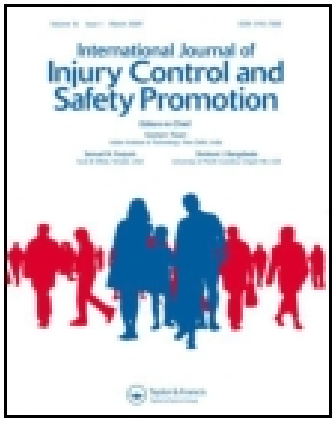

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Injuries in preschool children: the hypothetical protector effect of minor injuries and risk factors for minor and medically attended injuries

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Injuries in preschool children: the hypothetical protector effect of minor injuries and risk factors for minor and medically attended injuries

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This study aimed to investigate the relationship between minor and medically attended injuries and to analyse the influence of child-related factors and family-related factors in injuries of preschool children. Individual interviews were conducted with 335 parents of 1- to 5-year-old children. Parents informed about the child and the family variables and reported the child's history of injuries in the last year. The frequencies of minor injuries and medically attended injuries were not correlated. The risk factors for both kinds of injuries include the number of siblings and the size of the family. Minor injuries were more frequent in older than in younger children. Medically attended injuries were more frequent in boys than in girls. The risk factors that influence minor and medically attended injuries are different, suggesting that the strategies to prevent and reduce injuries need to take that difference into consideration.

Keywords: children; minor injuries; medically attended injuries; risk factors

1. Introduction

Child injuries are a major concern worldwide, being one of the leading causes of death, hospitalisation and disability across the world. A number of factors are known to influence the probability of occurrence of child injuries. Some of these factors are more related to the child's characteristics, such as the gender and age of the child, whereas other factors are more related to the family characteristics, such as the socio-economic factors and the household composition.

In what concerns the child-related factors, boys tend to have more injuries and more severe injuries than girls (Baker, O'Neill, Ginsburg, & Li, 1992; Eberl et al., 2009; Flavin, Dostaler, Simpson, Brison, & Pickett, 2006; Granié, 2010; Morrongiello, Ondejko, & Littlejohn, 2004). Sex differences in injury rates appear within the first year of life for most types of injuries (Rivara, Bergman, LoGerfo, & Weiss, 1982). The gender gap for child injuries increases with age. Injury rates among children under the age of 4 are about the same for males and females, but in the 10–14 years of age group male death rates are 60% higher than female death rates (Peden et al., 2008). There are some indications that the differences in injury rates between girls and boys are not completely explained by the differences in exposure to risk (Rivara et al., 1982). Thus, different explanations have been advanced for boy's greater injury rates, such as: their greater activity levels (Eaton & Yu, 1989), greater involvement in risk-taking activities (Morrongiello et al., 2004) or the existence of different parental socialisation practices for boys and girls (Morrongiello & Dawber, 2000). Epidemiological data also reveals the effect of age (Flavin et al., 2006; Peden et al., 2008) in the frequency and patterns of child injuries. Since studies concerning the frequency of minor injuries are quite scarce, we still do not know how the incidence of this type of injuries is related to age. However, we know that child injuries are a major concern from the age of 1 year and progressively contribute more to overall death rates until adulthood (Peden et al., 2008). In what concerns the pattern of injury, some medically attended injuries, such as road traffic injuries, tend to increase in older age groups, whereas other patterns of injury, such as burns, show the opposite trend (Flavin et al., 2006; Peden et al., 2008).

Regarding the family characteristics, the number of older siblings and the time spent under the supervision of older siblings have been referred as a risk factor for injuries (Dunn & Munn, 1986; Howe, Rinaldi, Jennings, & Petrakos, 2002), which indicates that having brothers might also influence the probability of occurrence of injuries. Some studies indicate that

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mothers and older siblings' supervisors adopt different supervision behaviours (Morrongiello, Schell, & Schmidt, 2010; Morrongiello, Schmidt, & Schell, 2010), whereas other studies report that younger siblings show poor compliance when being supervised by older siblings (Morrongiello, MacIsaac, & Klemencic, 2007; Morrongiello, Schell, et al., 2010). In addition, the modelling effects of older siblings and the encouragement of risk-taking by the presence of older peers might influence the history of injuries. Most of the family-related factors that have been indicated as risk factors for child injury are associated with the socio-economic status of the family. Some studies indicate that at greater risk of injury are: children who live in poor households and deprived neighbourhoods (Dowswell & Towner, 2002; Haynes, Reading, & Gale, 2003; Silversides, Gibson, Glasgow, Mercer, & Cran, 2005); children who live in larger families (Delgado et al., 2002; Dunn & Munn, 1986) and children whose parents have a lower education level (Delgado et al., 2002).

Most studies of child injuries have focused on the analysis of death rates and medically attended injuries. The relationship between the frequency of minor injuries and of medically attended injuries constitutes an important gap in the literature regarding childhood injuries. Some studies suggest that minor injuries may cause temporary disability and may be precursors for more serious injuries (Kohen, Soubhi, & Raina, 2000). However, the study of Marsh and Kendrick (2000), which addressed the relationship between injuries of different severities, indicates that minor injuries are of limited use in predicting medically attended injuries. In fact, Marsh and Kendrick (2000) found no significant difference between children who were reported to have experienced minor injuries and those who did or did not have a future medically attended injury. In their study, the frequency of minor injuries was assessed by diary (14-day calendar for near misses and minor injuries), and the frequency of medically attended injuries was based in emergency departments' records for the following 2-year period. The authors underline that the size of their sample (104 children) might have reduced the power to detect a true relationship between minor and medically attended injuries. Due to the limited number of studies, this issue still needs to be further explored, preferably in larger samples. If the frequency of minor injuries is somewhat predictive of the probability of having future medically attended injuries, this information could be used to evaluate the effectiveness of injury prevention programmes over shorter periods of time as suggested by Marsh and Kendrick (2000).

In this study, we sought to fill in the gap in the literature regarding the relationship between minor injuries and medically attended injuries. To our knowledge, this relationship was only addressed by Marsh and Kendrick (2000), who claimed that larger samples were needed to further investigate this issue. In order to have a greater sample and to avoid the low overall response rate that was reported by Marsh and Kendrick's study, we used a different method of assessment, collecting the information by individual interviews instead of using diaries. Additionally, we investigated the risk factors for minor injuries and for medically attended injuries. The risk factors for medically attended injuries are well documented in previous research (e.g. Delgado et al., 2002; Drago, 2005; Flavin et al., 2006), but the information on minor injuries is rare. Therefore, the purposes of this study were: (1) to analyse the relationship between minor and medically attended injuries and (2) to study the influence of different risk factors in those injuries. We hypothesised that the occurrence of minor injuries and medically attended injuries would be related and that the occurrence of injuries would be influenced by child-related factors and family-related factors.

2. Methods

2.1. Participants

Participants were 335 parent–child dyads (147 girls, 188 boys, 261 mothers, 74 fathers), from schools in an inner city area (56.42%), a suburban area (33.43%) and a rural area (10.15%) in Portugal. Children were 1- to 5-year olds ($M = 3.71$, SD = 1.17 years), 48.66% were only children and 51.34% had brothers. Most children (76.12%) lived with both parents, and a few lived with just one parent (17.01%) or with their parents and other adults in the household (6.87%). Most households had three or four persons: 9.25% had two persons, 38.81% had three persons, 35.22% had four persons and 16.72% had five or more persons. The parents' mean age was 33.56 years (SD = 6.69 years), 44.18% did not conclude the secondary school, 30.75% graduated from secondary school and 25.07% had a college degree. Most parents were employed: 61.79% had a permanent job, 15.52% had a temporary job and 22.69% were unemployed.

2.2. Procedures

Individual interviews with the parents were conducted to collect information of two kinds: (i) descriptive data (birth dates of parent and child, household characteristics, parental education level, employment situation) and (ii) data about the child's injury history in the last year (severity and frequency of injuries). Regarding severity, the injuries were classified as minor injuries or medically attended injuries. Minor injuries were defined as those resulting in light tissue damage (e.g.

cuts, bruises and skinned knees) and that lasted at least 24 h, but that needed no medically assistance (Peterson, DiLillo, Lewis, & Sher, 2002). Medically attended injuries were defined as injuries that were treated in hospital or other emergency departments and involved medically assistance (Cummings, Rivara, Thompson, & Reid, 2005). Regarding frequency, the parents were asked to recall the number of minor injuries and medically attended injuries in the last 12 months registering them in a four-level scale (i.e. no injuries, one to two injuries, three to four injuries and more than four injuries).

For the statistical analysis, the Spearman rank correlation was performed to evaluate the relationship between minor and medically attended injuries. Coefficient frequency distributions and chi-square test (χ^2) were adopted to investigate the influence of the different child-related factors and family-related factors in the frequency of minor injuries and of medically attended injuries.

3. Results

The results indicated that there was no correlation between the frequency of minor injuries and the frequency of medically attended injuries ($r_s = -.013$, $p = .809$), suggesting that the children who had higher frequency of minor injuries did not necessarily present more medically attended injuries.

The analysis of the injury history of the children in our sample indicated that in the last year 35 children (10.45%) did not have any minor injury, 94 children (28.06%) had one or two minor injuries, 81 children (24.18%) had three or four minor injuries and 125 children (37.31%) had more than four minor injuries. Since only a few children had no minor injuries, this group was merged with the group of children who had one or two minor injuries for the statistical analysis. Therefore, three groups were created based on the frequency of minor injuries: zero to two minor injuries ($n = 129$), three or four minor injuries ($n = 81$) and more than four minor injuries ($n = 125$).

Medically attended injuries regarding that same year were less frequent in our sample: 254 of the children (75.82%) did not have any medically attended injury, 72 children (21.49%) had one or two medically attended injuries, 8 children (2.39%) had three or four medically attended injuries, and only 1 child (.30%) had more than four medically attended injuries. For the analysis of medically attended injuries, only two groups were considered: children with no medically attended injuries in the last year ($n = 254$) and children who had at least one medically attended injury in the last year ($n = 81$).

3.1. Child-related factors

The age of the child was related to the frequency of minor injuries ($\chi^2(2, N = 335) = 12.16$, $p = .002$) but not with the occurrence of medically attended injuries ($\chi^2(1, N = 335) = 1.41$, $p = .235$). Children who were 1- and 2-year-old had significantly less minor injuries than 3- to 5-year olds. In the younger group, 48.96% of the children had zero to two minor injuries and 22.92% had more than four, whereas in the older group, 43.10% of the children had more than four minor injuries and 34.31% had zero to two minor injuries. The occurrence of medically attended injuries was similar in both age groups (80.21% of the younger children and 74.06% of the older children did not have any medically attended injury).

The gender of the child was not an influent variable in what concerns the frequency of minor injuries ($\chi^2(2, N = 335) = 2.85$, $p = .240$), but it influenced the probability of occurrence of medically attended injuries ($\chi^2(1, N = 335) = 4.83$, $p = .029$). The occurrence of medically attended injuries was greater in boys than in girls, with 28.72% of the boys and 18.37% of the girls having at least one medically attended injury in the last year.

Children with siblings had more minor injuries than only children: 30.06% of only children and 44.19% of children with siblings had more than four minor injuries ($\chi^2(2, N = 335) = 7.22$, $p = .027$). The occurrence of medically attended injuries was also more frequent in children with siblings ($\chi^2(1, N = 335) = 10.04$, $p = .002$): 16.56% only children and 31.40% of children with siblings had medically attended injuries in the previous year. Considering children with siblings, the occurrence of medically attended injuries and the frequency of minor injuries was not related to the birth order, since the frequency of injuries was similar in children with and without older brothers.

3.2. Family-related factors

The number of persons in the household was related to the frequency of minor injuries ($\chi^2(6, N = 335) = 15.65$, $p = .016$) and also to the occurrence of medically attended injuries ($\chi^2(3, N = 335) = 19.79$, $p < .001$; see Figure 1). Children who lived in households with three persons were reported to have less minor injuries than the other children. With respect to the children with more than four minor injuries, the percentages were 27.69% in households with three persons, 39.83% in households with four persons and 48.21% in households with more than four persons. Interestingly, children who lived in households with only two persons registered a percentage of 48.39%.

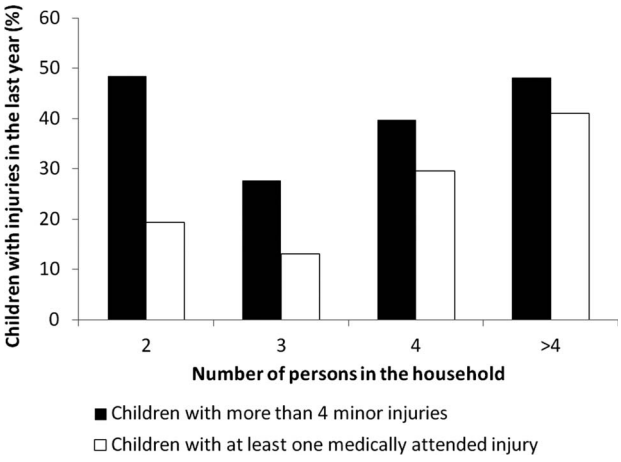

Figure 1. Percentage of children with high frequency of minor injuries and percentage of children who had medically attended injuries in the last year, according to the number of persons in the household.

Medically attended injuries were more frequent in larger families. This type of injury occurred in 41.07% of children who lived in households with more than four persons, in 29.66% of children who lived in households with four persons, in 13.08% of children who lived in households with three persons and in 19.35% of children who lived in two-person households.

The area of residence, the parent's education level and job situation and the household composition were neither related to the frequency of minor injuries nor to the occurrence of medically attended injuries.

4. Discussion

In this study, we analysed the history of minor and medically attended injuries of preschool children, aiming to identifying possible risk factors for those injuries.

Contrary to our initial hypothesis, the frequency of minor injuries and medically attended injuries were not correlated, meaning that children who had more minor injuries did not necessarily have more medically attended injuries. This contradicts the idea that minor injuries may be precursors for more serious injuries (Kohen et al., 2000) but is in accordance with a previous study that addressed the predictive power of near miss and minor injuries for future medically attended injuries (Marsh & Kendrick, 2000). In fact, it is possible that children who experience more minor injuries are engaged in more risk-taking situations. These situations might increase the probability of having greater injuries, due to a larger risk exposure, but they might also teach children how to cope with risk in a way that makes them less prone to suffer greater injuries. The positive effects of risk-taking, and the negative effects of eliminating children's risk-taking experiences, have been underlined by some authors (Greenfield, 2004; Little, 2006; Peterson et al., 2002) and should be further explored in future studies. The determination of what is an acceptable level of risk exposure is a recurring problem in the design of playground equipment. However, as Wakes and Beukes (2011) suggest, fun and safety can both be considered without being diametrically opposed within playground design. At least to a certain point, a controlled but intense exposure to moderate risk situations, with a correlated increase in minor injuries, might create some resilience to face high-risk conditions, with a subsequent reduction of injuries requiring medically assistance. If this is the case, minor injuries may prevent more serious injuries in the future. However, the adequate level of risk exposure remains unknown, as well as the individual differences that may bias this hypothetical relationship.

The lack of correlation between the frequency of minor and medically attended injuries indicates that the risk factors for these two types of injuries might not be the same. Actually, although the second hypothesis of this study was confirmed, since both child-related factors and family-related factors influenced the frequency of minor and medically attended injuries, those factors were quite different for the two types of injury.

Minor injuries were more frequent in the older children, which might be related to the greater mobility of 3- to 5-year olds when compared to toddlers. Age is related with different aspects of child development, which are known to be related with different patterns of injury (Flavin et al., 2006; Peden et al., 2008). Following this line of reasoning, children's increased mobility might contribute to an increase in the frequency of minor injuries. There is not much data concerning the differences in the frequency of injuries between toddlers and young children, because most studies consider the 1- to 4-year-old age bracket for analysis (e.g. Borse et al., 2009; Peden et al., 2008), which seems a rather wide interval for this kind of analysis. However, some studies that addressed medically attended injuries indicate that toddlers are more injury prone than older children (Drago, 2005; Flavin et al., 2006), while others verified a greater frequency of medically attended injuries in older children (Kohen et al., 2000). In our study, medically attended injuries occurred with similar frequencies in the toddlers and young children age groups.

In accordance with the previous reports (Borse, et al., 2009; Peden et al., 2008), medically attended injuries were more frequent in boys than in girls, but the frequency of minor injuries was similar between

genders. The greater occurrence of medically attended injuries in boys than in girls might be influenced by other child-related factors, such as high indicators of risk-taking, which are usually more common in boys (Morrongiello & Dawber, 2000; Morrongiello et al., 2004).

Being an only child seems to be a protective factor for minor injuries and for medically attended injuries. Children with siblings (younger or older) had more minor and medically attended injuries than only children. Siblings provide valuable opportunities for interaction, learning and skill development but they are also frequently a source of conflict (Brody, 2004; Dunn & Munn, 1986) and a risk-taking facilitator. On the other hand, the existence of more than one child in the household divides the parents' attention and makes the supervision task more difficult. In fact, the number of persons in the household also influenced the frequency of minor and medically attended injuries. Children who lived in households with three persons had less minor injuries and less medically attended injuries than children who lived in larger families or in single-parent families. In our sample, 87.7% of the three-person households consisted in households with two parents and one child. Consequently, having more adults than children in the household seems to decrease the child's risk of having minor injuries and medically attended injuries. In two-person households (i.e. single-parent families), the number of minor injuries was approximately the same than in four-person households, but the frequency of medically attended injuries was smaller, reinforcing the idea that being an only child might be a protective factor for medically attended injuries. The fact that medically attended injuries were more frequent in larger families is in accordance with the previous studies (Delgado et al., 2002; Dunn & Munn, 1986).

The socio-economic indicators in our study (e.g. parent's education level and job situation) were not related to the history of injuries of the children, which contradicts previous findings (e.g. Delgado et al., 2002; Dowswell & Towner, 2002; Haynes et al., 2003; Silversides et al., 2005). However, in our interview, parents were not directly asked about their income, so we only had indirect socio-economic data of the participants, which is a limitation of the present study.

It is also important to note that there are probably cultural influences on the occurrence of minor and medically attended injuries in children. In fact, the burden of injury is consistently higher in low-income and middle-income countries than in high-income countries (Peden et al., 2008). For this reason, the relationship between minor injuries and medically attended injuries as well as the risk factors for these types of injury might vary in different countries and in different cultures. Future studies in different cultural settings might be useful to further investigate this issue.

5. Conclusion

In the present study, minor and medically attended injuries were not correlated and different child-related and family-related risk factors were identified for both types of injuries. Minor injuries were more frequent in older children, with brothers, who did not live in a three-person household. Medically attended injuries were more frequent in boys, with brothers and in households with four or more persons. The lack of correlation between minor injuries and medically attended injuries suggests that the strategies to reduce the occurrence of small injuries, which are clearly more frequent than severe injuries during infancy and childhood, may not transfer to the reduction of medically assisted injuries. It is also possible that the most active children that suffer frequent minor injuries may learn to cope with risk while exploring the environment and action limits. This means that over-protective strategies that try to eradicate children's risk-taking behaviours could be counterproductive. This issue deserves to be further investigated.

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