance of this knowledge is that, presence of ADHD in substance-abusing population complicates the picture children with ADHD (60, 68). Presence of ADHD often results in an earlier onset and more severe course of a SUD (69, 70). The presence of ADHD in substance-abusing population is also associated with, poorer treatment adherence, difficulty in achieving treatment goals and thus poor or slow progress in treatment (69, 71, 72) . The association is also related to higher rates of relapse (69, 71, 72). Wilens et al, 2011 suggest that ADHD may be under diagnosed in the substance use

disorder population, thus as the above discussion indicate early identification could allow interventions that would prevent the disorder from becoming chronic and incapacitating.

There are several reasons about the relation between ADHD and substance use disorder (73).

1) Dopamine (DA) neurotransmission is central to ADHD and substance use disorder and methylphenidate (MPH) is highly efficacious treatment for the core symptoms of ADHD
2) In the neuroimaging studies found replicated evidence of blunted striatal DA release and disrupted neural circuitry between the anterior cingulate cortex and striatum with prefrontal cortex
3) Offspring of adults with substance use disorder are more likely to develop psychopathology, including ADHD
4) The prevalence of psychopathology, including substance use disorder, is higher in first-degree relatives of ADHD probands than in healthy controls. Therefore, it may share common etiological influences, including similar genetic factors.

Recent works have further highlighted the association between ADHD, cigarette smoking and substance use. Studies of children with ADHD showed evidence of ADHD as a risk factor for later not just for SUDs but cigarette smoking as well (73-76). Charach et al, (2011) concluded that childhood ADHD is associated with alcohol and drug use disorders in adulthood and with nicotine use in adolescence (76).

Milberger et al (1997a, 1997b) indicated that the presence of ADHD is not only significant risk factor for early initiation of cigarette smoking in children and adolescents with ADHD but in the high-risk siblings of ADHD probands as well (77, 78). This early initiation of smoking promotes adolescents with ADHD to higher risk for substance use use (18, 73). Smoking leads to peer group pressures and availability of many and abundant illicit substances and with the nicotine exposure, the brain is more susceptible to later behavioral problems and substance use disorder (18). Self-medication hypothesis is also thought to

play a role whereby ADHD adolescence use substance more frequently to elevate their moods and to help them to sleep (60).

For adolescence with ADHD and substance use disorder, treatment of ADHD may reduce craving for substances and subsequently reduce the risk for relapse to substance use (79). However, Manuza et al, (2008) did not find that the onset or duration of stimulant treatment was related to the risk for substance use disorder (80). However other studies have suggested that early intervention and treatment do reduce or delay the onset of SUDs and cigarette smoking into adolescence (18). Neuro-imaging findings supports this notion, as ADHD and SUD-related craving have and share neurobiological similarities, thus the treatment of ADHD may reduce craving for substances and subsequently reduce the risk for relapse to substance use (81). It is also important to note that the presence of co-morbid disruptive behavioural disorders complicates inferences about the specificity of ADHD effects on substance use outcomes (73).

2.4 Risk factor for delinquency and substance use

Delinquency, is one manifestation of antisocial behaviour in adolescence. Antisocial behavior is a broad construct that encompasses not only delinquency and crime, but also disruptive behavior of children, such as aggression, below the age of criminal responsibility (3, 82). The prevalence of antisocial and delinquent behavior in juveniles has increased dramatically over the past decades (3, 82). This trend is also noted along with the prevalence of other health-endangering behaviors, such as substance use and suicide (3). There are different developmental pathways in which delinquency develops during adolescence Studies on continuity in antisocial behavior indicate that a multiproblem pattern is a stronger predictor of delinquency than a single problem behavior (83). Attention has focused on risk factors for upward trends in delinquency among youths. Researchers have high-lighted several risk factors for delinquency and it can be divided into several domains in involving the individual, family, school, peer group and community. In the individual domain, substance use, being male, hyperactivity, difficulty concentrating, aggression, low IQ, having medical and physical problem, and antisocial

behavior are the risk factor for delinquency (84). A high association has been obtained between aggression and hyperactivity in childhood and later antisocial behavior particularly in life-course-persistent offenders (83). Almost all of the studies looking at the association of ADHD and various antisocial behaviors, found positive relationship between violent and property crimes, delinquency, drug abuse and ADHD (9, 85). Family structure is one of the important risk factor for delinquent behavior. Children raised by two-parent families experience a lower risk of delinquency than children who being raised in a single-parent family (84, 86). According to the social control theory, a single parent may have less time to offer support, affection and counseling to their children, not because they are less caring, but because they find it more difficult to prioritize their children's needs above other life demands (87). In view of this theory, the children who being raised in one single-parent family may have motivation and opportunity to engage in unconventional activities, including delinquency (88). In term of substances use, researchers found that adolescents living in single-parent families are at a greater risk of substance compared to those residing in two-parent families (89, 90). However, Mack et al (2007) found maternal attachment as the most important determinant of delinquent behavior among youth from all types of family. It is the attachment between parent and child that is paramount and more important that the family composition, and it is the strength of this relationship is the most important factor in deterring delinquent behavior (91). Family factors that have affects attachment and parental availability includes parental criminality, family discord, and ineffective parenting (92, 93). Other family socio-cultural factors, such as low socioeconomic status or poverty, poor parent child relationship, broken home, separation from parents, abusive parents, family conflict, antisocial parents, poor monitoring and supervision are risk factors linked to juvenile delinquency (84). McCord et al, (1979), found the strongest predictors of later convictions for violent offenses among boys at age 10 were parental aggression and violence, including harsh and punitive discipline (92-94), Derzon and Lipsey, (2000), Wasserman and Seracini, (2001) found substance use increases the level of risk for the development of delinquency and crime (92, 93). Exposure to familial conflict early in life increases the risk of substance use disorders during adolescence (95). Poor family environments (i.e., poor parental relationships, a high degree of family problems) were significantly associated with a higher level of drug use (96). Adolescents use substances as

a maladaptive means of coping with stress induced by adverse family environments in childhood (95).

Problems at school also can lead to delinquency, a child's level of academic achievement and experiences in school also have bearings to delinquency risk (83). Children with poor academic performance, poor attitude and commitment to school and low educational aspirations during the elementary and middle school grades are at higher risk compared to other children (97). While for adolescents attending schools, this serves as a buffet against delinquency (98).

Peer influences such as peer delinquent behavior, attachment or loyal to peers, time spent with peers and peer pressure for deviance have associated with antisocial behavior and the delinquent behavior is significant when the youth have little interaction with their parents (84).

The issue of delinquent behavior has taken on increased importance in recent years, be it in community of in discussions of juvenile justice and treatment issues. Early mental health problems, or mild behavior and emotional difficulties if left untreated, can lead to a downward spiral at later years, leaving the adolescent and community with negative consequences such a worsening delinquent behavior, substance use and criminal activities.

There are many risk factors (as discussed) and there are many categories of risk factors. The environment can influence the likelihood of delinquency in several ways, the family structure, peers influences and the neighborhoods (84). Chung and Steinberg, (2006) postulated that weak neighborhood social organization is indirectly related to delinquency through its associations with parenting behavior and peer deviance and that a focus on just 1 of these microsystems can lead to risk for juvenile offending behavior (99). Being raised in the neighborhood with high availability of drugs and crime is one of the risk factors for delinquency (84). Community social ties may confer both pro- and antisocial influences to youth (99). There are two theories in understanding neighborhood effects (99):

1) Relationship and ties model

This theory is from the family stress theories that suggest the link between neighborhood disadvantage and delinquent outcomes is mediated by parenting behavior (e.g. supervision) and characteristics of the home environment.

2) Norms and collective efficacy model

In this theory, it was suggest that the link between neighborhood disadvantage and delinquency is mediated by peer group norms and behavior (e.g., level of deviant attitudes and activity)

Neighborhood structure refers to the socio-demographic compositional features of surrounding communities (e.g., rate of employment, average wages and income) and the neighborhood social processes (99). This refers to the community's social organization (e.g., social connections among neighbors) and is usually evaluated on the basis of residents' perceptions of how their communities function (99). Early childhood, neighborhood disadvantage and family conflict place children at risk for early-starting deviant trajectories, and that involvement with deviant peers in the neighborhood takes on an increasingly important role in patterns of antisocial behavior over middle childhood (100). Disadvantage neighborhood structural factors e.g. poverty, disorganization and instability are linked to higher rates of juvenile delinquency (99).

2.5 Genetics of Attention Deficit Hyperactive Disorder and Substance Use Disorder

Researchers have indicated that ADHD is the most common, highly heritable childhood-onset psychiatric disorder (101, 102). Biological parents with a hyperactive child have about 25% risk of having the disorder than a comparison group of adoptive parents (103). In a study done by McGough et al (2005), found parents with ADHD children were significantly more likely to be unskilled workers and less likely to have a college degree (40). Twin and family studies of ADHD show a similar and substantial genetic heritability with little or no family environmental effect (104, 105). Heritabilities were found to be as high as around 70% for both hyperactivity-impulsivity and inattentiveness subtypes (106).

Studies (107, 108) show evidence of subtype-specific familiality, which indicates that there may be some genes that have unique effects on the different subtypes. In the twin study

done by McLoughlin et al., (2007), found that hyperactive-impulsivity and inattention substantially shared genetic overlap, while Kuntsi et al., (2004) the association with hereditary was stronger for both inattention and hyperactivity than for impulsivity. The findings suggest that there are many genes are associated with ADHD (109), and that there is a large genetic overlap with no specificity for ADHD subtypes (110). The genes involve may be have unique effects on the different subtypes thus evidence for genetic heterogeneity of clinical subtypes of this disorder (109).

As discussed earlier, there is increase incidence of ADHD seen in adolescents and adults with psychoactive substance use disorder and increased substance use was associated with disruptive behavior among children and adolescents. The significant link between substance use disorder and ADHD have been consistently reported and noted in family members of children with ADHD (22). Elevated rates of alcoholism were noted in parents and second-degree relatives of children with ADHD including substance use disorder in the relatives (111, 112). Patterns of familial risk analysis suggesting the association between ADHD and SUD are not only seen amongst adolescent males, it is seen as well in adolescent females with ADHD (113). In a study by Biederman et al., (2008) showed in drug dependence probands there is increase risk for drug dependence in relatives irrespective of ADHD status, whereas alcohol dependence was predicted by ADHD probands with co-morbid alcohol dependence.

Literature have shown offspring of parents psychopathology namely SUD, are at increased of psychopathology themselves. It is well documented that parental substance dependence is associated with externalizing psychopathology, namely disruptive behavior. Parental diagnoses of alcoholism and anti-social personality disorder were associated with increased risks for a variety of childhood psychiatric disorders, and dysfunctional parenting style was associated with the diagnoses of CD, and substance abuse (114, 115). Researches have indicated that adolescent and adult offspring of parents with psychoactive substance use disorder are at increased risk of ADHD as well as abnormal cognitive and behavioral traits suggestive of ADHD (115) and disruptive behavior disorders and anxiety disorder (116). Wilens et al. (1995) reported that 23% of children of opioid-dependent parents had scores

on the attention problems subscale of the Child Behavior Checklist that were highly suggestive of ADHD. Children of opiate-dependent patients, particularly sons of addicts with depression, may be at risk for a developmental path toward antisocial personality and poor social and intellectual functioning (117).

The literature on these disorders may be important targets for early intervention to prevent the development of SUD, as well as the morbidity associated with these disorders.

2.6 Prevalence of ADHD in the juvenile criminal justice system

It is now known that ADHD is not simply a disorder confined to childhood but it is a chronic pervasive disorder that severely impairs behavioral control and learning which profoundly compromise functioning in multiple areas throughout the persons' life span (22, 54). ADHD have profound and chronic adverse impact on the life functioning of a person with ADHD and in virtually every domain of the person's life (21-23, 25, 33).

It is though a lack of understanding of the prevalence and impact of ADHD could explain the pervasive neglect of detection and intervention thus the role of ADHD in criminality and recidivism (118). Based on the individual education plans (IEP), USA indicate that 28% of juveniles had prior diagnosis of ADHD (119). Studies in other countries besides United States reported prevalence rate of ADHD among juveniles averaging 45% (120, 121). In Malaysia, it was reported that ADHD amongst the juvenile in the prison is about 24.8% (122). However, it is thought that the data underestimates the true prevalence of ADHD due to the inadequacies or lack of assessment of this disorder. Some studies reported that the prevalence of ADHD among the juvenile is estimated to range from 20% to 72% (39). Which means that, at the minimum, one out of every four persons accused of a crime and appearing before corrections professionals could have ADHD (123). Two thirds of all convicts released from state prisons are rearrested within 3 years (123). ADHD increases the risk for developing antisocial and substance use disorders in adolescence, which, in turn, increases the risk for criminal behavior in adolescence and adulthood (12-

14). Consequently, as it is widely prevalent in the juvenile justice system, the assessment of ADHD and its co-morbidity should be included in every mental health screening that should take place when a juvenile becomes involved with the system as well as treatment planning.

2.7 Definition of juvenile/child

According to the Malaysian Child Act 2001, a child is defined as:

a) person under the age of eighteen years; and
b) in relation to criminal proceedings, means a person who has attained the age of criminal responsibility as prescribed in section 82 of the Penal Code (Act 574).

The UN Convention on the Rights of the Child 1989 defines child as "every human being below the age of eighteen years unless the relevant national laws recognize an earlier age of majority" (124).

The age of offender/ juvenile under the juvenile court act 1997, defines age as 'a person whose age, at the time when the offence was committed, was between fourteen and eighteen years old and young adult shall be a person whose age, at the time when the offence was committed, was between eighteen and twenty one'.

2.8 Juvenile Delinquency

The rate of juvenile delinquency has been on the rise each year with the evidence by the newspaper reports and media. In 2009, Malaysian statistics recorded 3,263 students who were arrested for committing crime. The figure increased in 2010 by 11.8%, 3,701 students were arrested. (125). There is also increasing number of juvenile especially those between ages 16 and 18 years old from 2822 in 2002 to 3531 in 2004 with male juvenile out-numbering female (126).

In Malaysia, delinquent acts of a juvenile is divided into 2 categories. First, act or omissions which are prohibited and punishable by law under the respective legal systems and second, acts which are known as 'status offences' in which one is beyond the control of parents and other is being exposed to moral danger (127).

In section 82 of the Malaysian Penal Code (Act 574) states that 'nothing is an offence, which is done by a child under ten years of age'(128). What the statement means is that children below 10 years old who commit offences will get absolute protection from being prosecuted and punished even if the crime is of a serious nature.

This is based on the principle adopted from the doctrine of *doli incapax* as applied in the English law where the child is deemed incapable of forming the intent to commit a crime or tort, or understand the nature and consequence of his act especially by reason of age i.e. under the age of ten years old (129).

However for children above ten and below twelve years old who commit offences, they are given conditional protection based on section 83 of the Penal Code. If the child does not understand the nature and consequence of the offences, he will not be held liable, or otherwise. Children in this age group are also given similar defense based on the principle of *doli incapax* in which it depends on the degree of understanding of the nature and consequence of his act during the time of committing the offence.

For child age twelve years old but below eighteen years old may be held liable when an offence is committed. However, the punishments and the criminal justice procedures are different from adults. For those children who are required to be detained by the courts, until the age of eighteen years old, based on the section 14 in child act 2001, they will be placed in as the following

a) the detention of child in a place of detention, probation hostel, approved school or Henry Gurney School, an approved institution or centre;
b) the supervision of a child by a Social Welfare Officer or probation officer, as the case may be; or
c) any probation period

   which has the effect of extending the period of such detention, supervision or probation beyond the date on which the child attains the age of eighteen years.

2.9 Henry Gurney School

In chapter 5, Child act 2001 mentioned the child can be sent to Henry Gurney, if:

a) a child is found guilty of any offence punishable with imprisonment;
b) the probation report submitted to the Court For Children shows that
    i) the parents or guardian of the child can no longer exercise or is incapable of exercising any proper control over him;
    ii) the child is habitually in the company of persons of bad character; and
    iii) the child is not suitable to be rehabilitated in an approved school; and
c) it appears to the Court For Children
    i) that the offence committed is serious in nature; and
    ii) by the reason of the nature of the child's criminal habits and tendencies it is expedient that the child be subject to detention for such term under such instruction and discipline as appears most conducive to his reformation and the repression of crime

Henry Gurney School is a school established or appointed under section 73 and under the direction and control of the Director General of Prisons and approved by the Minister for the education, training and detention of person to be sent there (130).

Children aged fourteen and above only to be sent to Henry Gurney School. The detention period is three years from the date of the order and his detention is valid until the age of twenty-one years old (130).

In Malaysia, there were previously five Henry Gurney Schools. However recently, there are only three operational Henry Gurney Schools remain in Malaysia:

1) Henry Gurney School Telok Mas, Melaka
2) Henry Gurney School Kota Kinabalu, Sabah
3) Henry Gurney School Keningau, Sabah

Henry Gurney School Telok Mas, Melaka covers for the population in the Peninsular Malaysia whereas Henry Gurney School Kota Kinabalu and Keningau covers for East Malaysia.

Table 2.1: Total number of juvenile offender in Henry Gurney School in year 2010

BIL	S.H. GURNEY	MALE	FEMALE	TOTAL
1	TELUK MAS	159	9	168
2	KOTA KINABALU (W)	0	7	7
3	KENINGAU	93	0	93
	TOTAL	**252**	**16**	**268**

Table 2.2: Total number of juvenile offender in Henry Gurney School in year 2011

BIL	S.H. GURNEY	MALE	FEMALE	TOTAL
1	TELUK MAS	197	8	205
2	KOTA KINABALU (W)	0	6	6
3	KENINGAU	65	0	65
	TOTAL	**262**	**14**	**276**

** combine table 2.1 and 2.2

The table above showed increased number of male offender with number of female offender reduced about 14%. However, overall there was a 3% increased in total number of juvenile offenders admitted to the Henry Gurney School from year 2010 to 2011.

3.0 OBJECTIVES

3.1 General Objectives

The aim of the study is to determine the prevalence and co-relation of ADHD and substance use disorder among the juvenile offenders in Malaysian Juvenile Detention Centre.

3.2 Specific Objectives:

1. To examine the socio demographic profile among juveniles with ADHD and substance use in Malaysian Juvenile Detention Centre

2. To examine the association regarding family background of the juvenile offenders with ADHD and substance use

3. To examine the association between the types of offences committed by the offenders with ADHD and substance use

4.0 METHODOLOGY

4.1 Study Setting

In Malaysia, the Prison Department detains juveniles aged between 14 and 21 years in either prison or Henry Gurney School. There are 3 Henry Gurney School available in Malaysia:

1) Henry Gurney School Telok Mas, Melaka
2) Henry Gurney School Kota Kinabalu, Sabah
3) Henry Gurney School Keningau, Sabah

The study was conducted at Henry Gurney School, Telok Mas, Melaka. The Henry Gurney School was chosen, as it is the biggest Henry Gurney School in Malaysia covering the Peninsular Malaysia. It is also has both male and female juvenile offenders. Whereas, Henry Gurney School Kota Kinabalu have only female juvenile offenders and Henry Gurney School Keningau have only male juvenile offenders. The reason Henry Gurney School Kota Kinabalu and Keningau was not included in this study because of the limited time in conducting the study. In Sabah, the dialect is different from the peninsular, thus to conduct this study need to find local translator to translate the questionnaire to the local dialect. Due to the time constraint, the attempt was abandon.

4.2 Study Design and Sampling Method

This is a cross-sectional study. It used convenient sampling method to recruit non-duplicated sample of subjects.

4.2.1 Inclusion Criteria

1. All subjects age below 18 years old
2. Subjects who is co-operative and who consented

4.2.2 Exclusion Criteria

1. Subjects who refused or unable to co-operate with the interview
2. Subjects who are unable to understand or communicate in Malay or English language
3. Subjects who did not give consent

4.2.3 Data Collection

The data collection was done from February 2012 till April 2012. All subjects meeting the inclusion criteria were identified with the help of the staff via the juvenile's record office data. The subjects were explained about the study and a Subject Information Sheet was provided. All the subjects recruited in this study were asked to give a written consent. Since the subjects are below 18 years old, guardian or parents would need to sign the consent.

The consent was then obtained from the school warden on behalf of their parents. This is based on the Chapter 2 of the Child Act, 2001 mentioned a Protector or Police can give consent to the child if the parent or guardian is not available or cannot be found within a reasonable time. Subjects were told about the confidentiality and emphasize that no identification data would be revealed in this study.

Once the consent was obtained, the socio-demographic data and the imprisonment background will be obtained using the questionnaire developed by the research team. The participating subjects were screened using Problem Orientated Screening Instrument for Teenager (POSIT). It is a self-rated questionnaire to screen subjects with substance use and at the same time measure any problems in physical health, mental health, family relations, peer relations, educational status, vocational status, social skills, leisure/recreation and aggressive behavior/delinquency. The investigator assisted those subjects who have difficulty understanding the questions. All the same subjects were then interviewed using the MINI-Kid, to assess for presence of Attention Deficit Hyperactive Disorder (ADHD) and Substance Use Disorder.

4.3 Sample Size

The sample size was calculated based on the following formula:

$$N = \frac{Z^2P(1-P)}{d^2}$$

where N = sample size

Z = Z statistic for level of confidence

P = expected prevalence or population

d = precision

Z statistic : The investigator used the confidence interval of 95%, where the Z value is 1.96

Expected proportion (P) : The investigator used the expected prevalence of ADHD among the juvenile offenders is 8%, based on the study done internationally

Precision (d) : The precision of 5% was used.

Therefore,

$$N = \frac{(1.96^2)(0.08)(0.92)}{(0.05^2)}$$

= 113 subjects

In this study, the total juvenile detained in Henry Gurney School, Telok Mas age below 18 years old were 106. However, out of 106, only 100 subjects were able to be recruited in this study. Five of the subjects were not able to attend the interview due to the discipline

problems and were not allowed out of the male cells. Another one subject was not able to be interviewed because of her having serious mental illness then, she was then psychotic.

4.4 Instruments

4.4.1 Identification data

A questionnaire was developed by the research team to collect the relevant background information from the participating subjects. The questionnaire consisted of data on socio-demographic, family and imprisonment background.

The socio-demographic data consisted of age, gender, race, religion, state, level of education, employment status and income and past psychiatric history.

The family background data consisted of parent's marital status, parent's employment status and income, living arrangement at home, house structure, position in the family and family history of substance use and criminality.

The imprisonment background consisted of type of crime, length of stay and the background of offense.

4.4.2 Problem-Oriented Screening Instrument for Teenagers (POSIT)

The POSIT is a youth self- report screening instrument designed to identify potential psychosocial functioning in 10 areas in which a in depth assessment is required. It can be administered by a variety of assessors, including medical providers, the juvenile and court staff, school personnel and staff in alcohol or other drug abuse treatment programs. It was developed by Elizabeth Rahdert, as a key component of the Adolescent Assessment/ Referral System (AARS), undertaken by the National Institute on Drug Abuse (NIDA) in April 1987.

The POSIT was developed with the aims:

1. To estimate the service needs in city /state political jurisdictions for multiple problem adolescents and their families
2. To refer youths within the juvenile justice system to appropriate treatment services, and
3. To assist in treatment matching for troubled teenagers within clinical practice settings

The POSIT contained 139 questionnaire with "yes-no" items. It can be use for both male and female adolescent age between 12-19 years old. The instrument has 10 scales of psychosocial functioning as listed below:

1. Substance Use/Abuse
2. Physical Health
3. Mental Health
4. Family Relations
5. Peer Relations
6. Educational Status
7. Vocational Status
8. Social Skills
9. Leisure/Recreation
10. Aggressive Behavior/Delinquency

The POSIT consists of POSIT questionnaire, POSIT scoring templates and POSIT scoring sheet. It takes about 20-30 minutes for the youths to complete the questionnaire. The scoring system includes empirically based cut-off scores indicating low, middle, or high risk in each of the problem areas. A total raw score in each problem area determines the level of risk for that area. The scoring system is based as the following:

Table 4.1: Scoring score for each domain in the Posit questionnaire

Domain	No. of Items	Mild	Moderate	High
Substance use/ abuse	17	0	1-8	9-17
Physical health	10	1-3	4-7	8-10
Mental health	22	1-7	8-15	16-22
Family relations	11	1-4	5-8	9-11
Peer relations	10	1-3	4-7	8-10
Educational status	24	1-8	9-16	17-24
Vocational status	17	1-5	6-11	12-17
Social skills	11	1-4	5-8	9-11
Leisure/recreation	12	1-4	5-8	9-12
Aggressive behavior/delinquency	15	1-5	6-10	11-15

A reliability study done by Knight et al, (2001) studied the internal consistency and 1-week test-retest reliability of the POSIT and it showed a favorable alpha score (>0.7) for Substance Use/Abuse, Mental Health Status, Educational Status, and Aggressive Behavior/Delinquency. For all the 10 POSIT scales, high intraclass correlation coefficients were found(r= 0.72 – 0.88) (131).

For this study, the investigator had emailed the author for the permission to use the questionnaire and translate the questionnaire into the Malay version. The research team did the Malay translation copy. Due to the limitations of resources, the researcher was only able to do the translation via the back-translation technique. Dr Aida Syarinaz Adlan and Associate Professor Aili Hanim Hashim conducted the face validation on the translated Malay version of POSIT.

4.4.3 Mini International Neuropsychiatric Interview For Children and Adolescents – version 6.0 (M.I.N.I.Kid, 2009)

The Mini-International Neuropsychiatric Interview (M.I.N.I) is a short structured diagnostic interview, developed by psychiatrist and clinicians in the United States and Europe. It is for Diagnostic Statistical Manual-Edition 4 (DSM-IV) and International Classification of Disease -10th Revision (ICD 10) psychiatric disorder. It was designed for it to be short and easy to administer with highly sensitive and specific to detect with or without psychiatric disorder. It was also designed to capture important sub-syndromal variants and useful in clinical psychiatry as well as research settings.

The M.I.N.I family consisted of M.I.N.I-Plus, M.I.N.I.- Screen and M.I.N.I.-Kid. M.I.N.I.-Kid is a structured diagnostic interview to detect common disorders in child and adolescent. It was designed to be short and easy to administer with the language that is easy to understand by the children and adolescents. It contains 22 psychiatric diagnoses as the following:

1. Major Depressive Disorder
2. Dysthymia
3. (Hypo)Manic Episode
4. Panic Disorder
5. Agoraphobia
6. Separation anxiety disorder
7. Social Phobia
8. Specific Phobia
9. Generalized Anxiety Disorder (GAD)

10. Obsessive Compulsive Disorder (OCD)
11. Posttraumatic Stress Disorder (PTSD)
12. Alcohol Abuse and Dependence
13. Substance Abuse and Dependence
14. Tic Disorder
15. Attention Deficit Hyperactivity Disorder (ADHD)
16. Conduct Disorder
17. Oppositional Defiant Disorder (ODD)
18. Psychosis
19. Anorexia Nervosa
20. Bulimia Nervosa
21. Adjustment Disorder
22. Pervasive Development Disorder

According to the validation study of the M.I.N.I-Kid done by the author Sheehan DV, (2010) where it assess the concurrent validity of the M.I.N.I-Kid with Schedule for Affective Disorders and Schizophrenia for School Aged Children-Present and Lifetime Version (K-SADS-PL), it showed substantial to excellent M.I.N.I-Kid to K-SADS-PL for syndromal diagnoses of any mood disorder, any anxiety disorder, any substance use disorder, any ADHD or behavioural disorder and any eating disorder (kappa = 0.56-0-87) (132). It also showed that it took two-thirds less time to administer. The interrater and test-retest kappas were good (0.64-1.00) for all individual M.I.N.I-Kid disorders except dysthymia.

In order to use the M.I.N.I-Kid, an email was sent to the author, Dr. Sheehan informing the intention of using M.I.N.I-Kid for this study. Associate Professor Aili Hanim Hashim, who

is a trained rater, trained the investigator in this study. For this study, the investigator used M.I.N.I.-Kid to diagnose the following disorder:

1. Alcohol Abuse and Dependence
2. Substance Abuse and Dependence
3. Attention Deficit Hyperactivity Disorder (ADHD)

4.5 Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 20. Descriptive statistics were used to summarize the data. Bivariate correlations between ADHD and other variables were established using cross tabulation analysis. Chi square test and t-test was used to test statistical significance. Exploratory data analyses were used to check whether the data was normally distributed. All test were two-tailed with results considered significant at $p<0.05$.

4.6 Ethical Consideration

The Research Committee, Department of Psychological Medicine and Research and Ethics Committee, University Malaya Medical Centre has approved this study on 27th October 2011 (Reference no: PPUM/MDU/300/04/03). Written permission to conduct the study in Henry Gurney School was approved by the Director of the Prisons Department of Malaysia on 28th December 2011 (Reference no: JP/LTH/Rd/102/3 Klt.47(66)). The confidentiality was assured to the subjects of this study. The purpose of the study was explained to the subjects prior to commencement of the study. The written consent was obtained from the school warden due to their underage status. The subjects was identify with a specified coding during the analysis of the statistical data.

5.0 RESULTS

There are total of 106 juvenile detainees who are aged less than eighteen years old in Henry Gurney School. A total of 100 subjects were recruited in the study that fulfilled the inclusion and exclusion criteria. Six of the juveniles were excluded due to disciplinary problem.

The demographic characteristics among the subjects are shown in table 5.1 in which majority of the subjects is male and age seventeen years old.

Table 5.1: Baseline Demographic Characteristic

Characteristic	n (%)	Mean (sd)
Gender		
Male	90 (90%)	
Female	10 (10%)	
Age		
17 years old	82 (82%)	16.79 (0.48)
< 17 years old	18 (18%)	
Race		
Malay	86 (86%)	
Chinese	4 (4%)	
Indian	9 (9%)	
Others	1 (1%)	
Education level		
Primary	16 (16%)	
Secondary	84 (84%)	
Employment Status		
Employed	64 (64%)	
Unemployed	36(36%)	
Income		
< RM1000	53 (53%)	
RM1000 - RM2000	9 (9%)	
➢ RM 2000	2 (2%)	

Family income <RM1000 RM1000-RM2000 >RM2000	 55 (55%) 29 (29%) 16 (16%)	
Parent's marital status Married Divorce Deceased	 67 (67%) 20 (20%) 13 (13%)	
Living arrangement With parents Other arrangements Alone With friends With others	 86 (86%) 6 (6%) 2 (2%) 6 (6%)	
Number of siblings in the family Small family (3 siblings and below) Large family (4 siblings and above)	 32 (32%) 68 (68%)	
Psychiatric history Prior psychiatric contact No past psychiatric contact	 3 (3%) 97 (97%)	
Family history of drugs Yes No	 17 (17%) 83 (83%)	
Family history of alcohol Yes No	 13 (13%) 87 (87%)	
Family history of criminality Yes No	 18 (18%) 82 (82%)	

Table 5.2: Type of offences committed by the juvenile

Type of offences	n (%)
Homicide	1 (1%)
Violence	25 (25%)
Property related	30 (30%)
Substance related	21 (21%)
Sex related	17 (17%)
Others	6 (6%)

Table 5.3: Attention Deficit Hyperactivity Disorder, Alcohol use and Substance use among the juveniles

	n (%)
ADHD	67(67%)
Combined	33 (33%)
Inattentive	20 (20%)
Hyperactive/impulsivity	14 (14%)
Substance Use Disorder	77 (77%)
Substance Abuse	11(11%)
Substance Dependence	47(47%)
Alcohol Abuse	33 (33%)
Alcohol Dependence	55 (55%)

Substance: Cannabis, Heroin, Amphetamine, Methamphetamine, Glue

Table 5.4: Chi square analysis of the association between substance use disorder and attention deficit hyperactive disorder (ADHD)

Item	ADHD n (%)		P value	OR	95% CI
	Yes	No			
Substance use disorder Yes No	51 (66.2%) 16 (69.6%)	26 (33.8%) 7 (30.4%)	0.77	0.86	0.31, 2.35

In this table showed that 66.2 % of subject with ADHD has substance use disorder. Among subjects without substance use disorder 69.6% were ADHD subjects. This result is not statistically significant with the evidence of p= 0.77. Though the result is not statistically significant, but the co-morbidity is marked clinically.

Table 5.5: Chi square analysis of association between family history of drugs use, alcohol use and criminality and ADHD in the subjects

Item	ADHD n(%)		P value	OR	95% CI
	Yes	No			
Family history of drugs Yes No	15 (88.2%) 52 (62.7%)	2 (11.8%) 31 (37.3%)	0.04*	0.22	0.48, 1.04
Family history of alcohol Yes No	12 (92.3%) 55 (63.2%)	1 (7.7%) 32 (36.8%)	0.04*	0.14	0.02, 1.15
Family history of criminality Yes No	12 (66.7%) 55 (67.1%)	6 (33.3%) 27 (32.9%)	0.97	1.02	0.35, 3.01

Table 5.5 showed statistically significant association between subjects with attention deficit hyperactive disorder (ADHD) and family history of drugs and alcohol with evidence of p< 0.05.

Table 5.6: Chi square analysis of association between family history of drugs use, alcohol use and criminality and Substance use disorder in the subjects

Item	Substance use disorder n(%)		P value	OR	95% CI
	Yes	No			
Family history of drugs Yes No	 15 (88.2%) 62 (74.7%)	 2 (11.8%) 21 (25.3%)	0.23	0.39	0.08, 1.87
Family history of alcohol Yes No	11 (84.6%) 66 (75.9%)	2 (15.4%) 21 (24.1%)	0.48	0.57	0.12, 2.79
Family history of criminality Yes No	 16 (88.9%) 61 (74.4%)	 2 (11.1%) 21 (25.6%)	0.19	0.36	0.07, 1.71

Table 5.6 showed no statistical significant association between subjects with substance use disorder and family history of drug, alcohol and criminality. However, among the substance use disorder subjects, most of them had a family history of criminality.

Table 5.7: Domain in Posit scored by the juveniles

Item	Mean (sd)	Severity
Substance use/abuse	6.63 (5.02)	Moderate
Physical	4.40 (2.17)	Moderate
Mental	10.08 (4.06)	Moderate
Family	4.50 (2.26)	Moderate
Peer relation	6.13 (1.85)	Moderate
Education	11.72 (3.76)	Moderate
Vocational	7.36 (2.74)	Moderate
Social skills	4.79 (1.82)	Moderate
Leisure	6.23 (1.73)	Moderate
Aggressive	8.29 (2.94)	Moderate

In this table 5.7 showed that most juveniles had moderate problem in each of the domains.

Table 5.8: Student T-test analysis of POSIT score of the study subject with Attention Deficit Hyperactive Disorder (ADHD)

Posit	ADHD (mean)(sd)		Mean Difference	P value	95% CI
	Yes	No			
Substance use / abuse	6.51 (4.85)	6.88 (5.41)	-0.37	0.73	-2.50, 1.76
Physical	4.54 (2.11)	4.12 (2.32)	0.42	0.37	-0.50, 1.34
Mental	10.25 (3.91)	9.73 (4.39)	0.53	0.54	-1.19, 2.24
Family	4.73 (2.24)	4.03 (2.27)	0.70	0.15	-0.25, 1.65
Peer relation	6.30 (1.81)	5.79 (1.90)	0.51	0.20	-0.27, 1.29
Education	12.09 (3.67)	10.97 (3.88)	1.12	0.16	-0.46, 2.70
Vocational	7.54 (2.70)	7.00 (2.83)	0.54	0.36	-0.62, 1.70
Social skills	5.04 (1.86)	4.27 (1.63)	0.77	0.04*	0.02, 1.53
Leisure	6.10 (1.71)	6.48 (1.79)	-0.38	0.31	-1.11, 0.35
Aggressive	8.54 (2.73)	7.79 (3.31)	0.75	0.23	-0.49, 1.99

Table 5.8 showed subjects with ADHD had moderate problem in all domains. Though social skills domain showed moderate problem in ADHD subjects, it is statistically significant with evidence of $p<0.05$.

Table 5.9: Student T-test analysis of POSIT score of the study subject with Attention Deficit Hyperactive Disorder (combined type)

Posit	ADHD (mean)(sd)		Mean Difference	P value	95% CI
	Yes	No			
Substance use / abuse	7.39 (5.01)	6.25(5.02)	1.14	0.29	-0.98, 3.26
Physical	4.61 (1.84)	4.30 (2.33)	0.31	0.51	-0.61, 1.23
Mental	11.09 (4.12)	9.58 (3.94)	1.51	0.08	-0.19, 3.20
Family	4.91 (2.32)	4.30 (2.22)	0.61	0.21	-0.34, 1.56
Peer relation	6.7 (1.88)	5.85 (1.78)	0.85	0.03*	0.08, 1.61
Education	13.06 (3.50)	11.06(3.73)	2.00	0.01*	0.46, 3.54
Vocational	7.64 (2.55)	7.22 (2.84)	0.41	0.48	-0.75, 1.57
Social skills	5.09 (1.96)	4.64 (1.74)	0.45	0.25	-0.32, 1.21
Leisure	6.18 (1.88)	6.25(1.67)	-0.72	0.85	-0.81, 0.66
Aggressive	8.85 (2.70)	8.01 (3.03)	0.83	0.18	-0.40, 2.07

In this table 5.6 showed subject with attention deficit hyperactive disorder (combined type) has statistically significant moderate problem with peer relation and education based on the score from the POSIT questionnaire.

Table 5.10: Student T-test analysis of POSIT score of the study subject with Attention Deficit Hyperactive Disorder (inattentive type)

Posit	ADHD (mean)(sd)		Difference of mean	P value	95% CI
	Yes	No			
Substance use / abuse	4.80 (3.56)	7.09 (5.24)	-2.289	0.07	-4.74, 0.17
Physical	4.55 (2.72)	4.36 (2.03)	0.188	0.73	-0.90, 1.27
Mental	9.05 (3.32)	10.34 (4.20)	-1.29	0.21	-3.29, 0.72
Family	4.35 (2.25)	4.54 (2.28)	-0.19	0.74	-1.32, 0.94
Peer relation	5.8 (1.88)	6.21 (1.84)	-0.41	0.37	-1.33, 0.50
Education	10.45 (3.52)	12.04 (3.78)	0.93	0.09	-3.43, 0.26
Vocational	6.75 (3.04)	7.51 (2.66)	0.69	0.27	-2.12, 0.60
Social skills	4.70 (1.81)	4.81 (1.83)	0.46	0.81	-1.02, 0.79
Leisure	6.45 (1.61)	6.18 (1.77)	0.44	0.53	-0.59, 1.14
Aggressive	7.65 (2.78)	8.45 (2.97)	0.73	0.28	-2.26, 0.66

Table 5.11: Student T-test analysis of POSIT score of the study subject with Attention Deficit Hyperactive Disorder (Hyperactivity/impulsivity type)

Posit	ADHD (mean)(sd)		Difference of mean	P value	95% CI
	Yes	No			
Substance use / abuse	6.86 (5.71)	6.59 (4.93)	0.26	0.86	-2.62, 3.15
Physical	4.36 (1.82)	4.41 (2.24)	-0.05	0.94	-1.30, 1.20
Mental	10.00 (3.80)	10.09 (4.12)	-0.09	0.94	-2.43, 2.24
Family	4.86 (2.11)	4.44 (2.30)	0.41	0.53	-0.88, 1.71
Peer relation	6.07 (1.39)	6.14 (1.92)	-0.07	0.10	-1.13, 0.99
Education	12.14 (3.70)	11.65 (3.79)	0.49	0.65	-1.67, 2.65
Vocational	8.43 (2.41)	7.19(2.77)	1.24	0.12	-0.32, -0.24
Social skills	5.43 (1.79)	4.69 (1.81)	0.74	0.16	-0.29, -0.34
Leisure	5.43 (1.28)	6.36 (1.77)	-0.93	0.06	-1.91, 0.05
Aggressive	9.07 (2.62)	8.16 (2.98)	0.91	0.23	-0.77, 2.59

In Table 5.10 and 5.11 showed subjects with attention deficit hyperactive disorder (inattentive type and hyperactive/impulsivity type) had no statistical significant result for the entire domain in POSIT questionnaire.

Table 5.12: Student T-test analysis of POSIT score of the study subject with Substance use disorder

Posit	Substance Use Disorder(mean)(sd)		Difference of mean	P value	95% CI
	Yes	No			
Substance use / abuse	8.38 (4.27)	0.78 (1.98)	7.59	0.00*	5.77, 9.42
Physical	4.62 (2.15)	3.65 (2.12)	0.97	0.06	-0.04, 1.98
Mental	10.43 (4.13)	8.91 (3.64)	1.52	0.12	-0.38, 3.41
Family	4.77 (2.27)	3.61 (2.04)	1.16	0.03*	0.11, 2.21
Peer relation	6.36 (1.82)	5.35 (1.75)	1.02	0.02*	0.17, 1.87
Education	12.25 (3.65)	9.96 (3.66)	2.29	0.01*	0.57, 4.01
Vocational	7.44 (2.74)	7.09 (2.80)	0.36	0.59	-0.94, 1.65
Social skills	5.00 (1.90)	4.09 (1.31)	0.91	0.03*	0.07, 1.75
Leisure	6.25 (1.58)	6.17 (2.21)	0.07	0.86	-0.75, 0.90
Aggressive	8.84 (2.72)	6.43 (2.92)	2.41	0.00*	1.11, 3.71

Table 5.12 showed that subjects with substance use disorder had statistically significant high-risk problem in substance use/abuse domain and moderate problem in family, peer relation, education, social skills and aggressive domain with evidence of $p<0.05$.

Table 5.13: Student T-test analysis of POSIT score of the study subject with Substance Dependence

Posit	Substance Dependence (mean)(sd)		Difference of mean	P value	95% CI
	yes	no			
Substance use / abuse	9.40 (4.15)	4.17 (4.42)	5.23	0.00*	3.53, 6.94
Physical	4.72 (2.23)	4.11 (2.10)	0.61	0.16	-0.25, 1.47
Mental	10.34 (4.16)	9.85 (3.99)	0.49	0.55	-1.13, 2.11
Family	4.91 (2.22)	4.13 (2.26)	0.78	0.08	-0.11, 1.67
Peer relation	6.53 (1.85)	5.77 (1.78)	0.76	0.04*	0.04, 1.48
Education	12.45 (3.88)	11.08 (3.56)	1.37	0.07	-0.11, 2.85
Vocational	7.77 (3.10)	7.00 (2.35)	0.77	0.17	-0.32, 1.85
Social skills	5.09 (2.06)	4.53 (1.54)	0.56	0.13	-0.16, 1.27
Leisure	6.40 (1.57)	6.08 (1.87)	0.33	0.35	-0.36, 1.02
Aggressive	9.36 (2.46)	7.34 (3.01)	2.02	0.00*	0.92, 3.12

Table 5.9 showed subjects who had a diagnosis of substance dependence had statistically significant moderate problem in peer relation domain and aggressive domain.

Table 5.14: Student T-test analysis of POSIT score of the study subject with Substance Abuse

Posit	Substance Abuse (mean)(sd)		Difference of mean	P value	95% CI
	Yes	No			
Substance use / abuse	6.09 (4.30)	6.70 (5.12)	-0.60	0.71	-3.80, 2.60
Physical	4.09(1.70)	4.44 (2.23)	-0.35	0.62	-1.73, 1.04
Mental	9.64 (3.91)	10.13 (4.10)	-0.50	0.70	-3.08, 2.09
Family	5.36 (2.11)	4.39 (2.27)	0.97	0.18	-0.46, 2.40
Peer relation	5.55 (1.29)	6.20 (1.90)	-0.66	0.27	-1.83, 0.51
Education	10.18 (3.16)	11.91 (3.80)	-1.73	0.15	-4.10, 0.64
Vocational	7.18 (1.25)	7.38 (2.88)	-0.20	0.82	-1.95, 1.55
Social skills	4.36 (1.43)	4.84 (1.86)	-0.48	0.41	-1.63, 0.68
Leisure	6.27 (1.27)	6.22 (1.79)	-0.05	0.93	-1.06, 1.15
Aggressive	8.82 (3.16)	8.22 (2.92)	0.60	0.53	-1.27, 2.46

Table 5.14 showed no statistically significant result in the entire domain among the subjects with diagnosis of substance abuse.

Table 5.15: Student T-test analysis of POSIT score of the study subject with Alcohol Dependence

Posit	Alcohol Dependence (mean)(sd)		Difference of mean	P value	95% CI
	Yes	No			
Substance use / abuse	8.82 (4.16)	6.01 (5.09)	2.81	0.02*	0.46, 5.15
Physical	4.55 (1.97)	4.36 (2.24)	0.19	0.72	-0.86, 1.23
Mental	10.45 (3.83)	9.97 (4.14)	0.48	0.63	-1.47, 2.43
Family	4.82 (2.65)	4.41 (2.15)	0.48	0.46	-0.68, 1.49
Peer relations	6.68 (1.81)	5.97 (1.84)	0.44	0.11	-0.17, 1.59
Education	12.86 (3.75)	11.40 (3.72)	0.90	0.11	-0.32, 3.25
Vocational	7.41 (3.05)	7.35 (2.67)	0.63	0.93	-1.26, 1.38
Social skills	5.14 (2.19)	4.69 (1.70)	0.44	0.31	-0.43, 1.31
Leisure	6.14 (1.58)	6.26 (1.78)	-0.12	0.78	-0.96, 0.72
Aggressive	8.95 (2.61)	8.10 (3.01)	0.85	0.23	-0.55, 2.26

Table 5.16: Student T-test analysis of POSIT score of the study subject with Alcohol Abuse

Posit	Alcohol Abuse (mean)(sd)		Difference of mean	P value	95% CI
	Yes	No			
Substance use / abuse	8.18 (3.84)	5.87 (5.37)	2.32	0.03*	0.24, 4.39
Physical	4.70 (2.31)	4.25 (2.11)	0.44	0.34	-0.48, 1.36
Mental	11.00 (4.43)	9.63 (3.81)	1.37	0.11	-0.33, 3.07
Family	4.24 (2.18)	4.63 (2.31)	-0.38	0.43	-1.34, 0.57
Peer relation	6.30 (1.96)	6.04 (1.80)	0.26	0.51	-0.52, 1.04
Education	12.45 (3.56)	11.36 (3.83)	1.10	0.17	-0.48, 2.68
Vocational	7.24 (2.68)	7.42 (2.79)	-0.18	0.77	-1.34, 0.99
Social skills	5.06 (1.84)	4.66 (1.81)	0.40	0.30	-0.36, 1.17
Leisure	6.15 (1.62)	6.27 (1.80)	-0.12	0.75	-0.85, 0.62
Aggressive	8.79 (2.60)	8.04 (3.07)	0.74	0.24	-0.49, 1.98

Table 5.15 and 5.16 showed subjects with diagnosis of alcohol abuse and dependence had statistically significant high-risk problem in the substance use/abuse domain.

Table 5.17: Univariate analysis for associated factors of subjects with Attention Deficit Hyperactive Disorder

	ADHD n(%)		K	P value	OR	95% CI
	Yes	No				
Gender						
Male	61 (67.8%)	29 (32.2%)	0.25	0.62	1.40	0.37, 5.36
Female	6 (60.0%)	4 (40.0%)				
Age						
17 years old	55 (67.1%)	27 (32.9%)	0.00	0.97	0.98	0.33, 2.90
< 17 years old	12 (66.7%)	6 (33.3%)				
Race						
Malay	57 (66.3%)	29 (33.7%)	0.14	0.70	0.79	0.23, 2.72
Non Malay	10 (71.4%)	4 (28.6%)				
Education level						
Primary	9 (56.2%)	7 (43.8%)	1.00	0.32	0.58	0.19, 1.72
Secondary	58 (69.0%)	26 (31.0%)				
Employement Status						
Employed	43 (67.2%)	21(32.8%)	0.00	0.96	1.02	0.43, 2.44
Unemployed	24 (66.7%)	12(33.3%)				
Income						
<RM1000	34 (64.2%)	19 (35.8%)	0.51	0.47	0.60	0.14, 2.47
≥ RM 1000	9 (75.0%)	3 (25.0%)				
Family income						
<RM1000	38 (69.1%)	17 (30.9%)	0.24	0.62	1.23	0.53, 2.85
≥RM1000	29 (64.4%)	16 (35.6%)				
Single parent						
No	44 (65.7%)	23 (34.3%)	0.16	0.69	0.83	0.34, 2.04
Yes	23 (69.7%)	10 (30.3%)				

Living arrangement With parents Other arrangements	57 (66.3%) 10 (71.4%)	29 (33.7%) 4 (28.6%)	0.14	0.70	0.79	0.23, 2.72
Number of siblings in the family Small family (3 siblings and below) Large family (4 siblings and above)	19 (59.4%) 48 (70.6%)	13 (40.6%) 20 (29.4%)	1.24	0.27	0.61	0.25, 1.46
Psychiatric history Prior psychiatric contact No past psychiatric contact	3 (100.0%) 64 (66.0%)	0 (0.0%) 33 (34.0%)	1.52	0.22	0.66	0.572, 0.761
Alcohol Dependence Yes No	17 (77.3%) 50 (64.1)	5 (22.7%) 28 (35.9%)	1.35	0.25	0.53	0.18, 1.58
Alcohol Abuse Yes No	23 (69.7%) 44 (65.7%)	10 (30.3%) 23 (34.3%)	1.62	0.69	0.83	0.34, 2.04
Substance Dependence Yes No	32 (68.1%) 35 (66.0%)	15 (31.9%) 18 (34.0%)	0.05	0.83	0.91	0.40, 2.10
Substance Abuse Yes No	5 (45.5%) 62 (69.7%)	6 (54.5%) 27 (30.3%)	2.60	0.11	2.76	0.77, 9.81

Table 5.18: Univariate analysis for associated factors of subjects with Substance Use Disorder

	Substance use disorder n(%)		K	P value	OR	95% CI
	Yes	No				
Gender						
Male	68 (75.6%)	22 (24.4%)	1.06	0.30	0.34	0.41, 2.87
Female	9 (90.0%)	1 (10.0%)				
Age						
17 years old	63 (76.8%)	19 (23.2%)	0.01	0.93	1.06	0.31, 3.59
< 17 years old	14 (77.8%)	4 (22.2%)				
Race						
Malay	68 (79.1%)	18 (20.9%)	1.49	0.22	2.10	0.63, 7.04
Non Malay	9 (64.3%)	5 (35.7%)				
Education level						
Primary	10 (62.5%)	6 (37.5%)	2.26	0.13	0.42	0.14, 1.33
Secondary	67 (79.8%)	17 (20.2%)				
Employment Status						
Employed	52 (81.2%)	12 (18.8%)	1.81	0.18	1.91	0.74, 4.92
Unemployed	25 (69.4%)	11 (30.6%)				
Income						
<RM1000	42 (79.2%)	11 (20.8%)	0.10	0.75	0.76	0.15, 4.00
≥Rm1000	10 (83.3%)	2 (16.7%)				
Family income						
<RM1000	40 (72.7%)	15 (27.3%)	1.26	0.26	0.58	0.22, 1.52
≥Rm1000	37 (82.2%)	8 (17.8%)				
Single Parent						
No	52 (77.6%)	15 (22.4%)	0.04	0.84	1.11	0.42, 2.96
Yes	25 (75.8%)	8 (24.2%)				
Living arrangement						
With parents	66 (76.7%)	20 (23.3%)	0.02	0.88	0.90	0.23, 3.55
Others	11 (78.6%)	3 (21.4%)				
Number of siblings in the family						
Small family (3 siblings and below)	24 (75.0%)	8 (25.0%)	0.11	0.74	0.85	0.32, 2.27
Large family (4 siblings and above)	53 (77.9%)	15 (22.1%)				

Psychiatric history Prior psychiatric contact No past psychiatric contact	3 (100.0%) 74 (76.3%)	0 (0.0%) 23 (23.7%)	0.93	0.34	0.76	0.68, 0.85

In table 5.17 and table 5.18 showed that there were no statistical significant associated factors for subjects with attention deficit hyperactive disorder and substance use disorder.

Table 5.19: Chi Square analysis of association between type of offence and attention deficit hyperactivity disorder.

Item	ADHD n(%)		P value	OR	95% CI
	yes	no			
Homicide Yes No	1 (100%) 66(97%)	0 (0.0%) 33 (33%)	0.49	1.5	1.30, 1.72
Violence Yes No	17 (68.0%) 50 (66.7%)	8(32.0%) 25 (33.3%)	0.90	0.94	0.36, 2.48
Property Yes No	19 (63.3%) 48 (68.6%)	11 (36.7%) 22 (31.4%)	0.61	1.26	0.52, 3.10
Drugs Yes No	16 (76.2%) 51 (64.6%)	5 (23.8%) 28 (35.4%)	0.31	0.57	0.19, 1.72
Sex Yes No	10 (58.8%) 57 (68.7%)	7 (41.2%) 26 (31.3%)	0.43	1.54	0.53, 4.48
Others Yes No	4 (66.7%) 63 (67.0%)	2 (33.3%) 31 (33.0%)	0.07	4.48	0.77, 25.87

Table 5.19 showed no statistical significant association between attention deficit hyperactive disorder (ADHD) subjects and type of offences. However, property crime showed the highest type of offences involved with the ADHD subjects (19 out of 67 subjects).

Table 5.20: Chi Square analysis of association between type of offence and substance use disorder

Item	Substance use disorder n(%)		P value	OR	95% CI
	yes	no			
Homicide					
Yes	1 (100.0%)	0 (0.0%)	0.58	1.30	1.17, 1.45
No	76 (76.8%)	23 (23.2%)			
Violence					
Yes	19 (76.0%)	6 (24.0%)	0.89	1.08	0.37, 3.13
No	58 (77.3%)	17 (22.7%)			
Property					
Yes	25 (83.3%)	5 (16.7%)	0.33	0.58	0.19, 1.74
No	52 (74.3%)	18 (25.7%)			
Drugs					
Yes	19 (90.5%)	2 (9.5%)	0.10	0.29	0.06, 1.36
No	58 (73.4%)	21 (26.6%)			
Sex					
Yes	8 (47.1%)	9 (52.9%)	0.00*	5.55	1.82, 16.86
No	69 (83.1%)	14 (16.9%)			
Others					
Yes	5 (83.3%)	1 (16.7%)	0.70	0.66	0.07, 5.90
No	72 (76.6%)	22 (23.4%)			

Table 5.20 showed subjects with substance use disorder had statistically significant association with sex-related crimes with evidence of $p<0.05$. However, among subjects with substance use disorder, non-sexual related crime is higher than those who involved with sexual related crimes.

Table 5.21: Chi Square analysis of association between type of offence and alcohol dependence

Item	ADHD n (%)		P value	OR	95% CI
	yes	no			
Homicide Yes No	 0(0.0%) 22 (100.0%)	 1 (1.3%) 77 (98.7%)	0.59	0.99	0.96, 1.012
Violence Yes No	 5 (22.7%) 17 (77.3%)	 20 (25.6%) 58 (74.4%)	0.78	0.85	0.28, 2.61
Property Yes No	 6 (27.3%) 16 (72.7%)	 24 (30.8%) 54 (69.2%)	0.75	0.84	0.29, 2.42
Drugs Yes No	 7 (31.8%) 15 (68.2%)	 14 (17.9%) 64 (82.1%)	0.16	2.13	0.73, 6.20
Sex Yes No	 3 (13.6%) 19 (86.4%)	 14 (17.9%) 64 (82.1%)	0.63	0.72	0.19, 2.78
Others Yes No	 1 (4.5%) 21 (95.5%)	 5(6.4%) 73 (93.6%)	0.75	0.70	0.08, 6.28

Table 5.21 showed no statistically significant association between type of offences and alcohol dependence. However, drugs related crime shown to be the highest type of offence done by the alcohol dependent subjects.

Table 5.22: Chi Square analysis of association between type of offence and alcohol abuse

Item	ADHD n(%)		P value	OR	95% CI
	yes	no			
Homicide					
Yes	1 (3.0%)	0 (0.0%)	0.15	1.03	0.97, 1.09
No	32 (97.0%)	67 (100.0%)			
Violence					
Yes	11 (33.3%)	14 (20.9%)	0.18	1.89	0.75, 4.81
No	22 (66.7%)	53 (79.1%)			
Property					
Yes	9 (27.3%)	21 (31.3%)	0.68	0.82	0.33, 2.07
No	24 (72.7%)	46 (68.7%)			
Drugs					
Yes	6 (18.2%)	15 (22.4%)	0.63	0.77	0.27, 2.21
No	27 (81.8%)	52 (77.6%)			
Sex					
Yes	4 (12.1%)	13 (19.4%)	0.36	0.57	0.17, 1.92
No	29 (87.9%)	54 (80.6%)			
Others					
Yes	2 (6.1%)	4 (6.0%)	0.99	1.02	1.77, 5.85
No	31 (93.9%)	63 (94.0%)			

Table 5.22 showed no statistically significant association between type of offences and alcohol abuse. However, violence related crime shown to be the highest type of offence done by the alcohol abuse subjects.

Table 5.23: Chi Square analysis of association between type of offence and substance abuse

Item	ADHD n(%)		P value	OR	95% CI
	yes	no			
Homicide					
Yes	0 (0.0%)	1 (1.1%)	0.72	0.99	0.97, 1.01
No	11 (100.0%)	88 (98.9%)			
Violence					
Yes	3 (27.3%)	22 (24.7%)	0.85	1.14	0.28, 4.69
No	8 (72.7%)	67 (75.3%)			
Property					
Yes	3 (27.3%)	27 (30.3%)	0.83	0.86	0.21, 3.50
No	8 (72.7%)	62 (69.7%)			
Drugs					
Yes	2 (18.2%)	19 (21.3%)	0.80	0.82	0.16, 4.11
No	9 (81.8%)	70 (78.7%)			
Sex					
Yes	1 (9.1%)	16 (18.0%)	0.46	0.46	0.05, 3.82
No	10 (90.9%)	73 (82.0%)			
Others					
Yes	2 (18.2%)	4 (4.5%)	0.07	4.72	0.76, 29.47
No	9 (81.8%)	85 (95.5%)			

Substance: Cannabis, Heroin, Amphetamine, Methamphetamine, Glue

Table 5.23 showed no statistically significant association between type of offences and substance abuse. Property related crime and violence related crime shown to be highest crime done by the substance abuse subjects.

Table 5.24: Chi Square analysis of association between type of offence and substance dependence

Item	Substance dependence n(%)		P value	OR	95% CI
	yes	no			
Homicide					
Yes	0 (0.0%)	1 (1.9%)	0.34	0.98	0.95, 1.02
No	47 (100.0%)	52 (98.1%)			
Violence					
Yes	9 (19.1%)	16 (30.2%)	0.20	0.55	0.22, 1.39
No	38 (80.9%)	37 (69.8%)			
Property					
Yes	16 (34.0%)	14 (26.4%)	0.41	1.44	0.61, 3.39
No	31 (66.0%)	39 (73.6%)			
Drugs					
Yes	16 (34.0%)	5 (9.4%)	0.00*	4.96	1.65, 14.90
No	31 (66.0%)	48 (90.6%)			
Sex					
Yes	3 (6.4%)	14 (26.4%)	0.00*	0.19	0.05, 0.71
No	44 (93.6%)	39 (73.6%)			
Others					
Yes	3 (6.4%)	3 (5.7%)	0.88	1.14	0.22, 5.92
No	44 (93.6%)	50 (94.3%)			

Substance: Cannabis, Heroin, Amphetamine, Methamphetamine, Glue

Table 5.24 showed subjects with substance dependence had significant association with drug offence and sex offence with evidence of p value <0.05. However, the sexual related crimes were lower than the non-sexual related crimes done by the substance dependent subjects.

6.0 Discussion

Juvenile offenders are one of the major problems in many countries. Though not all young children who demonstrate high levels of conduct problems in their early childhood continue to exhibit these problems into adolescence (133), for those that do so, it is a worrying trend. Thus research has given high priority and continuously done to identify factors in areas of detection and prevention of juvenile delinquents. Though the national crime index has been reported to drop by 11.1% from 177,520 in 2010 to 157,891 in 2011 (134), the number of crimes and the rate of offending by juveniles are still too high (135).

Many studies have emphasized that children identified as having serious emotional or behavioral disorders are likely to have followed diverse paths leading them to delinquency and anti-social behaviors. Factors that results in poor bonding with their caregiver and poor behavioral regulation in early childhood (3, 4) and difficult behaviors in the children with task attainment (5, 12-14) results over time with assaultive/threatening behavior in middle childhood or adolescence.

6.1 Socio-demographic Characteristics

6.1.1 Gender

90% of the subjects included in the study were male and 10% were female (Table 5.1). In Henry Gurney School Telok Mas, majority of the juveniles are male. In Henry Gurney School, Kota Kinabalu, which comprises of only female juveniles, has less than 10 juveniles. This is seen in other studies on juvenile offender where the number of male offenders are much higher than the female offenders (136). In view of the small number of female in this study, no analysis was made between the genders. The difference between male and female offender is that male juvenile offenders commit more serious offenses and offends are committed more frequently than in female juvenile offenders (137, 138). Though males constantly out-number females in juvenile arrests (137, 138) the gender gap

is narrowing (135), the number of female offenders is increasing at a much faster rate than the number of male offenders (139).

6.1.2 Age

The age range for the subjects studied was between 15 years old to 17 years old with the mean age of 16.79 $\pm$ 0.48 (Table 5.1). In the study of juvenile detained in Malaysian prison (122). found similar results amongst the detainees, most of the subjects in the study sample were 17 years of age. The entrance age for Henry Gurney School is above 14 years old until 21 years old. Based on the other studies, adolescent aged between 15 to 17 years old are at the higher rate of committing an offence (12, 136). Minor problematic behaviors such as stubbornness are more likely to occur at younger ages, and these behaviors progress to more serious misdemeanor by adolescence (140, 141). Conduct problems identified in children during the pre-school years appear to be associated with a variety of negative outcomes in elementary school and adolescence (141). There is also the likelihood of early starts will become chronic offenders (140). There is a likelihood the offenders begin their delinquent behavior early with minor offences and progress more frequent and to more serious offences. When left undetected and untreated, these problems continue to persist and intensify into adulthood with costly consequences to the individual, his/her family and the community (141), as shown in the subjects studied. By the time they reached their adolescent years, their disruptive behavior had intensified enough for them to be seen as going against the law of the society and having commit crimes.

6.1.3 Ethnicity

The majority of the subjects (Table 5.1) were Malays 86%, followed by Indian (9%), Chinese (4%) and others (1%). Based on the Malaysia Department of Statistic, 2010, ethnic group of Bumiputera consists of 67.4% of Malaysian citizen in which Malays (63.1%) are the predominant ethnic group in peninsular Malaysia. Chinese consists of 24.6% of Malaysian Citizen, followed by Indian (7.3%) and other races (0.7%). Thus, the ethnic distribution in this study did not reflect the true national population. Aida (2009) found similar results amongst the study samples. According to the Malaysia Department of

Statistic 2009, the incidence of poverty among Chinese is the lowest compared to other ethnic (Malay: 5.3, Chinese: 0.6, Indian: 2.5, others: 6.7). Though Indian is a minority group in Malaysia, according to study done by Amar S.S, 2005 showed that statistically Indian form a major contributor in gangsterism and gang related activities (142) . It was mentioned that the main causal factor of violent crime and gang related activities due to manifestations of urban poverty (142).

According to Hirchman, C. (1987) Malay is defined as a person, who was born locally, habitually speaks Malay, follows Malay customs and professes Islam. Chinese and Indian communities consists of the descendants of immigrants from China and Indian subcontinent (143).

Definition of ethnicity based on the Malaysia Department of Statistic (2010):

1) Bumiputera consists of Malay and other Bumiputera from Sabah and Sarawak
2) Chinese population consists of Foochow, Hainan, Henghua, Hokchia, Hokchiu, Hokkien, Kantonis, Khek (Hakka),Kwongsai, Teochew and other Chinese.
3) Indian population consists of India Muslim/Malabari, Malayali, Punjabi, Sikh, Sinhala, Tamil India, Tamil Sri Lanka, Telugu and other Indians.
4) 'Others' consists of Eurasian, European, Thai, and other Asian nationality, and others.

6.1.4 Education level

84% of the subjects received secondary education level (Table 5.1). Even though, they entered the secondary education level, most of them had stopped schooling before entering Henry Gurney School. For most, the last education level attained was Form 1 and Form 2 i.e. early high school. Most of them had history of truancy and exhibiting disciplinary problems while at school. The reason these juvenile stopped schooling were because they were no longer interested in studying and for most of them, they have been involved with drugs during their schooling days. Using drugs while in their schooling years, complicated the problems further, a majority of them were involved with disciplinary problems and were eventually expelled.

In a study of sex offenders in Malaysia Aili et al, 2010 found more than half of the offenders reported academic, behavior and developmental difficulties; they reported losing interest in their studies and were struggling during their schooling days (144). Close to half of the sex offenders studied reported history of aggressive behaviour during their adolescent years and more than three-quarters had peers who often indulged in risky behaviors (144). Low IQ, poor attitude, performance and academic failure have often been cited as risk factor for delinquency (84). Weak social ties, delinquent peers and gang membership are other factors linked to worsening of delinquency (84). Apart from these factors, truancy and leaving school at a young age are also risk factor for juvenile delinquency (145). In this study, even though most of the juvenile received secondary education level, most of them had stopped schooling by early high school and what placed them further at risk of stopping school, were their disruptive behavior and their attitude towards school and their studies. The school climate has profound impact on the students' experience (83, 146). School policies concerning, suspension and expulsion, does not necessary have positive consequences for at-risk youth (147). In a cross-sectional study of primary and secondary schools in England, Heal (1978) found that in large schools with formal and severe punishment structures in place had more students misbehaving (148). The ongoing adolescent development to have autonomy and the need to explore especially in adolescents with disruptive behaviors do not go well with authoritarian adults and restrictive and punitive environment. Establishing supportive and trusting relationships with teachers or with appropriate peer groups results in the mastery of academic and social situations at school and the avoidance of adolescent behavior problems (148).

6.1.5 Employment status and income.

More than half of the juveniles were employed before sentenced and entering the Henry Gurney School. Among the employed juveniles, majority (53%) earned less than RM1,000. Most of the subjects were from low-socioeconomic background, they needed to work to help support their family. Apart than that, for some of them, they needed money to help buy and support their drug taking habit as well tobacco use, which usually happens prior to their

drug taking habits (59). Smoking amongst adolescent is of grave concern as it is thought, along with alcohol misuse, to lead to other drug use (59).

The recent trends around the world since 1990 have suggested increases in many dimensions of adolescent substance use (59). It is indeed worrying as more than three-quarters of the subjects (Table 5.3) were using illicit substance and alcohol. Malaysia is an Islamic country, this picture of alcohol usage among juvenile is indeed surprising. Alcohol consumption especially when the person is intoxicated as always been shown to be associated with road accidents, suicides, homicides, and violence (149, 150). While the use of illicit drugs have impact on the physical health and social well being in young people (59, 149, 150). In Malaysia, the number of drug users in the country is estimated to be 250,000 and the number is predicted to increase further to possibly half a million by the year 2015 (151).

6.1.6 Family income

Numerous studies have focused specifically on behavioral problems in childhood and their links to later delinquency (84-87, 152). Family factors have consistently been cited as strong predictors of offending (152).

55% of the subject has family income of less than RM1,000. It showed that most of the juvenile came from the low-socioeconomic group. The economic status plays a major role in the pathway towards delinquency, coming from low-socioeconomic background i.e. poverty is one of the major risk factor for delinquency (84). In the study done by Rezadoost et al, (2011), significant inverse relationship was noted between socioeconomic status and the intensity of delinquency (153). The lower the individual's socioeconomic status is the more likely his/her tendency is towards delinquent behavior (153). It could be explained the feeling of personal inferiority and the restrictions caused by limitation of funding leads to enhanced aggression.

The possibility of children coming from low-socioeconomic background has increased risk for delinquency is because children coming from these disadvantaged families are more likely to be neglected and abused (154, 155). Poor family environments (i.e., poor parental

relationships, a high degree of family problems, neglect) will significantly increase the likelihood of drug use (96). The other factors associated with this are the influence of peers and neighborhood within the surrounding area. Children living in disadvantaged neighborhoods are at risk for school dropout, and other behavioral difficulties e,g, oppositional defiant and conduct disorders (153). The children's environments, affect children not only in the structural but personal characteristics as well (156). Personal characteristics involve characteristics of the child's main caregivers, peers, teachers, and other significant people while other structural characteristics involve the physical and human structure of the community (e.g. demography) and the household (156). Poverty influences a child's development in the neighborhood, in the household and in the caregiver-child relationship, while personal characteristics of caregivers, peers, teachers, and other significant people influence children's development in proximal settings (90, 156, 157).

6.1.7 Parent's marital status and living arrangement

Most of the juvenile (67%) are being raised by two parents. Though most literature have associated children raised by single parent are at risk of delinquency (84, 86, 88), other literature have focused on the personal characteristics of the child's main caregivers, and other significant others as the most powerful influence on child outcomes (89, 90, 156, 157). In the era of the modern days, most parents are working, because of this, parents have less supervision on their children and the children are left on their own. Children left on their own can easily engaged into risky behavior e.g. delinquency and substance use. This likelihood is suggestive in the subjects studied where most of the juvenile (86%) stay with their parents, either one parent or two parents. Staying with both parents is not a guarantee that the children will behave and turn out well. Being there physically is not sufficient; parents need to play an active role in nurturing their children. Parental supervision or monitoring of their children, parenting styles especially their use of discipline or punishment, warmth or coldness of emotional relationships, and parental involvement with children is the more important dimensions of child rearing (158). It signifies that it is not just the number of parents that have bearing on how their children turn up to be, but family characteristics and functioning such as parenting skills, family size, presence of discord

parents psychopathology play a huge role to juvenile delinquency (92, 147). According to Aili et al, 2010, among the sexual offenders, 50% of the families were intact but with difficulties (144). Again we can conclude that, it is not about number of parents but the family characteristics and functioning that give a great impact to the growth of the child.

6.1.8 Number of siblings in the family

68% of the juvenile has large family as defined as having 4 siblings and more (Table 5.1). In a Cambridge study, showed that if a boy had four or more siblings by his tenth birthday, it doubled his risk of being convicted as a juvenile (158). Aida (2009) found in the detainees studied, those diagnosed as having any psychiatric diagnosis, are more likely to have bigger family size, 4 or more siblings in their families. Having bigger number of siblings increase the risk of child's delinquency risk is as the number of children increases in the family, not only are physical resources compromised, it also affects the parental attention that can be given to each child. Mixed with limited financial resources, the household becomes overcrowded leading to increasing frustration, irritation and conflict (158). Thus it is not surprising that the detainees in Malaysian prison studied reported low family satisfaction level (122). There are studies that have shown strong sibling influences in adolescent behavior (159).

6.2 Attention Deficit Hyperactivity Disorder, Alcohol use and Substance use among the juveniles

It was found that most of the juvenile studied scored moderate severity in all the domains in the POSIT score (Table 5.7). As mentioned earlier, the POSIT questionnaire was designed to identify potential problem areas that maybe helpful in treatment and service especially with juveniles in detention.

Juveniles in detention have other co-morbidity other than just alcohol or drug use (30). While 77% of the juvenile made the diagnosis for SUD, 67% of the subjects have enough criteria for the diagnosis of ADHD (Table 5.3). The commonest subtype of ADHD among the subject studied was found to be the combined subtype (33%). The combined subtype is the most prevalent subtype of ADHD found in early childhood while the inattentive

subtype in more commonly found in adolescence (160). There are some opinions that in some children, symptoms of hyperactive may remit upon advancing age, whereas inattentive symptoms increase (161, 162). It is now known that about two-thirds of ADHD children will continue to have some impairing symptoms of ADHD in adulthood (163-165).

ADHD is associated with impairment of psychosocial functioning that goes beyond the core symptoms of the disorder (54, 68, 166). Based on the student t-test analysis of POSIT scores (Table 5.8), subjects with ADHD have significant difficulties in their social skills, while juvenile with a diagnosis of ADHD with combined type showed that they have significant problem in peer relation ($p=0.03$) and in their education ($p=0.01$) as compared to other subtypes of ADHD (Table 5.9). Studies have supported these findings, children with ADHD have impairment in their social relations and adherence to social rules, norms and laws (45). Children with specific subtypes of ADHD are at higher risk for psychiatric co-morbidities such as conduct disorder than other sub-types of ADHD (165, 167, 168). Similar findings are noted in adults whereby in adults with the combined subtype are relatively more at risk of having other psychiatric co-morbidity compared to those with the predominately inattentive subtype (168). The literature also suggests that children with psychiatric co-morbidities such as conduct disorders may be at higher risk for the persistence of specific subtypes of ADHD (165, 168). It is not surprising as many studies have consistently shown that ADHD is predictive of a wide range of negative short- and long-term outcomes, including higher rates of behavioral, disorders; antisocial and drug abuse disorders; impaired school, cognitive, and psychosocial functioning; and educational and vocational disadvantage (12, 169, 170). A high percentage of children with ADHD require extra and often one-to-one tutoring; they need special education services; must repeat their grade; and 10% to 35% do not complete high school (166, 171). The adolescent with ADHD is at risk for school failure (48, 49) as the ADHD results in learning difficulties and impairs school performance (101, 166). Though 84% of the subjects received secondary education level (Table 5.1), for a majority of them the last education level attained was Form 1 and Form 2.

Many young people misuse and are dependent on multiple substances, in this study, more than half of the juveniles used substance (58%) and alcohol (55%) with a majority of them using illicit substances than alcohol (Table 5.3). Most of them took cannabis, methamphetamine, amphetamine, heroin and few inhale glue. Among adolescents and adults with ADHD and co-morbid drug use disorders, marijuana is the most commonly misused agent (164). Substance abuse produces enormous burden on many societies. In this study, the author found that juveniles who had diagnosis of substance dependence (Table 5.13) have significant problem in their peer relation ($p=0.04$) and in the aggressive domain ($p=0.00$) based on the student t-test analysis. From Table 5.12, it showed that subjects with substance use disorder had statistically significant problems with family ($p=0.03$) and peer relations ($p=0.02$), education ($p=0.01$), social skills ($p=0.03$) and aggression ($p<0.05$). This shows that in these juvenile using substance, affects many aspects of their life and functioning. The correlation between aggressive behavior and substance dependence is not uncommon and the type of drug use heightens the aggression with stimulant drugs such as cocaine and amphetamine increasing the risk of violence (172). From Table 5.15, in subjects with alcohol dependence, there is a significant risk with substance use and/or abuse. This implies that in these subjects with alcohol dependence are more likely to indulge in substance use and/or abuse as well. Similarly from Table 5.16, in subjects with alcohol abuse, there is a significant risk with substance use and/or abuse. This implies that in subjects with alcohol abuse, they are more likely to indulge in substance use and/or abuse as well.

Significantly more youths in detention have psychiatric co-morbidity compared to youth in the general population (6, 173) conduct and substance use disorders are comment among delinquent youth (173, 174). There is a strong literature supporting the relationship between ADHD and SUD and this association has important clinical and practice implications especially amongst juvenile and the juvenile justice system (18, 164). While the presence of psychiatric co-morbidity increases the risk of SUD (173), higher rates of ADHD are found in populations with SUDs (18, 164). In children with ADHD who also have Conduct Disorders co-occurring with ADHD seem to have the poorest outcome with respect to

developing SUDs and other major psychiatric morbidity (18, 164). In adolescents with substance use disorder (SUD), co-morbid attention-deficit/hyperactivity disorder (ADHD) is associated with greater severity of substance abuse, conduct problems, and worse treatment outcomes (175). Children with ADHD have shown that they are at risk for a variety of antisocial activities related to co-morbid drug use (164). Children with co-morbid ADHD and substance use disorder were reported to have a higher severity of drug use and worse treatment outcomes than those with ADHD but no substance use disorder (175). These individuals with both diagnoses have been reported to have an earlier onset, a longer course, and greater severity, with more relapses and greater difficulty remaining abstinent (164). Over the years, the focus on the use of stimulants in treating youths with ADHD have caused huge debate in the community as the use of stimulant in youths to treat their ADHD is thought to be a potential risk for misuse and abuse (18, 174). However timely intervention and pharmacotherapy is associated with an 85% reduction in risk for SUD in ADHD youth (18, 174) treatment with stimulants has a protective effect substance use disorders (18, 174, 176) including tobacco use (176). Since treatment for ADHD is important, there are three ways to reduce the potential stimulant abuse as the following (123):

1) Use a non-stimulant medication such as atomoxetine
2) Use stimulant medications that are less vulnerable to abuse such as prodrug or long acting formulations, e.g: Concerta or methylphenidate skin patch
3) Careful monitoring for signs of possible abuse or diversion such as missed appointment, repeated requests for higher doses or a pattern of 'lost' prescriptions

ADHD is a significant predictor of early initiation cigarette smoking i.e. before the age of 15 (18). Conduct and mood disorders coupled with ADHD put youths at higher risk for early-onset smoking (18). Data also suggest that smoking rouses youth with ADHD for an even higher risk for SUDs (18). Again the significant link is seen between ADHD, SUD and delinquency.

Though 66.2 % of the subject with ADHD in this study made the diagnosis of substance use disorder, the result is not statistically significant (Table 5.4, p= 0.77). The literature have shown that there is very strong and significant association between ADHD and

substance use (52) and ADHD and aggression (177). It is thought that the aggression is linked to impulsivity, i.e. poorly planned responses to stimuli and a lowered threshold for action and eventuality (177). ADHD may also worsen prognosis of SUD and antisocial behaviors into adulthood (175). In a prospective study of boys with ADHD (12), the development of an antisocial or substance use disorder in adolescence completely explains the increased risk for subsequent criminality. Similar findings have been noted in other studies (14, 178). Problems with peer relation especially when they are involved with delinquent peer group aggravated by poor academic performance augment the pathway towards delinquency (84). Peer influences especially coming from peers with delinquent behavior themselves, attachment or loyal to peers, time spent with peers and peer pressure for deviance behavior have been associated with increased risk of antisocial behavior (84). The delinquent behavior is significant when the youth have little interaction with their parents (84).

Most of the literature has focused on presence of development co-morbidity in children with ADHD (179). However, the family environmental within which families operates in and influences the family members has also been shown to influence outcome and severity of ADHD (179-181). These psychosocial influences includes like divorce and remarriage, disrupted parent-child relationships (including physical abuse), parenting stress, poverty, unemployment and parental psychopathology (159, 180, 181). From Table 5.5, statistical significant ($p< 0.05$) was found between subjects with (ADHD) and family history of drugs and alcohol. There is evidence that shows first-degree relatives of individuals with ADHD have a higher risk of substance use disorders while relatives of those with substance use disorders have a higher risk of ADHD (22, 164). While in relatives of those with ADHD plus a substance use disorder have a very high risk of both disorders compared with subjects who have neither disorder (164). Fagan and Najman (2003) demonstrated in their study, a strong sibling resemblance in adolescent delinquency. Fagan and Najman (2003) found that older siblings' delinquency was more closely related to younger siblings' delinquency especially for males and those whose parents had been arrested. These findings are significant as despite the parent or child being delinquent and anti-social, it does not

necessary weaken family ties. From Table 5.6, among the substance use disorder subjects, though three-quarters of the subjects have family history of drugs and alcohol usage as well as positive for criminal history among family members, however no statistical significance was found between subjects with substance use disorder and family history of drug, alcohol and criminality.

6.3 Type of Offences

Based on the type of offences (Table 5.2), the majority of the juveniles (30%) committed property related crime, i.e. burglary followed by substance related crime (21%). Property crime may sound trivial, it has been found to be positively related to violence and drug abuse (9, 85). It is worrying to note that in close to half of the crimes committed by the subjects (43%), they were violence related (homicide, violence and sex-related). This is similar to the study done by Martin et al, (2008) who found the highest types of offences committed by the juveniles were violent crimes against people (136). Roe-Sepowitz (2009) reported that males were found to most often use a firearm, were primarily and were more likely to be involved in a homicide even during just a robbery (182). Juveniles who indicate high levels of impulsive/antisocial behaviors are significantly more likely to recidivate compared to juveniles with low-levels of impulsive-antisocial behaviors, regardless of treatment type (183). Substance use disorders (SUDs) in youth are strongly associated with aggression which contributes to behaviors that result in juvenile justice involvement. In this study, using the chi square analysis showed that in subjects with SUDs there is a significant association with sex offences (Table 5.21) and the risk of committing a sex offence is three times higher in subjects with ADHD hyperactive/impulsivity sub-type (OR: 3.43) compared to ADHD combined sub-type (OR: 0.22). Most of the sex offences committed by the juveniles in this study were statutory rape. The analysis of association between type of offences and substance dependence (Table 5.24) showed significant association between subjects with substance dependence with committing drug (p=0.00, OR: 4.96) and sexual (p=0.00, OR: 0.19) related offences. This is not surprising as the number of sexual crimes committed by youths has been noted to be on the rise (184) and retrospective reports of adult offenders have indicated that paraphilias and sex crimes begin during adolescence in about 50% of the cases (185). Juveniles accounted for approximately 12.4% of all forcible

rapes committed in 2001 (186), while in older statistics juveniles were responsible for approximately one half of all child molestation cases committed in the United States in the late 1990s (187). Roe-Sepowitz (2009) reported male juvenile offenders to have more serious substance abuse, and mental health problems and this is supported by Wasserman et al (2010) who found high levels of SUD among juveniles in the justice system (182, 188). Kavoussi et al, (1988) found less than 10% of outpatient male adolescent sex-offenders to have a diagnosis of ADHD in which many of these youth have with poor impulse control and inhibition (189), while others have found much higher rates of juveniles with ADHD (9, 10).

Youths with ADHD are exposed to a higher-risk of a wide range of adverse psychiatric outcomes including markedly elevated rates of antisocial, addictive and mood disorders (54). The association and persistent substance use is in children with ADHD has been found to be mediated by the presence of co-morbid conduct disorder (48, 49, 68, 166). The presence of ADHD in substance-abusing population complicates the picture and rehabilitation (60, 68). The combination of ADHD and SUD has been shown repeatedly to have disastrous outcomes; it especially increases the antisocial behavior in normal youth during adolescents (178).

The present study shows the high prevalence of ADHD (67%) among the juvenile in the correctional center and even higher incidence of SUD (77%). 66.2 % of subject with ADHD has substance use disorder. The presence of these mental health disorders in these subjects has been shown to significantly affect many aspects of their functioning including academic achievement, family and peer relation, social skills and aggressive tendency. ADHD have profound and chronic adverse impact on the life functioning of a person with ADHD and in virtually every domain of the person's life, and co-morbidity complicates the prognosis. The above study highlights identification of specific risk factors for ADHD, delinquency and SUD may permit more targeted treatments for both disorders at earlier stages of their expression as well at the rehabilitation stage. Intervention may potentially reduce the morbidity, disability, and poor long-term prognosis of adolescents and adults with these comorbidities. The other issues include:

1. Knowledge of these pathways can lead to identification among juveniles in detention and when done correctly more successful outcomes can be achieved, we cannot prevent someone from having ADHD but we can look into ways of reducing their pathways towards delinquency and substance use/abuse.
2. Early identification of these problems can be effectively used to predict delinquent behavior and inform treatment strategy as presence of SUD complicated the picture and consequences of children with ADHD.
3. There is a urgent need to improve assessment and thus management of detained juveniles
4. There is an urgent need to detect and intervene correctly in high-risk children in the community
5. Despite increase awareness, many adults and practitioners remain reluctant to assess and subsequently treat individuals for ADHD and SUD

6.4 Limitations and strengths

There are number of limitations that encountered in this study as the following:

1) the diagnosis of adhd is based exclusively on self-report. No collaborative history was obtained from the family. Recall bias could occur as the subjects may have difficulty to recall the events during their childhood.
2) the sample size of this study was small and it did not reach the calculated sample size due to the subjects being in strict confinement. Even though there is two other Henry Gurney School in Sabah, due to the time constraint and need to find local translator to translate the questionnaire to the local dialect, the attempt was abandon.
3) for safety purposes, the subjects were interviewed in the presence of the staff. This may lead to the subjects of not telling the truth regarding the intake of the substance.
4) the female subjects in this study were too small, therefore, analysis between the genders was not able to be done.

6.4.1 Limitation for administering M.I.N.I.Kid and POSIT questionnaire

1. there is no malay translated m.i.n.i kid although the m.i.n.i. adults has been translated and validated into bahasa indonesia (which similar with malay language).
2. the posit questionnaire is a self-rated questionnaire. It is only available in English and Spanish. In view that the subjects were not very fluent in English, attempts were made to translate the questionnaire to the Malay language. However due to the time constraint, the questionnaire was not scientifically validated. Face validation was done by one of the supervisor in this study, who is a consultant child psychiatrist and expert in this area.

6.4.2 Strength of the study

Although there were limitations in this study, there are also several strengths:

1. as far as the researchers' best knowledge this study is the first study done in Malaysia to look at the association of Attention Deficit Hyperactive Disorder with Substance Use Disorder among juveniles in a correctional center. The findings in this study would certainly be beneficial to the Malaysian authority to liaise with the health department in terms of getting assessment and probably better management of the disorder to get a better outcome.
2. the researcher used a diagnostic tool i.e. the MINI-KID, which is based on the gold standard DSM-IV criteria for psychiatric diagnoses of the subjects especially in juvenile/ detention centers.

7.0 Conclusion

The conclusion for this study as the following:

1. The prevalence of Attention Deficit Hyperactivity Disorder (ADHD) among the juveniles was 67% and the prevalence of Substance Use Disorder (SUD) was 77%.
2. 66.2% of subject with ADHD has SUD. However, there was no statistically significant association between ADHD and SUD among the juveniles. Though the comorbidity is highly prevalent and it has a significant impact on functioning of juvenile.
3. 88.2% of the subjects with ADHD have family history of drug use and 92.3% have family history of alcohol use. The association between subjects with ADHD and the above family history was statistically significant but not for not subjects with SUD
4. Based on the POSIT questionnaire, most subjects with ADHD showed statistically significant problems in moderate impairment in their social skills problem. Whereas in subjects with SUD had statistically significant high-risk problems in substance use/abuse and moderate problems in family relations, peer relations, education, social skills and the aggressive domain.
5. There was no statistically significant association between ADHD subjects and type of offences. However there was statistically significant association with sex related crime and substance use disorder even though the non-sexual crime was higher than those who committed sexual related crimes.

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