



Health status recovery at one year in children injured in a road accident: A cohort study



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ABSTRACT

Despite the frequency of traumatic injuries due to road accidents and potential importance of identifying children at risk of impaired recovery one year after a road accident, there is a lack of data on long-term recovery of health status, except in children with severe traumatic brain injury. The aim of the present study was to evaluate predictive factors of recovery in children one year after road traffic injuries. The prospective cohort study was composed of children aged <16 years, admitted to public or private sector hospitals in the Rhône administrative area of France following a road accident. Recovery of health status one year after the accident and information concerning quality of life and the consequences of the accident for the child or family 1 year after the accident were collected by questionnaire, usually completed by the parents. Victims were in majority male (64.6%) and had mild or moderate injuries (81.9% with Maximum Abbreviated Injury Scale (M-AIS) <3). One year after the accident, 75.0% of the mild-to-moderate and 34.8% of the severe cases estimated health status as fully recovered. After adjustment, severity score (M-AIS ≥ 3) and lower limb injury (AIS > 1) were associated with incomplete recovery of health status: weighted odds ratio (OR_w), 4.3 [95% confidence interval (95% CI), 1.3–14.6] and OR_w, 6.5 [95% CI, 1.9–21.7], respectively. Recovery status correlated significantly with quality of life physical scores ($r=0.46$), especially body pain ($r=0.48$) and role/social–physical ($r=0.50$) and, to a lesser extent, quality of life psychosocial scores ($r=0.21$). In a cohort of children injured in a road accident, those with high injury severity score and those with lower limb injuries are less likely to recover full health status by 1 year. Impaired health status was associated with a lower physical quality of life score at 1 year.

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1. Introduction

According to the Rhône Area Registry of Road Traffic Casualties, the mean annual incidence of road traffic injury in children was 420 per 100,000 children between 2003 and 2009 (Javouhey et al., 2012). It is still one of the leading causes of injury and death of children and adolescents in high-income countries (Peden et al., 2008; Chandran et al., 2010). In adults, the long-term impact of these injuries on quality of life and physical and psychological health status is widely described in the literature (Barnes

and Thomas, 2006; Soberg et al., 2007; Nhac-Vu et al., 2011) but little is known concerning outcome after road traffic injuries in children. Haukeland (1996) highlighted the fact that adults have far more severe health problems associated with more severely diminished well-being than children after traffic injuries. Studying consequences of trauma in children, Wesson et al. (1992) found that 54% of children with minor injuries (ISS < 16) and 71% of children with major injuries (ISS ≥ 16) had persistent physical limitations at 12 months. Aitken et al. (2002) showed differences in summary physical health scores between the injured children and controls on the Children Health Questionnaire (CHQ) which persisted 6 months after trauma. However, the majority of studies targeted children with traumatic brain injuries (TBI) and evaluated consequences for the child and family (Max et al., 1998; Waters et al., 2001; Anderson et al., 2005b; Aitken et al., 2009). Other types of injury due to road traffic accidents could also affect children's health-related quality of life (QoL), especially lower-limb injuries, which were compared

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to TBI in some studies and may also have an impact on children's physical condition (Stancin et al., 2002). Factors of recovery after a road traffic accident, and specifically outcome in children injured in road accidents, whatever the type and the severity of injury, have been less widely described and have rarely been assessed.

The ESPARR cohort study (*Etude et Suivi d'une Population d'Accidentés de la Route dans le Rhône: Rhône area road traffic accident victim follow-up study*) (Hours et al., 2010; Nhac-Vu et al., 2011) was conducted in the Rhône administrative area of France (population, 1.6 million) in order to determine long-term outcomes in patients injured in road accidents. Victims of road traffic accidents were followed for 5 years, with regular assessment of health status, physical and social condition and impact on family and environment.

The aim of the present study was to assess predictive factors of recovery one year after road traffic injuries in children included in the ESPARR cohort.

2. Methods

2.1. The ESPARR cohort

The ESPARR cohort is linked to the Rhône Area Registry of Road Traffic Casualties (Charnay and Laumon, 2002), which records all road traffic accident casualties seeking medical care in public or private health facilities of the Rhône administrative area. Inclusion criteria were: injured in a road traffic accident involving at least one mechanical means of transport and occurring in the Rhône administrative area; admitted to one of the area's hospital emergency departments; surviving the crash at least until hospital admission; being resident in the study area (to facilitate follow-up) (Hours et al., 2010).

From October 2004 to July 2006, the Rhône Area Registry of Road Traffic Casualties recorded 10,765 victims of road accidents, 1410 of whom were younger than 16 years. Among the 1322 patients included in the ESPARR cohort, 204 (14.9%) were younger than 16 years and were included in the pediatric ESPARR cohort. Recruitment differed depending on the maximum injury severity on the Abbreviated Injury Scale (AIS 90; AAAM, 1990). The objective was to include all children with M-AIS ≥ 3 and one out of six children with M-AIS < 3 . In fact 25.6% of children in the Registry with M-AIS ≥ 3 and 13.4% of those with M-AIS < 3 were included. The presence of interviewers in emergency wards was planned accordingly. For casualties with M-AIS < 3 , a cluster sampling framework was set up in the emergency wards: days were divided into 3 shifts of 5 h (8 am–1 pm; 1 pm–6 pm; 6 pm–11 pm). In the two main teaching hospitals in the study area, an interviewer was present in the emergency wards during 1 in 3 shifts; in other general hospitals, 1 or 2 shifts per week were sampled at random. Interviewers asked all road accident victims admitted during the shift and meeting the inclusion criteria to participate in the study. Casualties with M-AIS ≥ 3 were identified during the interviewer's daily visits to other wards in the two major hospitals. Parents or caregivers were interviewed as soon as possible after the crash and signed informed consent to the follow-up of their child.

The study protocol was submitted to and approved by the local ethics committee (CCPPRB) and the French Ministry of Research. Collection and data analysis were approved by the national data protection authority (CNIL).

2.2. Initial data

Demographic variables such as age at accident and gender were included in the analysis as well as a variable concerning living in an urban renewal area. Age was divided into 3 categories (less than

6 years, 6 to 11 years and 12 to 15 years) in order to have sufficiently large samples of the different types of road user. A family socio-occupational level variable was created by combining five other variables: single- or two-parent status, occupational status and occupational category of each parent. The number of persons in the household was dichotomized as living with one to four persons and living with at least five persons. Type of road user was divided into four categories according to mode of transport: four-wheeled vehicle occupants, motorized two-wheeled vehicle drivers, pedestrians and other (cyclists, scooter/in-line skate users). Injury severity was measured by the AIS, which standardizes injury data and scores lesions from 1 (minor) to 6 (fatal), and by M-AIS, the score of the most severe injury. Injuries of AIS 2 or more were also classified by body part involved: head, face, neck, spine, chest, abdomen, upper limbs, lower limbs and external lesions.

2.3. Outcome measures at follow-up

At six months and one year after the accident, standardized questionnaires were sent to the parents or caregivers of each participant in order to assess the child's health, social, emotional and familial status and the occupational and financial status of the family. These questionnaires were either sent by mail, followed by telephone reminders, or completed during face-to-face interview.

Health status recovery was assessed from a standard question: "In your opinion, what is the health status of your child today?", with five response options ("fully recovered", "improved but not recovered", "stabilized", "deteriorated" or "unknown"), dichotomized for analysis as "fully recovered" versus "not fully recovered", the latter combining all four remaining response options. There were three versions of the one year questionnaire. The "light" version did not include recovery status (15 children); this variable was assessed when possible (3 children) by the answer to the 6-month questionnaire; six of the eight missing recovery status values in the "short" and "long" questionnaires were completed with the 6-month questionnaire as well.

Consequences of the accident for the child or family one year after the crash were evaluated on seven dichotomous variables: "change in one parent's occupation", "financial difficulties following the accident", "change in leisure activities", "mood affected more than 6 months post-accident", "impact on school level", "body pain" and "presence of physical impairment". Missing values were excluded from analysis.

Quality of life was evaluated with the Child Health Questionnaire—Parents Form 50 (CHQ-PF50), comprising 12 scales: physical functioning; role/social-emotional/behavioral (which assesses emotional/behavioral consequences of the accident for social activities); role/social-physical (which assesses physical consequences of the accident for social activities); bodily pain; general behavior; mental health; self-esteem; general health perceptions; parental impact-emotional; parental impact-time; family activities; and family cohesion. These domains are summarized with 2 global scores: physical score and psychosocial score (Landgraf et al., 1998; Health Act CHQ, 2008).

2.4. Statistical analysis

Representativeness was assessed by comparing the study population with a reference group of children <16 years included in the Rhône Registry between October 1st, 2004 and December 31st, 2005 and not included in ESPARR cohort. Nominal variables were compared by χ^2 test or Fisher's exact test when necessary, and quantitative variables by Student's *t*-test. Predictive factors of incomplete recovery one year after the crash were sought among the following: socio-demographic data (gender, age, family condition, socio-occupational level, and living in an urban renewal area),

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