Epidemiology of home injuries: a large observational study among adult mothers in Italy

Alice Mannocci[a], **Chiara de Waure**[b], **Maria Rosaria Gualano**[c], **Maria Lucia Specchia**[b], **Antonella Sferrazza**[b], **Giorgio Liguori**[d], **Antonino Parlato**[e], **Giovanna Rossi**[f], **Domenico Luca Grieco**[b], **Roberta Siliquini**[c], **Antonio Boccia**[a], **Walter Ricciardi**[b] and **Giuseppe La Torre**[a]

[a] *Dipartimento di Sanità Pubblica e Malattie Infettive, Sapienza Università di Roma, Rome, Italy*
[b] *Istituto di Igiene, Università Cattolica del Sacro Cuore, Rome, Italy*
[c] *Dipartimento di Scienze della Sanità Pubblica, Università di Torino, Turin, Italy*
[d] *Cattedra di Epidemiologia e Igiene, Università "Partenope", Naples, Italy*
[e] *ASL NA2, Dipartimento Epidemiologia e Prevenzione, Naples, Italy*
[f] *ASL Cagliari 8, Cagliari, Italy*

Abstract
Aims. The aims of the study were to describe the epidemiology of home injuries (HI) among Italian students' mothers and to identify the possible predictors of having HI.
Methods. An anonymous questionnaire was used in several Italian schools. In order to identify predictors of having HI, a multivariate analysis was performed.
Results. In our sample (3,610 women), the prevalence of HI was 18%; 6.2% of the interviewed had a severe HI. The multivariate analyses showed that increasing age, to spend more than 13 hours a day at home and to be housewife are risk factors for having HI.
Conclusions. This study reports a high prevalence of HI, highlighting an urgent need for undertaking interventions to develop an adequate culture of safety and prevention.

Key words
• injury
• home injury
• public health
• health promotion

INTRODUCTION

Home injuries (HI) are leading causes of death and disability worldwide and are globally recognized as an important public health issue, imposing significant costs to society: indeed they represent a leading cause of hospital admissions [1].

It has been estimated that applying prevention measures would save almost 10 million pounds per year, highlighting the importance of reducing of these injuries in terms of cost savings [2].

Consequently, several European and non-European Countries carried out prevention policies [3, 4] on this relevant topic.

Recent statistics report that, in the European Union, HI are the fourth most common cause of death [5] whether in Italy they represent the most common cause of injury (HI account for around 4 million cases per year), even higher than incidence of road traffic injuries, especially among women, housewives and people who lived in the Southern and Central Italy [6].

In this context, in Italy HI have been identified as an important public health issue by the National Prevention Plans 2005-2008 and 2010-2012 [7, 8].

Regarding the existing literature, it can be noted that it is mainly about the occurrence of specific types of HI, e.g. falls and poisoning, often in selected population sample, such as the elderly [9] and the children [10], while there is still little understanding about the occurrence of HI in the general population.

The aims of the study were to describe the epidemiology and the characteristics of HI among students' mothers attending primary and secondary schools in Italy and to identify possible predictors of having HI.

MATERIALS AND METHODS
Definition

Unintentional HI are those events occurring within the confines of home, including garden, garage or recreational room [11]. Additionally, we defined a HI "severe" if injured responders needed a specific intervention (family assistance and care, assistance from non-family members, pharmaceutical assistance, ambulatory visit, medical guard, Emergency Department, ED) or required an ambulance and if they needed hospitalization or they couldn't move for a long period (more than 1 day).

Study population

In order to evaluate sample size, estimated prevalence of HI was set at 5% [12] and size of population from which the sample was selected at 12 000 000 [13]. Sample size was estimated to be 3151 at 99% level of confidence; with a statistical power set at 80% (worst acceptable result was 4%). Considering a possible amount of 50% of non responders, further 1575 questionnaires should be delivered for a total of about 5000 questionnaires.

Seventy-one Italian primary and secondary public schools were thus selected in three Italian regions (Lazio, Sardinia, Campania) during 2006-2007 school years. Both rural and urban schools were included in the study.

The participant pool was a convenience sample. The research was proposed to the School Principals during a meeting, after a telephonic contact and an official letter describing the purpose of the project. Local Authorities gave their approval and participants were asked about their informed consent.

Questionnaire

An anonymous questionnaire containing open-ended and closed-ended questions, validated in a pilot study [14], was administered to participants. We specify that the hypotheses on the risk factors tested in the present study are based on the pilot study [14].

The questionnaire was structured into two sections.

The first part investigated about responders who had a HI during the last year: where it happened, what caused it, which kind of HI occurred, what body part was injured, in which circumstances it occurred (*e.g.* domestic activities), type of treatment needed (no treatment, self treatment, family assistance and care, assistance from non-relatives, pharmaceutical assistance, ambulatory visit, medical guard, ED, admission to hospital – multiple choices question), need for ambulance, need to stop working and inability to move (for more than 1 day). The form also contained a question on the localization and the nature of injuries, according to an ICD-10 matrix system of codes [15].

The second section was about socio-demographic characteristics of responders (how much time they spent at home, civil status, educational level, kind of job, doing sport, doing physical activity less/equal or more than 2 times a week).

Questionnaires were delivered to students through teachers and students were asked to give them to their mothers.

Then, questionnaires were placed into boxes at the entrance of the school, anonymously.

Statistical analysis

Descriptive statistics were performed using frequencies, percentages, frequency tables for qualitative variables and mean ± standard deviation (SD) for quantitative variables.

The outcomes under study were the occurrence of injury and the occurrence of severe HI.

For the univariate analysis Mann-Whitney and Chi Square tests were used. The independent variables were: age, time spent at home (hours), civil status (married/cohabiting VS unmarried/single/divorced/widowed), educational level, kind of job, doing sport, doing physical activity (equal or less or more than 2 times a week).

In order to estimate the impact of the above mentioned variables on the outcomes, logistic regression models were computed.

The strategy to insert the covariates into the regression models was the Hosmer and Lemeshow procedure [16]: all the variables included had a p-value < 0.25 in the univariate analysis and were entered in the first step of the model.

After that, a stepwise approach (backward elimination) was used.

The results are presented as adjusted Odds Ratio (OR) with 95% Confidence Interval (95% CI).

The level of statistical significance was set at $p \leq 0.05$.

Statistical analysis was performed with SPSS 19.0 software for Windows.

RESULTS

5487 questionnaires were distributed and 3610 (response rate: 66%) were returned.

Mean age of students' mothers was 41.1 ± 5.9. Prevalence of HI was 18% (95% CI = 17.7-19.2), while 6.2% (95% CI = 5.23-6.77) of the interviewed had a severe HI.

As shown in *Table 1*, statistically significant differences for having HI emerged for the variable age: with increasing age the likelihood of HI was higher ($p < 0.001$ for both outcomes).

Notably, subjects who had HI spent more than 13 hours a day at home (16.6% *vs* 19.2% - p=0.05 and 5% *vs* 7.3% - p = 0.005, for having HI and having severe HI, respectively).

Additionally, there were statistically significant differences for educational level: responders with a lower educational level seemed to have higher risk to have an injury (p = 0.008 and p < 0.001 for having HI and having severe HI, respectively).

Moreover, wives appeared to be at lower risk of having HI than unmarried women: 17.5% had a not severe HI in comparison to 21.4% respectively (p = 0.04).

In *Table 2* an ICD-10 matrix shows the distribution by location and nature of injuries.

The most common anatomical locations were: wrist and hand (39.1%), ankle and foot (11.7%), knee and leg (10.2%). Stratifying these data by severity of injuries, we found that injuries occurring in the most frequent locations were less severe than the ones regarding the head and the neck, that were the less common body parts hit. Concerning the nature of the lesion, there was a high frequency of abrasion and open wound (26.8% and 26.7%, respectively), followed by contusions (19.4%).

Furthermore, cutting (44.5%) was the most frequent cause of the lesion, followed by burns (35.6%) and falls (31.0%).

Around 70% of responders were doing domestic activities at the time of injury.

Table 1
Descriptive and univariate analysis about having home injuries (HI)

Variables (N)		Having HI in the last year			Having severe HI in the last year		
		No (mean±SD)	Yes (mean±SD)	p-value	No (mean ± SD)	Yes (mean±SD)	p-value
Age (years) (3610)		40.9 ± 5.8	41.9 ± 6.3	**<0.001***	41.0 ± 5.8	42.6 ± 5.6	**<0.001***
		No %	**Yes %**		**No %**	**Yes %**	
Time spent at home (hours) (3610)	≤ 13 (1707)	83.4	16.6	**0.05****	95.0	5.0	**0.005****
	> 13 (1903)	80.8	19.2		92.7	7.3	
Civil status (3510)	Unmarried (468)	78.6	21.4	**0.04****	93.5	6.5	0.85**
	Married (3042)	82.5	17.5		93.7	6.3	
Educational level (3531)	No title (18)	50.0	50.0	**0.008****	88.9	11.1	**<0.001****
	Primary (187)	81.8	18.2		96.7	3.3	
	Secondary (1319)	81.5	18.5		95.6	4.4	
	High school (1454)	83.1	16.9		93.1	6.9	
	Degree (553)	82.4	17.9		90.3	9.7	
Job (3480)	Student (19)	78.9	21.1	0.16**	94.4	5.6	0.07**
	Unemployed (183)	83.6	16.4		96.1	3.9	
	Housewife (1496)	80.7	19.3		94.4	5.6	
	Factory worker (238)	80.3	19.7		96.0	4.0	
	Office worker (1050)	84.9	15.1		92.2	7.8	
	Self-employed (410)	81.5	18.5		93.3	6.7	
	Manager (72)	80.6	19.4		90.1	9.9	
	Retired (12)	66.7	33.3		81.8	18.2	
Doing sport (3477)	No (2488)	82.5	17.5	0.48**	94.1	5.9	0.20**
	Yes (989)	81.5	18.5		92.9	7.1	
Doing physical activity (times a week) (3610)	0-2 (1485)	82.4	17.6	0.60**	93.8	6.2	0.92**
	> 2 (2125)	81.7	18.3		93.7	6.3	

* p-value Mann Whitney test; ** p-value χ² test
Bold: significant results (p ≤ 0.05)

Considering the severity of the injuries, *Figure 1* shows 59% of mothers needed self treatment, 17.3% went to the ED and 13.3% needed family assistance. Only 1.7% needed admission to hospital. Globally, among the injured subjects, more than 65% did not need any medical assistance, while the other people required a specific medical intervention (medical guard, ambulatory visit, ambulance, ED, admission to hospital).

Interestingly, 33.6% had to stop working and 15.4% had to stay immobilized. Only 1% required the intervention of an ambulance paramedic emergency team.

The multivariate analyses *(Table 3)* confirmed that increasing age was a risk factor for the occurrence of a HI (OR = 1.03; 95% CI = 1.01-1.05 and OR = 1.04; 95%CI = 1.01-1.06, for having a HI and a severe HI, respectively); who spent more than 13 hours at home had a higher risk for having a severe HI (OR = 1.43; 95% CI = 1.07-1.91); housewives were at higher risk than other professions for having a HI (OR = 1.25; 95% CI = 1.05-1.50). Conversely, married women had a lower risk than unmarried women to have a HI (OR = 0.74; 95% CI = 0.57-0.95).

As far as the educational level concerns, different results were found for the two outcomes: mothers without educational title had a 4 fold risk of having HI in comparison to graduate mothers whereas
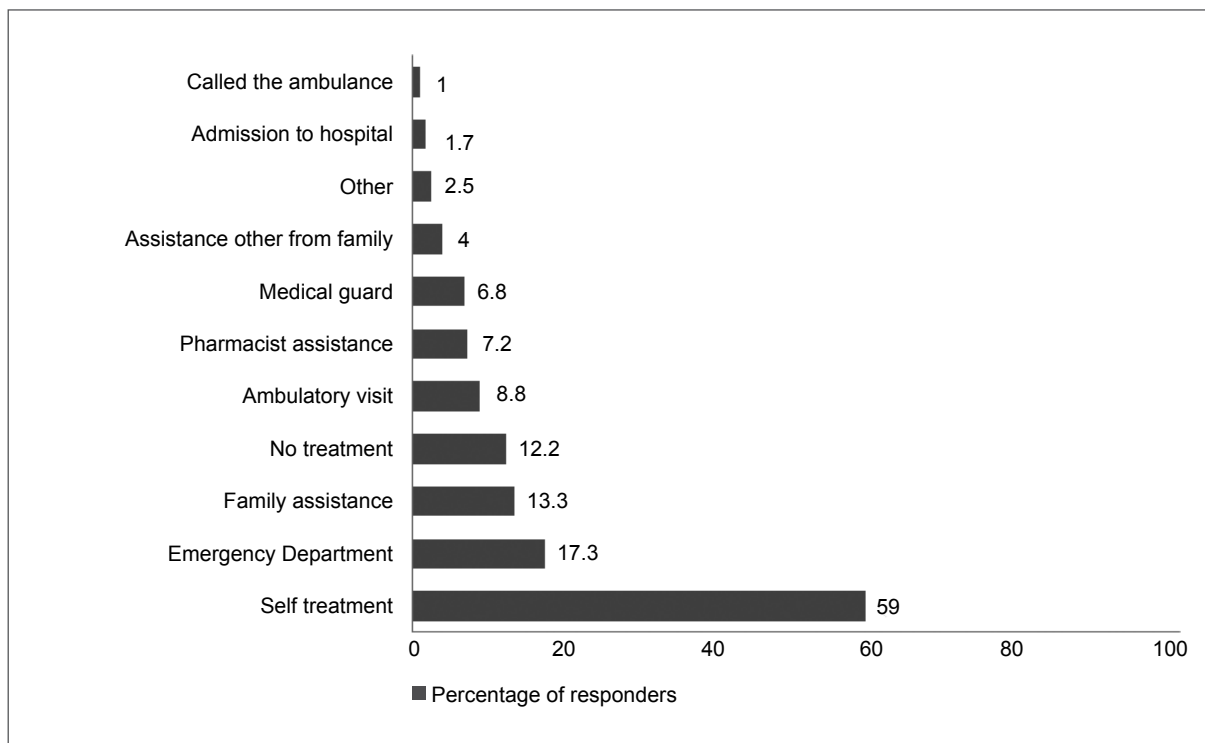
Figure 1
Bar graph of treatmens needed after injuries (%) (multiple response).

women with lower educational level (primary or secondary school) had lower risks of severe HI.

DISCUSSION

Injuries are one of the most under-recognized public health problems facing the world today [17].

This research was conducted in order to acquire several information and data regarding the issue of HI and also to describe epidemiology and characteristics of HI in Italy.

In this study, the main result concerns the prevalence of HI equal to 18%. This percentage is very high and sounds alarming, especially if we consider that more than 30% are classified as "severe" injuries.

In addition, we found that HI seem to be more common among who spent more than 13 hours at home every day, in particular old subjects and housewives. In the majority of cases, HI occurred during domestic activities. Furthermore, in our sample the most common injuries were caused by cutting, burns and falls and the body parts most frequently injured were upper and lower extremities. All these findings are in line with current statistics [18, 19].

In agreement with other studies [20, 21], it appeared that educational level had an important impact on the chance of having HI: responders with higher educational level were at low risk to have an injury, but considering only severe injuries, graduate mothers had higher risk.

Interestingly, results of the multivariate analysis showed that married subjects had a lower risk than unmarried people to have HI, this finding is in accordance with the study conducted by Keskinoglu et al. [22].

It is of interest to report some experiences about collection of HI data already existing both in Europe and in Italy.

The European Home and Leisure Accidents Surveillance System (EHLASS) is a EU project aimed at monitoring home and leisure accidents in Europe and it is based on a network called European Union Public Health Information Network (EUPHIN) that collects data from ED in each of the member states [23, 24]. In 1999 in Italy the National Informative System for Home Injuries (Sistema Informativo Nazionale sugli Incidenti Domestici, SINIACA) was created [25-27]; it is an information system used to contribute to the European Union Injury Database (EU IBD) that collects data from 25 Italian ED [28].

However, using these informative systems, there is an underestimation of the real incidence of HI, because a lot of people don't seek assistance from an ED.

Interestingly, some positive experiences are reported in the prevention of falls in elderly by using new technologies, such as web based applications and telemedicine tools [29, 30].

In interpreting the results, the main limits and strengths of the study should be acknowledged.

The main limitation was represented by the possible occurrence of recall and information bias; misclassification could not be excluded thus. Another significant criticism is represented by the convenience sampling, that could introduce limitations in generalization and inference.

ORIGINAL ARTICLES AND REVIEWS

Table 2
ICD-10 matrix describing the distribution and nature of lesions of home injuries (HI)

	Head	Neck	Thorax	Abdomen, lower back, pelvis and spine	Shoulder, arm	Elbow, forearm	Wrist, hand	Hip, thigh	Knee, leg	Ankle, foot	Multiple body regions	Total	(%)
Abrasion	11	8	7	10	20	25	75	7	25	4	3	195	26.82
Contusion	14	5	6	23	7	9	19	15	26	12	5	141	19.39
Open wound	8	2	1	2	6	6	143	1	11	11	3	194	26.69
Fracture	2	1	3	3	4	3	18		2	13	5	54	7.43
Dislocation, sprain and strain	1	1	1	2	6	4	12	1	3	31	2	64	8.80
Injury to nerves and spinal cord						1	2			1		4	0.55
Injury to blood vessels	1			2	2	2	2	2	1	2	1	15	2.06
Injury to muscle and tendon	1	1		3	3	1	3	2	4	3	1	22	3.03
Crushing injury	1		1	4	2		9	4	2	6	2	31	4.26
Traumatic amputation					1		1			1		3	0.41
Injury to internal organs	1			1		1				1		4	0.55
Total	40	18	19	50	51	52	284	32	74	85	22	727	100.00
(%)	5.50	2.48	2.61	6.88	7.02	7.15	39.06	4.40	10.18	11.69	3.03	100.00	

The principal strengths of our study are the large size of the sample and the active participation of local health unit (ASL) and school operators, that made possible to collect and use data at local level, previously very scarce or totally lacking. Particularly, our study surveyed HI among a large sample of middle age women; among them, the HI phenomenon is probably underestimated because of both the lack of *ad hoc* studies and the low probability to refer to health services facilities in case of mild injuries in this age group.

CONCLUSIONS

In conclusion, especially considering the high prevalence of HI found in our study, there is an urgent need to undertake, at local level, interventions aimed to the development of an adequate culture of safety and prevention, according to the National Prevention Plans. One framework to be applied for reducing home injuries is based on the public health model, based on identifying the magnitude of the issue through data collection in order to best know and identify risk and protective factors, followed by the implementation and evaluation of interventions based on evidence-based practices and policies. Policies should regard safe environments and safe behaviors, in order to achieve the goal of improving safety. Particularly, these interventions have to be focused on women emerged as more vulnerable in the present research: older age housewives, without any education title, unmarried and who spend more than 13 hours every day at home.

Table 3
Results of multivariate analysis concerning the occurrence of home injuries (HI) and severe HI

Variables		HI			Severe HI		
		OR	95% CI	*p*-value	OR	95% CI	*p*-value
Age		**1.03**	**1.01-1.05**	**< 0.001**	**1.04**	**1.01-1.06**	**0.002**
Time spent at home every day (hours)	≤ 13*	1			1		
	> 13	1.15	0.96-1.37	0.13	**1.431**	**1.07-1.91**	**0.01**
Job	Office worker*	1			1		
	Student	1.65	0.53-5.09	0.39	0.99	0.13-7.69	0.99
	Unemployed	1.14	0.74-1.76	0.56	0.75	0.34-1.63	0.46
	Factory worker	1.315	0.93-1.86	0.12	0.84	0.42-1.69	0.63
	Self-employed	1.23	0.92-1.65	0.15	0.96	0.62-1.47	0.84
	Manager	1.14	0.61-2.14	0.68	1.02	0.44-2.35	0.97
	Retired	0.72	0.14-3.75	0.69	2.83	0.58-13.85	0.19
	Housewife	**1.25**	**1.05-1.50**	**0.01**	1.03	0.71-1.48	0.89
Educational level	Degree*	1			1		
	No title	**4.00**	**1.51-10.60**	**< 0.01**	0.99	0.21-4.67	0.99
	Primary school	0.86	0.54-1.38	0.53	**0.45**	**0.19-1.05**	**0.05**
	Secondary school	0.94	0.73-1.21	0.64	**0.59**	**0.43-0.81**	**0.001**
	High school	0.98	0.81-1.17	0.81	0.76	0.54-1.08	0.13
Civil status	Unmarried*	1			-	-	-
	Married	**0.74**	**0.57-0.95**	**0.02**			
Doing sport	No*	-	-	-	1		
	Yes				1.05	0.77-1.43	0.74

*Reference group
- not included in the model
Bold: significant results (p ≤ 0.05)

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