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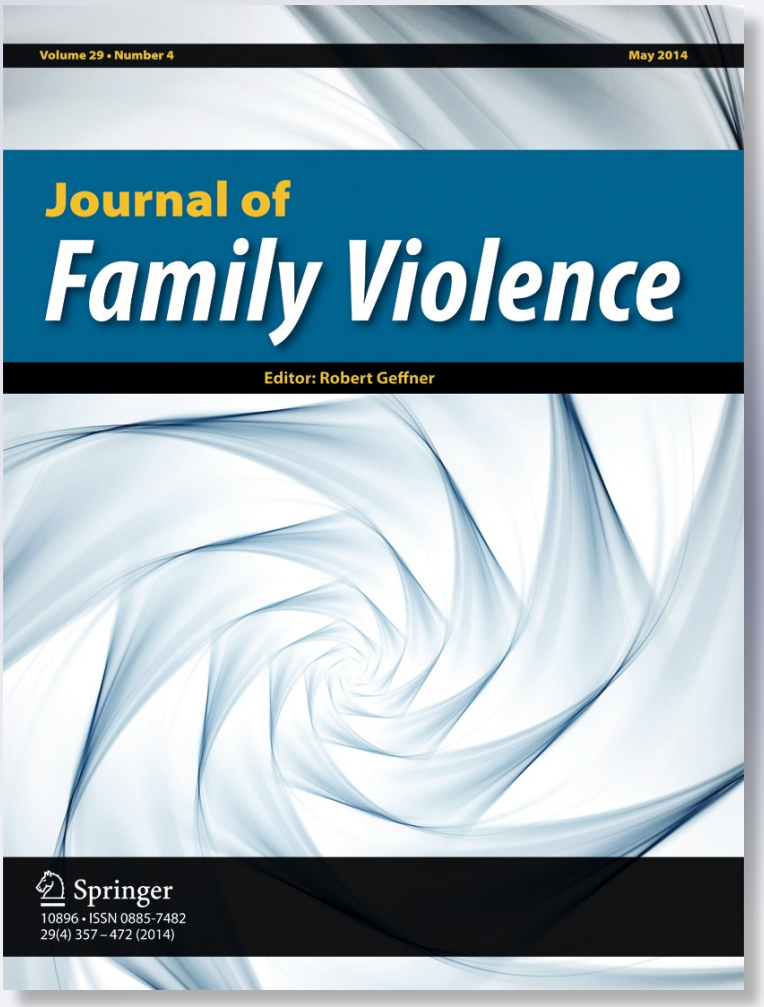

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Traumatic Brain Injury Among Mothers Identified as Having a High Risk of Child Maltreatment: A Pilot Study

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Abstract Traumatic brain injury (TBI) occurs frequently and may result in deficits in concentration, fatigue, attention, aggression and emotion regulation; significantly impacting an individual's ability to function. This study examined reports of TBI among mothers identified as having high risk for child abuse/maltreatment. Participants were 206 Mothers referred to a child abuse prevention programme (The Family Help Trust, Christchurch, New Zealand) between 2003 and 2010 (n=206); TBI prevalence of 36.4 % (n=75). One-third had experienced multiple TBI (n=24), and 58.7 % (n=44) of those reporting TBI had experienced their first injury prior to age 16. TBI in at-risk mothers was more than three times the TBI found in community samples, with many injuries occurring in childhood. Given the increased prevalence of TBI among mothers at high risk of child abuse, there is a need for greater information regarding the long-term outcomes of TBI, particularly for vulnerable groups requiring assistance to manage life roles.

Keywords Traumatic brain injury · Prevalence · Mothers · Child abuse

Child abuse and neglect are a major problem in many societies. A potential factor that may increase the risk of physical child abuse or neglect is a parental history of a traumatic brain injury, one of the most frequent injury events during child and young adulthood (Annegers et al. 1980; Kraus et al. 1990). Traumatic brain injury refers to an injury to the head that results in an alteration in consciousness and ranges in severity from mild to severe. Rates of traumatic brain injury (TBI) are most frequent among preschoolers and for those between 15 and 25 years of age, with the 20 to 25 age group at greatest risk as a result of motor vehicle accidents (McKinlay et al. 2008). It is important that we evaluate the role TBI plays in at-risk parenting in order to target interventions strategies aimed at increasing positive parenting behaviours.

Following a traumatic brain injury (TBI), a number of problems may be present depending on the severity of the event including difficulties with concentration, memory, sleep, fatigue and behaviour. Traumatic brain injury has also been associated with increased risk of psychiatric problems such as attention deficit disorder and conduct disorder, increases in drug and alcohol use, and other psychosocial problems such as anxiety and depression (Max and Dunisch 1997; Max et al. 1998, 2005a, b). Problems may be detected many years post injury. For example, in a recent study, it was reported that up to 50 % of children injured in the pre-school years will display one or more psychiatric problems by the time they reach adolescence (McKinlay et al. 2009). Further, TBI has also been linked with difficulties in irritability and decreased insight (Bowen et al. 1999).

Unfortunately, mental health problems and poor coping skills are also associated with poor parent-child relations (Rodriguez and Green 1997). However, when problems do emerge, the connection with the traumatic brain injury is rarely made (Hawley et al. 2004). Therefore, it is not known how many of individuals who experience TBI as a child or young adult will go on to experience difficulties as they take on the parenting role. In this study we wanted to examine reports of a TBI history for parents identified at a high risk of engaging in child abuse or neglect as this may impact both on their ability to parent and their ability to benefit from treatment programs.

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Method

Research Design

Archival data used in this study was provided by The Family Help Trust, a long-term early intervention child protection programme based in Christchurch, New Zealand. This programme is designed for pregnant women and their families who have been identified as high-risk for child abuse (Turner 2009). The Family Help Trust adheres to the definition of child abuse as described in the New Zealand Children Young Persons and their Families Amendment Act (1994); "the harming (whether physically, emotionally, or sexually), ill-treatment, abuse, neglect, or deprivation of any child or young person".

Instruments

After acceptance into the service, individuals are asked questions directed at identifying static and dynamic risk factors including whether or not they had experienced a traumatic brain injury at any point in their lives. A traumatic brain injury was defined as a self report of a head injury and/or concussion. Individuals were included in the study only if a full set of intake data was available.

Participants

In total there were 206 cases with completed intake data that were included in the study (137 closed and 69 active), and for whom consent had been obtained.

Data Collection

The intake interviews with the participants were held between March 2003 and October 2010 when mothers were at an average age of 30.5 years. The interviews were semi-structured in format.

Ethical Issues

Because of the sensitivity of the study, the study was designed to ensure anonmity of the data. Researchers involved in the study had access to coded data only. Ethics approval for the study was given by the University of Canterbury Human Ethics Committee.

Statistical Analysis

Frequency data was used to provide information regarding the number of individuals who had experienced a TBI event. Individuals with TBI were also divided according to whether or not they had experienced a single injury event or multiple injury events; and frequency data was used to compare age of injury, symptoms and treatment type for those with single versus multiple injury events. Chi square and binomial tests were used to evaluate whether any group differences were present.

Results

From the 206 cases included in the study, 36.4 % (n=75) reported experiencing a TBI over their lifetime. A number of the TBI events were recent, with 3.4 % (n=7) of the participants reporting that a TBI event had occurred in the past 6 months. Out of the mothers with TBI, 68 % (51/75) reported one TBI event, and nearly one-third reported multiple TBIs; 32.0 % (n=24/75). Six mothers reported five TBI events which was the maximum that could be recorded on the interview form. Mothers with more than one TBI were significantly older (mean =33.1 years), followed by mothers with one TBI (31.5 years) and mothers without TBI (29.7 years), $H(2, n=204)=4.95$, $p=0.05$).

Table 1 provides information regarding the age of first injury; 58.7 % of the participants who reported a TBI event had experienced their first injury under or at the age of 15, while 41.3 % were injured after the age of 15. To examine the effects of multiple injuries, we divided participants in two groups: individuals with one TBI and those with more than one. For individuals with more than one TBI, 37.5 % experienced the first injury under the age of five, while 79.5 % were under the age of 15. The age of first injury was significantly lower for individuals with more than one TBI $Z(n=75)=2.31$, $p=0.02$. Individuals who experienced more than one TBI event were also significantly more likely to have continuing symptoms related to the injury, $Z(n=75)=-2.06$, $p=0.04$, and to be receiving some form of treatment $Z(n=75)=2.06$, $p=0.04$.

As seen on Table 2, 18.7 % of individuals who had experienced a TBI were still experiencing problems at the time of the intake interview. Medication was the most common type of treatment, and it should be noted that some individuals were receiving more than one treatment. Mode of injury for each age range (≤ 15 years and >15 years, of age) is shown on Table 3. The most common cause of TBI at age 15 or younger was car accident, followed by falls and child abuse. The most common cause of TBI for those over age 15 was a report of being 'hit/bashed', followed by car accident and assault. Individuals with more than one TBI received their first injury at a lower age, experienced more symptoms, and were more likely to be receiving treatment for TBI. Child abuse was cited more frequently as a cause of TBI for individuals with more than one injury (see Table 4).

Table 1 Age at injury, symptoms and treatment for individuals accessing Family Help Trust services who had experienced a traumatic brain injury

Measure		Any TBI % (*N*=75)	1 TBI % (*N*=51)	>1 TBI % (*N*=24)	*p-value*
Age of first injury	≤5	24.0 %	17.6 %	37.5 %	<0.02
	>5≤10	14.7 %	15.7 %	12.5 %	
	>10≤15	20.0 %	15.7 %	29.5	
	>15≤20	24.0 %	29.4 %	12.5 %	
	>20≤25	8.0 %	7.8 %	8.3 %	
	>25	9.3 %	13.7 %	0.0 %	
Symptoms related to TBI		50.7 %	41.2 %	70.8 %	<0.04
Treatment for TBI	Yes	18.7 %	9.8 %	37.5 %	<0.04
	Not required	9.3 %	7.8 %	12.5 %	

Discussion

Traumatic brain injury was extremely high for this population. Over 36 % of the women reported experiencing a TBI over their lifetime, and nearly one-third of these individuals reported multiple TBI events. Over 58 % of the participants who reported a TBI experienced their first injury under or at the age of 15, while 41.3 % were injured over the age of 15. For individuals with more than one TBI, 37.5 % experienced the first injury under the age of five, with 79.5 % under the age of 15. Individuals who experienced more than one TBI event were also significantly more likely to have continuing symptoms related to the injury and to be receiving some form of treatment for TBI.

Over 18 % of individuals who had experienced a TBI were still experiencing problems at the time of the intake interview. The frequency of TBI injury among these women was comparable to a recent population based study of 200 men in the same age range, where 32 % were found to have a history of TBI with a loss of consciousness (Perkes et al. 2011). While TBI frequencies from our study and that of Perkes et al. (2011) do not seem too dissimilar, it should be remembered that males consistently outnumber females in TBI statistics. A community sample of women of this age would be expected to have a TBI frequency of around 9.5 % (McKinlay et al. 2008); women in our sample were over three times more likely to have a TBI than the general population. The figures reported here may seriously underestimate the true frequency of TBI as they are based on retrospective memory, and the literature has consistently demonstrated that individuals tend to underreport injury events (McKinlay et al. 2008).

It is also likely the injury events recalled by the women were more serious events as the most common cause of TBI's under or at age 15 was car accident, followed by fall and child abuse. For those over age 15 at time of first injury, report of being 'hit/bashed', followed by car accident and assault were the most frequent sources of injury. However, a consistent finding in the literature is that falls are by far the most common source of injury for children under 16 years of age, and sporting injuries and peer assault for those over 15 years of age (McKinlay et al. 2008). Motor vehicle injury is generally associated with more severe TBI. Consistent with the literature, early injury was associated with increased likelihood of negative outcomes (Anderson and Moore 1995; Anderson et al. 2006; McKinlay et al. 2002, 2009), and individuals with more than one TBI received their first injury at an earlier age, experienced more symptoms and were more likely to be receiving treatment for TBI. Child abuse was reported more frequently for individuals who were injured under 16 years of age.

Table 2 Treatment type for individuals with a traumatic brain injury and reported experiencing problems

Type of treatment for TBI	All TBI % (*N*=14)	1 TBI (*N*=5)	>1 TBI (*N*=9)
Medication	40.0	57.1	30.8
Hospital	25.0	28.6	23.1
Surgical intervention	5.0	0.0	7.7
Other	30.0	14.3	38.5

Table 3 Mode of TBI for individuals 15 years of age or less compared to those over 15 years of age

Mode of injury	≤ age 15 (*N*=43) Frequency (%)	> age 15 (*n*=42) Frequency (%)
Car accident	17 (29.3 %)	19 (29.7 %)
Fell	7 (12.1 %)	17 (26.6 %)
Child abuse	6 (10.3 %)	13 (20.3 %)
Assault	4 (6.9 %)	5 (7.8 %)
Fight	4 (6.9 %)	4 (6.3 %)
Was hit/bashed	3 (5.2 %)	3 (4.7 %)
Other	17 (29.3 %)	3 (4.7 %)

Table 4 Mode of injury for individuals with one TBI compared to individuals reporting multiple TBI events

Mode of injury	1 TBI (n=50) Frequency %	> 1 TBI (n=24) Frequency %
Car accident	17 (34.0 %)	19 (23.8 %)
Was hit/bashed	9 (18.0 %)	14 (17.5 %)
Fell	7 (14.0 %)	14 (17.5 %)
Assault	6 (12.0 %)	11 (13.8 %)
Fight	6 (12.0 %)	5 (6.3 %)
Child abuse	1 (2.0 %)	3 (3.8 %)
Other	6 (12.0 %)	14 (17.5 %)

Limitations

There are a number of limitations in this study that must be acknowledged. The assessment of traumatic brain injury relied on self report. Further, traumatic brain injury was defined as a head injury or concussion; however, except for TBI count information, there was no information about the severity of the injuries. Further, a large number of mothers who did not acknowledge a head injury event did report physical abuse as a child, or as a partner; this suggests that the prevalence of TBI reported here is an underestimation. Further, women who had a history of TBI but did not report TBI, could have compromised comparisons between groups. The sample used for this pilot study is a very specific group characterized by numerous social disadvantages, and therefore it is difficult to generalize the findings.

Implications for Practice

Notwithstanding these limitations, the study provides important information regarding the prevalence of TBI among a high risk group of women, and has implications in terms of the potential to target interventions that could reduce the incidence of child abuse and/or neglect. Traumatic brain injury is associated with increased difficulties in information processing and cognitive tasks.

Conclusion

The rate of women reporting TBI highlights a possible area of difficulty when designing and implementing programmes for women in high risk groups, and should be a factor that is considered. There is an urgent need for further research regarding the prevalence of TBI among women in high risk populations, and research should also focus on developing intervention programs appropriate for this population.

Appendix 1

Questions used by the interviewer to elicit information regarding history of traumatic brain injury, mode of injury and treatment.

1. Up to (enter month of initial assessment) last year/earlier this year, have you had, or been told that you've had a head injury, and/or concussion?
    a. If Yes: Please describe the cause of the head injury, – for example, from a car accident, a fight etc.
2. If the mother has received one or more head injury/ concussion over their lifetime, enter cause of EACH injury age received the injury.
3. Have you experienced any symptoms or difficulties since receiving the head injury that you think or know are related to receiving the head injury?
    a. If Yes: what symptoms have you experienced?
4. Up to (enter month of initial assessment) last year/earlier this year, has your head injury been assessed, diagnosed or treated by a doctor or any other health professional?
    a. If Yes: What assessment, diagnosis and/or treatment did you receive?

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