Attention deficit and hyperactivity disorder tendency and unintentional injury among adolescents in China

Lawrence T. Lam [a],*, Li Yang [b],**, Yanyan Zheng [b], Chong Ruan [b], Zhenlain Lei [b]

[a] *The Royal Alexandra Hospital for Children, Locked Bag 4001, Westmead, NSW 2145, Sydney, Australia*
[b] *School of Public Health, Guangxi Medical University, Nanning, Guangxi, China*

Abstract

This study aims to investigate the association between ADD tendency, with or without hyperactivity, and all types of unintentional injuries among adolescents. This study was a population-based health survey utilising a two-stage random cluster sampling design. The study was conducted among high school students in Nanning, the capital city of the Guangxi Province, China. Subjects were recruited from the total population of adolescents who attended high school years 1, 2, and 3 with ages ranging from 13 to 17 years. Information on ADD was collected by trained health professional via personal interviews. Other information, including unintentional injury was collected via a self-report health survey questionnaire. One thousand and twenty-nine ($n = 1429$) students were recruited with 115 (7.9%) identified as having a high ADD tendency, and 340 (22.6%) reported as having experienced an injury in the last 3 months. After adjusting for other potential confounding factors, results from the logistic regression analyses indicated that adolescents who scored high on the ADD tendency had an increased risk of injury by about 70% as compared to those who scored low (OR = 1.68, 95%CI = 1.18–2.40). ADD tendency has been identified as a potential risk factor of injury among adolescents. Screening for risk factors can be considered as a potential preventive strategy.
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1. Introduction

Attention deficit disorder (ADD), both with and without hyperactivity, as a neuropsychiatric syndrome, has long been identified as a childhood problem (Laufer et al., 1957). Studies conducted in the 1980s and 1990s have demonstrated that ADD is a chronic condition with symptoms persisting into late adolescence and even adulthood (Weiss and Hechtman, 1993). The prevalence of ADD, both with and without hyperactivity among children and adolescents, varies in different populations. However, according to the Diagnostics and Statistical Manual of Mental Disorder-IV (DSM-IV, American Psychiatric Association, 1995), the overall prevalence of children and adolescents diagnosed with ADD is about 4–5% in the developed world. A similar prevalence has also been found in China with an

estimated of 5% of school children being diagnosed with ADD in the more developed part of China (Yan, 1988).

ADD has also been associated with other conditions and problems, in particular injuries, among children due to the specific nature of the disorder (Meyer et al., 1963; Bijur et al., 1986; Wazana, 1997; DiScala et al., 1998). According to the DSM-IV, symptoms described as diagnostic criteria for ADD, particularly the hyperactivity/impulsivity component of the disorder, have a specific bearing on the association between ADD and injuries. Theoretically, the behavioural manifestations of the disorder would lead to a greater involvement in dangerous activities, thus more frequent accidents and injuries are likely to occur.

An earlier report, in reviewing the then available studies, suggested that the evidence from retrospective studies on the association between ADD and childhood injuries was weak and that prospective studies failed to establish any association (Davidson, 1987). However, in a recent review that included more well designed studies on the relationship between child risk factors and injuries, Wazana (1997) found that hyperactivity was inconsistently associated with all types of injuries. Of the five studies that included hyperactivity as a study vari-

* Corresponding author. Tel.: +61 2 9845 3055; fax: +61 2 9845 3082.
** Co-corresponding author. Tel.: +86 5351624.
E-mail addresses: lawrencl@chw.edu.au (L.T. Lam),
yangli8290@hotmail.com (L. Yang).

able, two yielded significant results (Meyer et al., 1963; Pless et al., 1995), two found insignificant associations (Bijur et al., 1988; Christofell et al., 1996), and one found significant relationships when hyperactivity was assessed retrospectively, but not prospectively (Davidson, 1987). The reason for such discrepancies was probably due to the lack of uniformity in ADD assessment methodologies used in different studies, as well as intrinsic problems related to the design of these studies such as the "case-finding" effect in assessing ADD retrospectively which increased the chance of a significant finding.

Since then, more studies have been conducted. In the study on injuries to children with ADD, DiScala et al. (1998) reported that injured children with ADD were more likely to sustain more severe injuries, and were more likely to require a longer stay in hospital, as compared with injured children without ADD. In the case-control study by Kirseh and Wirrell (2001), in comparing cognitively normal children with epilepsy and their non-epileptic peers, it was also found that children diagnosed with ADD in both cases and controls had higher rates of injury than other children in the study.

While the issue of ADD and injury among children has been receiving more attention, it was not until the mid-90s that there was an equivalent development of research among adolescents (Barley et al., 1993). Most of these research efforts have been invested in investigating the effect of ADD on the risk of motor vehicle-related incidents (Barley et al., 1993, 1996; Nada-Raja et al., 1997; Woodward et al., 2000). Moreover, nearly all of these were longitudinal studies that followed children who had previously been diagnosed with ADD into their adolescence and young adulthood to determine whether they were at higher risk of motor vehicle crashes compared to a non-ADD group.

There was very little study that examined the relationship between ADD and other types of injuries. In a more recent study by Lam (2002a,b), significant associations between different causes of injuries, particularly self-inflicted injuries, and diagnosis of ADD were found. These associations were particularly prominent among young males and those who came from a socioeconomically disadvantaged background. However, the focus of the study was mainly on the association between hospital admission and ADD diagnosis. Hence the results obtained from such a study can only represent the more severe type of injuries, and may not be applicable to the general adolescent population. In order to further elucidate the potential relationship between ADD and injuries among adolescents, a population-based epidemiological study, such as a health survey, has been recommended (Lam, 2002a,b).

In terms of the unintentional injuries among children and adolescents ample studies have been conducted in developed and developing world such as in China. However, due to the size of the country, there has not been any national study on unintentional injuries among adolescents that provides comprehensive information on the prevalence of injury including most part of the country. Data collected from various major areas of China have suggested that the prevalence of unintentional injuries among adolescents ranges from about 33% to 38% with males having a higher prevalence (Chen et al., 2005; Li et al., 2003).

The exposure variable used in nearly all studies on the relationship between ADD and injury mentioned above is the diagnosed status of ADD which is, by definition, a medical diagnosis and should be carried out by a trained medical professional. In terms of prevention and practical utility, such a diagnosed status of a medical condition is less useful than an early detection of a potential problem or disease through a detection process such as a screening (Morrison, 1998). In terms of identifying risk factors for the prevention of injury, it would be more useful to know whether children and adolescents who have a higher tendency of ADD would have a greater risk of involvement in an injurious incident.

Hence, the aim of this study is to investigate the association between ADD tendency and all types of unintentional injury among adolescents utilising a population-based epidemiological approach.

2. Methods

This study was a population-based health survey utilising a two-stage random cluster sampling design. The study was conducted in Nanning of the Guangxi Province in South Western China in March 2005. Nanning, the capital city of the Guangxi Province, is the biggest and most populated city of the Province with an estimated population of about 1.4 million in 2001. The population size for young adolescents aged between 15 and 19 years was estimated to be 199,605. This represented about 15% of the total population in the city. Institute ethics approval was granted by the Ethics Committee of the Guangxi Medical University to conduct the study.

The sample frame of the study was the total population of adolescents who attended high school years 1, 2, and 3 with ages ranging from 13 to 17 years. There were in total 85 high schools in the Nanning city with an average of five classes in each year and about 50 students in each class. Hence, there were more than 60,000 young adolescents in the sample frame.

The sampling of students consisted of a two-stage process with stratification according to high school years. First, using individual schools as primary sampling unit, a number of schools were randomly selected with a probability which is proportional to the size of the target population in each school. Second, using the class as the secondary sampling unit, different clusters of students were randomly selected from each of the selected schools. The sample size estimation was conducted with an assumption of an odds ratio of 2.0 for the exposure group to have the outcome condition with a prevalence of about 10% as compared to the non-exposure group at a 5% significant level and 80% of study power. Further assumptions were made on the cluster samples having an intraclass correlation of 0.02 for ADD tendency, and an average cluster size of 50 students. Hence, according to Kish (1965), the effect of cluster sample design (deff) was calculated as $\text{deff} = 1 + (\text{intraclass correlation}) \times (\text{cluster size} - 1) = 1.98$ [19]. The estimated sample size for the cluster sample was the estimated sample size for a simple sample multiplied by the effect of cluster sample design. Based on the above assumptions, the required sample size was estimated to be about 1300.