

## Home Accidents in the First Two Years of Life and the Relationship with Parent Characteristics. An Information Flow-Based Study

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### ABSTRACT

**Background:** A certain number of domestic accidents involving children can be prevented. The risk factors for domestic accidents include the age and physical and mental abilities of the child and the behaviour and social and cultural characteristics of the parents, especially the mother. The combined use of current information flows can be useful for describing these events and investigating the risk factors.

**Methods:** Record linkage was performed between records regarding Emergency department admissions for home accidents involving children aged 0-1 year, for the 2014-2016 birth cohorts, and the corresponding Birth Assistance Certificate, which provide detailed information concerning the parents.

**Results:** Of a total of 1,502 Emergency admissions aged 0-1 year, 842 regarded children in the 2014-2016 birth cohorts; of the latter 791 subjects were resident in the province of Trento. Of these residents, 735 (93%) were linked positively with their Birth Assistance Certificate. The head and face are the parts of the body most commonly injured. The risk of a home accident is higher in the presence of younger parents and a separated/ divorced/ widowed mother, whereas an older mother or father constitutes a protective condition. Nationality, schooling and family size are not associated with a higher risk.

**Conclusions:** Accidents that occur in the home during childhood are usually the result of an interaction between environmental and behavioural factors. Parental skills, associated with age and stressogenic factors connected with the condition of the mother, can play an important role in conditioning the risk of home accidents in childhood.

### Keywords

Childhood, Domestic accidents, Surveillance, Risk factors, Prevention.

### Introduction

In Europe, accidents in general are the first cause of death and one of the main causes of illness and disability amongst children under 14 years of age [1]. A considerable portion of these events are accidents that occur at home, many of which could be prevented.

Scientific literature has identified a series of risk factors associated

with a greater likelihood of home accidents involving children. They can be broken down into individual and environmental factors and interact with one another in various ways [2]. The individual factors include the age and physical and mental abilities of the child, the behaviour of the adults and the social and cultural characteristics of the parents, especially the mother.

According to the data provided by scientific literature, domestic accidents are more likely to occur amongst the offspring of young mothers and mothers from non-Western countries [3], in families

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with more than two siblings [3,4] and amongst children whose mothers are substance abusers [5]. Socio-economic deprivation affects not only the morbidity of domestic accidents, but also their severity and associated mortality [6-8]. The social and cultural status of the father also correlates with the risk of a domestic accident [9].

The greater availability of computerised information flows makes it easier than ever before to describe the occurrence of accidents amongst children and their relationship with social and economic variables. In this paper, the Authors describe the frequency of home accidents involving children in the first two years of life, based on Emergency Department admissions in the province of Trento and analyse their association with a series of social and economic variables gleaned from Birth Assistance Certificate (BAC).

### Materials and Methods

All the Emergency facilities in the province of Trento (in north-east Italy, with a population of 540,000 inhabitants as at 12.31.2019) are provided with computerised information systems and the data they generate are combined in a single central electronic archive. Data regarding admissions for home accidents have been collected since 2000, whereas data regarding the circumstances under which they occurred (dynamics, contingent activity and place of occurrence) have been collected since 2008. Using the Emergency database, the authors extrapolated records regarding admissions for domestic accidents involving children up to two years of age that occurred between 2014 and 2017. The 0-1 year's age range was chosen due to the high frequency of accidents, with consequent health-related outcomes, and to the particular importance for the child's physical and mental development of the "first 1000 days", a period that is also monitored on a nationwide level [10]. The characteristics of the child and the accident were recorded. The significance of the differences between the proportions was analyzed using the chi-squared test or Fisher exact test.

The Emergency data, for the 2014-2016 birth cohorts, were linked, in order to explore the association between the occurrence of the accident and a series of variables regarding the mother and the father, with those recorded on the BAC. The BAC is the primary information source in Italy about childbirth, pregnancy, and newborn health status. It must be filled out by the professionals attending the childbirth (generally midwives), and the data of each childbirth facility are combined in regional/ autonomous provincial databases, before being transmitted to the Ministry of Health [11]. This document contains a series of variables regarding the parents, the mother's obstetric history, the course of the pregnancy and the characteristics of the birth and the neonate. In the province of Trento, the BAC data are entered in the computer system of each birth facility and made available to the Clinical and Evaluational Epidemiology Service so that it may perform the statistical and epidemiological analyses within its sphere of competence.

Linkage between the Emergency and BAC databases was only performed for subjects residing in the region, in order to guarantee

source homogeneity. As Emergency data are anonymised, the linkage keys used were the child's date of birth, gender, nationality, municipality of residence and healthcare code. A multivariate logistic analysis was performed in order to analyse, in the linked dataset, the association between the frequency of home accidents and a series of variables recorded on the BAC, namely, maternal variables such as: the mother's age, nationality, marital status, education level and occupational status, parity and number of previous children; and paternal variables such as nationality, education level and occupational status. Further multivariate logistic analyses were performed to evaluate the level of association between the variables listed above and the severity of the event, as defined by a triage colour code of yellow or higher and/or hospitalisation and the type of injury (contusions, wounds or fractures, head injuries, ingestion or inhalation of a foreign body or burns). The 95% confidence intervals were calculated for each adjusted odds ratio. The statistical analyses were performed using Epi-Info 7 software.

### Results

A total of 1,502 Emergency Department admissions were recorded between 2014 and 2017 in the province of Trento, for home accidents involving children aged 0-1 years (375/year), equal to 25% of all admissions for domestic accidents involving children (0-14 years). In 93% of cases, the subject was resident in the province of Trento, and of these 12% were foreign nationals. Males accounted for 55.8% of the caseload.

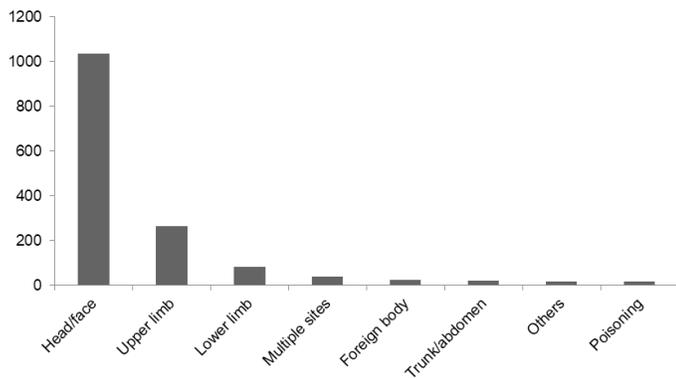
Considering the full caseload, green triage codes accounted for 73% of cases, white triage codes for 17% and yellow triage codes for 10%. Yellow triage codes prevailed in the first year of life, with a statistically significant difference ( $p < 0.05$ ). There was just one red triage code, in a child in the second year of life. Foreign children present an excess of white codes ( $p < 0.01$ ) and a deficit of green codes ( $p < 0.01$ ). No differences were observed with regard to gender.

The most common dynamic was a fall or a trip (70%), which most commonly occurs, for both genders, in the first year of life, with a statistically significant difference ( $p < 0.001$ ). No differences were observed between Italians and foreign nationals.

Activities of daily living (eating, drinking, sleeping, walking, and washing) represent the most common contingent activity and account for 31% of cases. As anticipated, play and sports are the prevalent activity during the second year of life, with a statistically significant difference ( $p < 0.01$ ). No differences were observed with regard to gender or nationality.

The kitchen is the single room with the highest occurrence rate (21.6% of cases). No differences were observed with regard to the child's age, gender or nationality. The type of accident is associated with the part of the house in which it occurs, considering that 30% of foreign body ingestions/ inhalations, 45% of poisonings/ intoxications and 72% of burns occur in the kitchen.

The head and face (Figure 1) are the parts of the body most frequently injured (69% of cases), especially in the first year of life, whereas the upper and lower limbs are more commonly involved in the second year of life, with a statistically significant difference ( $p < 0.01$ ). There are no variations in distribution with regard to gender or nationality. In both genders, the most common clinical event is head injury (43.8%), which is approximately twice as common in the first year of life, and is followed by bruising/ grazing, wounds and burns; the latter being more common amongst children of foreign origin ( $p < 0.01$ ).



**Figure 1:** Province of Trento. Injury site in cases of home accidents in subjects aged 0-1 year. Period 2014-2017.

Of 1502 Emergency admissions aged 0-1 year, 842 regarded children pertaining to the 2014-2016 birth cohorts, 791 subjects of these were resident in the province of Trento; 735 of these (93% of cases) were linked positively with their BAC.

#### Odds ratio and 95% confidence intervals.

Parameter	Odds ratio	95%	CI	p value
Mother's nationality (foreign vs Italian)	0.8862	0.6690	1.1739	0.3995
Father's nationality (foreign vs Italian)	0.8161	0.6045	1.1018	0.1846
Single vs married mother	0.9423	0.7912	1.1223	0.5055
Sep./ div./ widowed vs married mother	<u>1.5092</u>	<u>1.0192</u>	<u>2.2346</u>	<u>0.0399</u>
Mother employed vs housewife	1.1254	0.8855	1.4303	0.3340
Mother unemployed vs housewife	1.2026	0.9078	1.5930	0.1985
Mother student vs housewife	0.6230	0.3079	1.2607	0.1883
Father employed vs unemployed	0.9492	0.6860	1.3135	0.7531
Mother's age <25 vs. 25-29 years	1.1890	0.8585	1.6467	0.2976
Mother's age 30-34 years vs. 25-29 years	0.8451	0.6812	1.0486	0.1263
Mother's age 35-39 years vs. 25-29 years	<u>0.7600</u>	<u>0.5889</u>	<u>0.9807</u>	<u>0.0349</u>
Mother's age 40+ years vs. 25-29 years	0.7866	0.5546	1.1158	0.1785
Father's age <25 vs. 25-29 years	1.2125	0.7367	1.9954	0.4485
Father's age 30-34 years vs. 25-29 years	1.0554	0.8038	1.3858	0.6980
Father's age 35-39 years vs. 25-29 years	1.0544	0.7882	1.4106	0.7212
Father's age 40+ years vs. 25-29 years	1.0016	0.7306	1.3730	0.9922
Pluriparous vs primiparous mother	1.0617	0.9065	1.2434	0.4580
Mother's education <8 years vs >8 years	0.9616	0.7502	1.2326	0.7571
Father's education <8 years vs >8 years	1.0225	0.8446	1.2379	0.8193
One previous child vs first child	0.9321	0.7783	1.1163	0.4446
2 or more previous children vs first child	0.9712	0.7549	1.2494	0.8201

**Table 1:** Home accidents in subjects aged 0-1 years and parent characteristics. Multivariate adjusted.

The analysis of associated family risk factors was carried out on the BAC data of 12,727 live births. There was a higher risk of domestic accident amongst children with younger parents, although the difference compared with the reference age is not statistically significant, and the same applies for the mother's occupational status. The presence of a separated/ divorced/ widowed mother was seen to be a risk factor, whereas the presence of an older mother was seen to be a protective condition. Nationality, education level and family size do not appear to be associated with a higher risk (Table 1).

Of the 731 cases included, the severity of the event is associated with a larger family, i.e. the presence of 2 or more offspring, with a trend that increases with the number of children. Older paternal age appears to be a protective factor with regard to the severity of the event (Table 2). Although no particular associations were observed with the occurrence of contusions, wounds/fractures, head injuries, and the ingestion/ inhalation of foreign bodies, burns would appear to be associated with a father of foreign origin, an employed mother and the size of the family, with a risk that increases with the number of children (Table 3).

#### Conclusion

The characteristics of the domestic accidents involving children up to 2 years of age reported in this paper are consistent with those reported by previous larger Italian studies [12]. They confirm more specifically, the characteristics of accidents occurring in the first year of life, where falls are prevalent, and the head and face are the parts of the body most commonly involved, with a higher occurrence of head injuries, which are, in most cases, of a mild

### Odds ratio and 95% confidence intervals.

Parameter	Odds ratio	95%	CI	p value
Mother's nationality (foreign vs Italian)	1.0407	0.4731	2.2895	0.9210
Father's nationality (foreign vs Italian)	0.4899	0.2155	1.1136	0.0886
Unmarried vs married mother	1.2512	0.7568	2.0688	0.3823
Sep./ div./ widowed vs married mother	0.7814	0.2721	2.2436	0.6467
Mother employed vs housewife	0.8207	0.4036	1.6687	0.5852
Mother unemployed vs housewife	1.3136	0.5535	3.1176	0.5362
Mother student vs housewife	0.4574	0.0803	2.6068	0.3783
Father employed vs unemployed	0.9725	0.3761	2.5147	0.9541
Mother's age <25 vs. 25-29 years	0.4343	0.1693	1.1145	0.0828
Mother's age 30-34 years vs. 25-29 years	0.6265	0.3299	1.1898	0.1530
Mother's age 35-39 years vs. 25-29 years	0.7566	0.3523	1.6248	0.4744
Mother's age 40+ years vs. 25-29 years	1.0129	0.3566	2.8773	0.9808
Father's age <25 years vs. 25-29 years	1.3183	0.2479	7.0112	0.7458
Father's age 30-34 years vs. 25-29 years	0.5377	0.2191	1.3196	0.1755
Father's age 35-39 years vs. 25-29 years	0.4848	0.1859	1.2648	0.1389
Father's age 40+ years vs. 25-29 years	<u>0.3536</u>	<u>0.1281</u>	<u>0.9758</u>	<u>0.0447</u>
One previous child vs first child	1.3527	0.8088	2.2625	0.2496
2 or more previous children vs first child	<u>2.2788</u>	<u>1.0192</u>	<u>5.0950</u>	<u>0.0448</u>
Pluriparous vs primiparous mother	0.8540	0.5433	1.3425	0.4942
Mother's education <8 years vs >8 years	1.7495	0.7879	3.8845	0.1693
Father's education <8 years vs >8 years	0.9858	0.5740	1.6931	0.9588

**Table 2:** Severity of the home accident and characteristics of the parents. Multivariate adjusted.

Parameter	Odds ratio	95%	CI	p value
Mother's nationality (foreign vs Italian)	0.5473	0.1600	1.8717	0.3367
Father's nationality (foreign vs Italian)	<u>5.3005</u>	<u>1.6107</u>	<u>17.4432</u>	<u>0.0061</u>
Unmarried vs married mother	0.6979	0.3119	1.5614	0.3813
Sep./ div./ widowed vs married mother	0.5217	0.1081	2.5187	0.4180
Mother employed vs housewife	<u>3.7153</u>	<u>1.2580</u>	<u>10.9721</u>	<u>0.0175</u>
Mother unemployed vs housewife	1.6493	0.4608	5.9026	0.4418
Mother student vs housewife	6.2754	0.5293	74.3964	0.1455
Father employed vs unemployed	0.9982	0.3047	3.2700	0.9976
Mother's age <25 vs. 25-29 years	1.2894	0.2812	5.9123	0.7436
Mother's age 30-34 years vs. 25-29 years	0.8962	0.3604	2.2286	0.8137
Mother's age 35-39 years vs. 25-29 years	1.0173	0.3605	2.8707	0.9741
Mother's age 40+ years vs. 25-29 years	1.0025	0.2272	4.4238	0.9974
Father's age <25 years vs. 25-29 years	1.7611	0.2583	12.0093	0.5634
Father's age 30-34 years vs. 25-29 years	0.9566	0.2644	3.4607	0.9461
Father's age 35-39 years vs. 25-29 years	1.7694	0.4641	6.7465	0.4033
Father's age 40+ years vs. 25-29 years	0.8231	0.1866	3.6300	0.7971
One previous child vs first child	<u>2.4586</u>	<u>1.1000</u>	<u>5.4953</u>	<u>0.0284</u>
2 or more previous children vs first child	<u>5.0696</u>	<u>1.9307</u>	<u>13.3119</u>	<u>0.0010</u>
Pluriparous vs primiparous mother	1.6760	0.8590	3.2703	0.1300
Mother's education <8 years vs >8 years	1.2257	0.4780	3.1429	0.6718
Father's education <8 years vs >8 years	0.6111	0.2673	1.3967	0.2429

**Table 3:** Risk of burns and parent characteristics. Multivariate adjusted Odds ratio and 95% confidence intervals.

entity. Overall, injuries during the first year of life, considering also the condition of greater vulnerability during this stage of development, are characterised by a greater severity. On the whole, no differences were observed with regard to gender or nationality. The kitchen was confirmed the part of the house associated with the highest risk, particularly in the case of burns [12]. Record linkage between information flows: Emergency Department database and BAC database records can constitute a good procedure for investigating the social and cultural factors associated with the occurrence of a domestic accident during childhood, although it

is difficult to guarantee 100% coverage. This can be attributed to various factors, such as incompleteness or errors in the entry of data in the two databases, or the presence of cases in which the mother "does not want to/ cannot be named", in compliance with Italian Ministerial Decree 349/2001 regarding the BAC information flow. This entails a reduction in the completeness of the information. In several cases, there was no BAC available for resident children reporting to Emergency facilities in the province, because they were born in facilities outside the province. In connection with this, it should be borne in mind that approximately 8% of births

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in the resident population, during the period studied, was born in a facility outside the province, from which it was not possible to obtain the corresponding BAC. Two further aspects must be taken into consideration with regard to data quality concern, on the one hand, the propensity to go to Emergency Department in the event of a home accident and, on the other, the ability to identify the admission as resulting from an accident in the home, with the consequent complete and correct recording of the data. An ad hoc survey could take into account and minimise these aspects; however, this would entail higher costs, including those of an organisational nature. Accidents and, more specifically, accidents that occur in the home during childhood, are usually the result of an interaction between environmental/structural and behavioural factors. The latter may regard both the child and his/her level of physical and mental development and the behaviour and level of perception of domestic risks of the adult [13]. On this note, the PASSI (*Progressi delle Aziende Sanitarie per la Salute in Italia*, Progress in Local Health Authorities in Italy) surveillance system reports, in the nationwide sample studied between 2015-2018, an awareness of the risk of domestic accident of 6.4%, whereas the sample for the province of Trento is lower than the national value and is equal to 5.6% [14]. By acting as a stressogenic factor, particular aspects contingent, and concomitant or subsequent to the arrival of the child in a home can create conditions that generate or exacerbate risk conditions, especially in the more vulnerable families. Stress can, either directly or indirectly, favours the occurrence of accidents. Indeed, stress reduces an individual's ability to monitor the environment and can lead to irritability, changes in vigilance, tiredness, distraction and depression, all conditions that can impair an adequate protection of the child at home [15,16]. The multivariate analysis conducted on the two linked archives indicates that a young maternal or paternal age, of less than 25 years, is associated with a higher risk, although this difference was not statistically significant, whereas a maternal age of over 35 years would appear to be a protective condition. An older maternal or paternal age is most likely associated with more consolidated parental skills that are better suited to managing the interactions between the child and his/her domestic environment [3]. The role of the father would appear to be less evident. Nationality, academic qualification and family size (number of offspring) do not appear to have an influence, a finding that conflicts with the results of previous studies [3-9]. A correlation with occupational status and, to an even greater extent, marital status, was observed. The presence of a separated/ divorced/ widowed mother correlates with a higher risk of home accidents. These conditions are accompanied, at least theoretically, with more fragile levels of family support, although the BAC used in Italy or in province of Trento, do not provide information as to whether the mother actually has a cohabiting partner. Accident severity would appear to correlate, on the one hand, with the size of the family, where the presence of 2 or more offspring, in addition to the new baby, is associated with a higher level of risk, but is also associated with the age of the father, where the presence of an older father is associated with a reduction in the degree of severity and a significant protective effect with a paternal age of over 40 years. This aspect is consistent with the findings of previous studies (68).

The analysis of the type of event only shows associations with regard to burns, where the significant independent risk factors are constituted by the presence of a foreign father (in particular those of eastern European origin), an employed mother and family size, where the risk increases with the number of offspring, factors that were also identified in previous studies [3-4,9]. To conclude, in the province of Trento, no clear relationship was observed between home accidents in childhood and socio-economic factors, as defined on the basis of academic qualification and occupational status [17,18]. It should also be taken into account that the province of Trento is an area with a low incidence of social deprivation, with well-structured and -coordinated public care services for both pregnant mothers and new-born babies, which, *per se*, promote an overall reduction in inequality [19,20]. In the setting described, the demographic factors regarding marital status and family size represent prevalent aspects to be taken into account in initiatives undertaken to mitigate the occurrence of domestic accidents from a population perspective [21].

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