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Undiagonsed attention deficit/hyperactivity disorder (ADHD) among unionized drivers in Ghana: Public health and policy implications

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ABSTRACT

Road traffic accidents (RTA) are among the leading causes of mortality in sub-Saharan Africa. Many males that drop out of school in Ghana, a population at risk for attention-deficit hyperactivity disorder (ADHD), find employment by joining driver's unions. Moreover, the vehicles of Ghanaian unionized drivers are over-represented in fatal road accidents. Untreated ADHD has been linked with higher rates of RTAs. The objectives of this cross-sectional analysis is to determine the following among unionized drivers in Ghana: 1) the prevalence of ADHD, and 2) the association between self-reported ADHD risk and driving behavior. Data comes from participants' responses (200 unionized drivers and 171 community controls) to a 6-item ADHD Self − Report Scale (ASRS), the Driving Behavior Survey (DBS), and a culturally adapted version of the Jerome Driving Questionnaire (JDQ-GH). The self-reported prevalence of ADHD was 17.6% for the unionized drivers and 7.8% for the control group ($\chi^2 = 7.7$, $df = 1$, $p = 0.006$). Also, ADHD drivers endorsed that they were more likely to pay bribes to police and having worse driving behaviors across among both unionized drivers and controls. Study findings suggest that increased awareness of ADHD and possible screening of drivers for ADHD with subsequent evaluation and treatment may result in prevention of vehicle accidents.

1. Introduction

The total mortality attributed to Road Traffic Accidents (RTAs) in Africa was estimated at 200,841 deaths in 2012. According to the World Health Organization (WHO), some 1.3 million people die and another 50 million people are injured or disabled from RTAs annually across the globe. Though Africa is classified as the least motorized of all the WHO regions, the continent has the highest prevalence of RTAs. Existing evidence suggest that the global average of deaths from RTAs is 18.0 deaths/100,000 people, in Africa it is 27.8 deaths/100,000 people and in Ghana 22 deaths/100,000 people (World Health Organization, 2013).

While there are likely many factors contributing to these vehicular mortality and morbidity estimates, the relative contribution of an individual driver's neuro-cognitive characteristics are not fully understood, which is more so the case in Africa. To our knowledge there is little data in Africa on the prevalence of neuro-cognitive disorders such as attention deficit hyperactivity disorder (ADHD). ADHD is a childhood onset neurodevelopmental disorder, which in adolescents and adults presents with symptoms that negatively impact driving behavior and increase the risk of accidents (Faraone et al., 2003; Polanczyk et al., 2007; Willcutt, 2012).

Given the deleterious effects of RTAs on population health, the WHO has developed road safety programs with the following guiding principles: 1) road safety management, 2) safer roads and mobility, 3) safer vehicles, 4) safer road users, and 5) post-crash response. The WHO has focused on supporting member countries to enact legislation to manage excessive speeding, drunk–driving, motorcycle helmet use, the use of seat-belts while driving, and child restraints. Only 7% of member countries have effectively implemented such legislation. Core ADHD symptoms of inattention, distractibility and impulsivity can potentially undermine all the identified interventions. Traditionally, neuro-cognitive functioning of drivers has not been considered a factor in evaluating road safety programs (World Health Organization, 2013).

In 2013, estimates suggest that Ghana experiences four deaths per a day or 11.9 fatalities per 10,000 vehicles due to RTAs. A little under

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two-third (i.e., 60%) of these deaths are due to speeding and cost about $230 million per a year, representing about 1.7% of the nation's gross domestic product. During the first quarter of 2014, 3,512 accidents, 522 deaths, and 3,301 injuries were recorded. From January 2000 to December 2010, there were 20,503 deaths and 63,384 injuries in Ghana due to RTAs. Twenty-four percent of these accidents involve "passenger buses" and taxis often operated by male unionized drivers who are often poorly educated or have previously dropped out of high school (Siaw et al., 2013).The WHO guided National Road Safety Program in Ghana does not address individual driver factors, which reportedly comprise 25% of the variance of RTAs (Treat et al., 2007). ADHD is one such individual-level factor. Its core symptoms are inattention, distractibility and impulsivity. Increasingly emotional lability has also been recognized as a common symptom (Skirrow and Asherson, 2013). Other symptoms reflective of impaired executive functioning, including risk-taking behaviors such as difficulty in planning and setting priorities, make for an increased risk of accidents when someone with these symptoms is operating a motor vehicle. The authors' interest in union drivers in Ghana is rooted in the fact that these drivers typically drive multi-passenger vehicles, thus making accidents involving them potentially more costly in lives and injuries.

The literature over the past decade suggests an association between ADHD and driving accidents in North America and other western countries (Cox et al., 2011; Jerome et al., 2006). Barkley indicated that, drivers themselves report inattention as the single most frequent reason for their car accidents (Barkley, 2002). Researchers have also presented findings suggesting that educational achievement is inversely related to road traffic driver accidents and injuries (Barkley and Cox, 2007; Hasselberg and Laflamme, 2003; Lam, 2002)). Identification of drivers with ADHD and their treatment has been correlated in some jurisdictions with reduced risk of RTAs and fatalities (Barkley and Cox, 2007; Chang et al., 2014; Jerome, 2014; Lam, 2002). Vaa in a *meta*-analysis presented findings suggesting that individuals with ADHD had a 54% higher risk of being involved in an accident when compared with non-ADHD drivers (Vaa, 2003). Chang and colleagues in a population–based prospective study in Norway, confirmed the increased risk of RTAs in adults with ADHD and found that with medication treatment, there was a 58% risk reduction for driving accidents in males (Chang et al., 2014). This finding was however not present in females and requires further study.

Also, in 2010, an analysis of over 7,000 severe pedestrian injuries and deaths the New York City Department of Transportation revealed that driver inattention accounted for 36% of these pedestrian involved collisions. Drivers failing to yield to pedestrians accounted for 27%. Speed and driver intoxication accounted for 21% and 8% respectively. Pedestrians were at fault in 20% of cases (World Health Organization, 2013). Most fatalities from accidents involve vulnerable populations' i.e. pedestrians, cyclists and motor bike riders (World Health Organization, 2013). Inattention is a core ADHD symptom and speeding is often a reflection of impulsivity, another core ADHD symptom. It is also established that individuals with untreated ADHD are more likely to have substance use disorders (Wilens, 2007).

Additionally, the literature from simulation studies shows that individuals with ADHD have levels of impairment comparable to drivers who are legally intoxicated at the 0.08% BAC level. They had more difficulty maintaining constant speed than controls when tested with alcohol at 0.05% BAC relative to placebo. They had a positive illusory bias which caused them to over-estimate their abilities while driving and viewed themselves as less intoxicated than controls when tested with the same level of alcohol (Diener and Milich, 1997; Weafer, 2008). The findings from simulation studies raise concerns about the added effects of common co-morbid conditions of ADHD such as alcohol and substance abuse and the exaggerated risk in such drivers.

In the African context, awareness of ADHD as a neuro-developmental disorder is low in the pediatric population in whom symptoms first present. The fact that it is a life-long disorder with various implications for affected adults is even less recognized. As such, ADHD is often under-diagnosed in adults or misdiagnosed as a personality disorder. In children it is often misdiagnosed as a behavior disorder not requiring pharmacological treatment. There are also cultural and societal biases and controversies in the social representations of ADHD, so that educating non-mental health professionals and lay persons is challenging (Asherson, 2012; Ulzen et al., 2005). According to WHO, there is little or no reliable ADHD prevalence data available from low income countries (LICs) with the highest rates of RTAs (Polanczyk, 2007). Injuries, mostly from automobile accidents are the 5th leading cause of disease burden (2.7%) in the world and projected to be the 3rd leading cause of disease burden (4.9%) in 2030 (WHO, 2004). However, the possible contribution of undiagnosed and untreated ADHD to this burden is poorly understood in LICs like Ghana, and therefore is likely to have serious implications.

To our knowledge, this cross-sectional study is the first to screen for ADHD among drivers in Africa, and examine its relationship with driving behavior. A sample of unionized drivers, who operate multi-passenger vehicles in Ghana within and between cities and towns were screened for ADHD and driving behavior with the use of the Adult ADHD Self Report Scale (ASRS −V1.1) from the WHO composite International Diagnostic Interview (2003), the Driving Behavior Survey (DBS) from Russell Barkley, and a culturally adapted version of the first section of the Jerome Driving Questionnaire (JDQ) adapted for use in Ghana and the LIC context (JDQ-GH).

Working for a drivers' union is one of the few occupational options available for males with minimal education. Barkley et al. reported a three-fold increase in the likelihood of failing a grade or suspension, as well as an eight-fold increased likelihood of school expulsion or dropout among adolescents with ADHD compared to those without the disorder (Barkley et al., 1990). As such, the authors hypothesized that a sample of unionized drivers would more likely have a significant number of drivers screen positively for ADHD than members of a comparison group drawn from a general population of drivers. We also expected the presence of ADHD symptoms to be associated with more dangerous driving and hence a greater likelihood of accidents in the sample of unionized drivers. Therefore the objectives of this endeavor were to 1) estimate the prevalence of ADHD symptoms in a sample of unionized drivers in Ghana; and 2) determine the relationship between ADHD symptoms and driving behavior among unionized drivers in Ghana.

2. Methods

2.1. Sample and participant recruitment

There were 371 participants (200 unionized drivers and 171 comparisons) in this cross-sectional study. The recruitment of participants was initiated through a consultative process involving the local WHO Office, the National Road Safety Commission of Ghana and the drivers' unions. This process led to an understanding of ADHD as a neurobiological condition, which if present could contribute to road accidents. As a result, the unions invited their drivers to participate in the study with informed consent. The study was approved by the Institutional Review Board (IRB) of The University of Alabama and the Ethics Committee of the Ghana Health Service.

2.2. Measures

2.2.1. Self −report ADHD

The 6-item ADHD Self-Report Scale (ASRS) was used to measure self-reported ADHD. It is a five point Likert scale. The validity and reliability of the ASRS have been confirmed and used for epidemiological purposes in the USA (Adler et al., 2006). It has since been adapted for use internationally in countries including China (Yeh, 2008), Korea (Ji-Hae, 2013) and Israel (Zohar, 2009) and has shown consistent psychometric properties internationally.

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