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RESEARCH ARTICLE

Accidents Increase in Inadequate Housing Conditions: A Cross-Sectional Study from Turkey

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Abstract

Objective: Housing is an important determinant of health, and substandard housing is a major public health issue. The aim of this study was to determine the prevalence of home accidents, and to evaluate the associations between housing conditions and home accidents in a health centre region in Ankara.

Methods: In this cross-sectional research, we collected data from a representative sample of 210 houses using two standard questionnaires, which was used in the WHO's Large Analysis and Review of European Housing and Health Status (LARES) project. In total, 528 people participated.

Home accidents were self-reported and questioned for the previous year. We developed a composite index to assess the overall housing conditions. Housing conditions were accepted "inadequate" if the score was below the median. We developed a logistic regression model to predict the housing-related factors in accidents.

Results: Of the participants, 60.4% were female, 89.0% had health insurance, and 56.1% were married. Fifty-eight point three percent of the respondents were living in inadequate housing conditions. The prevalence of home accidents during previous year was 21.2%. The first three most common accident types were falls, cuts, collision/striking and the mostly injured body parts were arm/upper limb, leg/lower limb, surface area of the body. Some of the items which have been involved in these accidents were construction features, kitchen equipment, and knives. The accidents were more common among females, people who reported fatigue, in kitchens with too little workplace and houses with noise problems($p<0.05$). The odds of home accidents were 1.8 times more (95% CI:1.1-2.8) among residents living in inadequate housing conditions. The logistic model showed that, accidents were 2.1 times more (95% CI: 1.1-4.2) in those living in houses where adaptations for physical constraints were lacking, and 1.9 times more among females (95% CI: 1.1-3.3).

Conclusion: Home accidents were common and related to housing conditions. We recommended that factors that can cause accidents in residential buildings be taken into consideration during the construction phase through cooperation of the municipality, the construction sector and the health personnel. This will enable everyone to benefit from these arrangements in the house.

Key words: Housing, home accidents, injuries, LARES, housing conditions, safety

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Introduction

Housing is an important determinant of health, and substandard housing is a major public health issue. Housing definition therefore, needs to be comprehensive including the building, dwelling, and the immediate environment (Cobanoglu, 1996; Bonnefoy, 2007; Guler, 2008). The World Health Organization (WHO) defines healthy housing as the housing where health, hygiene, comfort and privacy, functional and adequate physical, social and spiritual conditions are provided (Cobanoglu, 1996; Bonnefoy, 2007; Guler, 2008; Jacobs, 2011). The United Nations Habitat Agenda defined adequate housing and shelter broadly. Housing is defined as meaning adequate privacy; adequate space; physical accessibility; structural stability and durability; adequate lighting, heating, and ventilation; adequate basic infrastructure, such as water supply, sanitation, and waste management facilities; suitable environmental quality and health-related factors; and adequate and accessible location with regard to work and basic facilities (Jacobs, 2011).

Housing is a complex construct that cannot be represented only by the physical structure of the home. The WHO approach to housing is, based on a four-layer model of housing, taking into consideration the physical structure of the dwelling as well as the meaning of home and the external dimension of the immediate housing environment, and the community with all neighbours (Bonnefoy, 2007).

Housing conditions and the built environment can significantly affect public health. Some of the housing related environmental health risks include; indoor or outdoor air pollution from cooking, heating and lighting, exposure to extreme heat or cold; disease vectors, damp and mould, design features, access to green spaces for physical activity, noise exposures, and use of unsafe construction materials and poor construction practices (Bonnefoy et al., 2003; Niemann and Maschke, 2004; Niemannet al., 2006; Bonnefoy, 2007; Veitch and Galasiu, 2012; WHO, 2018).

The home is also where accidents frequently occur. In the European Union, more than half of the 20 million home and leisure related accidents that occur each year take place in or around the home (Bonnefoy et al., 2003). Too many factors may pose a risk for accidents in dwellings like stairs, windows, electric installations, and heating devices. As these risks cannot be avoided fully, dwellings should be made as safe as possible through the necessary building and architectural designs. Guidelines were prepared for this purpose, in which the risks are defined, the hazards in the house are listed and the solutions are developed (WHO, 2001; Bonnefoy et al., 2003; CDC and US HUD, 2008; Guler, 2008).

Falls, poisoning and fires are the most frequent causes of accidental injuries and deaths that occur in residential areas (WHO, 2001; CDC and US HUD, 2008; Guler, 2008). Evidence shows that children and the elderly are the most affected, and low socioeconomic conditions are related with accidents (Last, 2008; WHO, 2001).

There are limited number of studies, which reveal the relationship among housing conditions and health impacts in Turkey. Studies are mainly focused on specific individual risk factors, or specific groups like elderly, community-dwellings and housing elements.

In this research, we aimed to determine the prevalence of the home accidents and the influencing factors that are related to housing conditions in a health center region in Ankara.

Methods

In this cross-sectional study, we collected data from a representative sample of 210 houses using two standard questionnaires, which was used in the WHO's Large Analysis and Review of European Housing and Health Survey (LARES) project. We got permission from WHO and applied two questionnaires; the first one was the face-to-face household questionnaire on the perception of residential conditions and the second was an individual self-administered health questionnaire. In total, 528 residents participated.

Accidents were self-reported and questioned for the previous year. We developed a composite index to assess the overall housing conditions. Housing conditions' composite index included number of rooms, number of children and adults sleeping in one room, desire for moving to another house, enough workspace in the kitchen, lighting, and accessibility of the house for handicapped people with wheel chair, walking aids or any other physical constraints, adaptability for the specific needs, renovation of the building or the house. These variables were scaled from zero to one point and the total score was calculated. We accepted housing conditions as "inadequate" if the total score was below the median. We calculated psychosocial benefit score of home (Kearns et al., 2000). The detailed information on description and evaluation of methods and approaches are described elsewhere (Bonnefoy et al., 2007).

We analyzed the data using SPSS 14, and Excel 2007. For descriptive analysis, we used percent distribution, mean, median, and standard deviation. We compared the groups by chi square test. We built a logistic regression model to predict the housing-related factors in accidents. In this model, after controlling for gender (female/male), age (0-9, 10-24, 25-49, 50-64, ≥65), labour (unemployed/employed), body mass index (BMI) (overweight/normal), socioeconomic level (low/high), education (secondary school or lower/higher education), health insurance (none/present), physical activity (no/yes) and renovation of the dwelling (no/yes); we explored housing-related factors (housing conditions, immediate environment, psychosocial benefit score of home, lighting, adaptations for the specific needs, dwelling easily accessible for handicapped people with wheelchair, walking aids like canes or any other physical constraints).

Results

Of the participants, 60.4% were female, 89.0% had health insurance, and 56.1% were married. A hundred and three were pre-school children, and 51 were still at primary school. Of the 425 teenagers and adults, 32.0% were primary school graduates, 29.6% high-school graduates, and 5.6% were illiterate. In the study, there were persons with disabilities in 11 dwellings (2.1%). Of the dwellings, 32% had adaptations for the specific needs like lift, broader doors, no doorsteps, specific installations, walk-in shower, and toilets with seats. These regulations were not made specifically for those persons. In the study, 38.5% of the participants stated that their sleep was disturbed by noise. Of the dwellings, 89% had sufficient daylight (data not shown).

Accidents occurred at 21 of 210 buildings (10%). Figure 1 shows the type of the accidents by age groups. Of the 25 accidents in the buildings, 16 were falls, three were burns, three were cuts or puncture wounds, two were collision or striking, and one was an elevator accident. Of these people, nine were children, nine were adults, and seven were elderly. Forty-three point eight percent of the falls were among elderly, 66.7% of burns were among children, and 66.7% of the cuts or punctures were among adults. Thirty-six percent of the injured were children, 36.0% were adults and 28% were elderly.

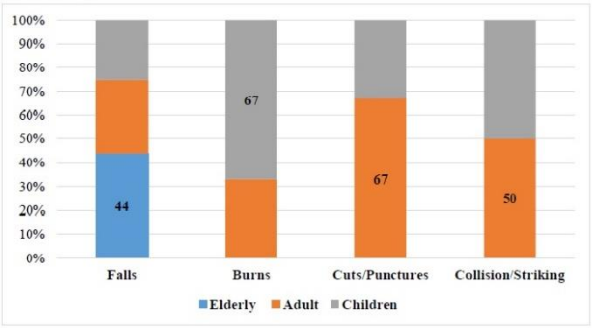

Figure 1. Type of accidents or injuries occurred in the building in the last 12 months by age groups

Table 1 shows the prevalence, type, and causes of the accidents residents reported in the dwellings, the items and the body parts involved. The home accident prevalence was 21.2% for the previous year. The most frequent injuries were falls (67.9%), cuts (35.7%), and collisions (27.7%). Most common injured body parts were arm or upper limb (67.9%), leg or lower limb (35.7%), surface areas (27.7%) and head (16.1%) respectively. The most frequently involved items in these accidents were construction materials (50.0%), kitchen equipment (47.3%), and knives and silverware (11.3%), respectively (Table 1).

Of the residents who reported at least one home accident in the previous year, 75.9% were female, and 24.1% were male. Females were more likely to report an accident (OR: 2.5, 95%CI: 1.5-3.9). Participants who reported insufficient work space in the kitchen were 1.9 times (95% CI: 1.0-3.5), and insufficient number of rooms were 1.7 times (95% CI: 1.1-2.6), participants who reported fatigue were 1.9 times (95% CI: 1.2-2.5) more likely to report an accident compared to the ones who did not (Table 2). Educational status, socio-economic level, renovation of the house was not related with the accidents (data not shown).

We evaluated the association between accidents and housing conditions by using the housing conditions composite index. We found that residents who reported inadequate housing conditions (58.3%) were 1.8 times (95% CI: 1.1-2.8) more likely to report home accidents (Table 3).

After adjusting gender, age, labour, BMI, socioeconomic level, education, health insurance, physical activity, and renovation of the dwelling; the likelihood of accidents in females was 1.9 times (95% CI: 1.1-3.3), in inadequate housing conditions was 1.9 times (95% CI: 1.1-3.3), and in houses with no adaptations for specific needs was 2.1 times more (95% CI: 1.1-4.2) (Table 4).

Table 1. Home accidents in the previous year

	n	%
Home accidents in the previous year (n=528)		
Yes	112	21.2
No	416	78.8
Type of injury (n=112*)		
Falls	61	54.5
Cuts	55	49.1
Collision	30	26.8
Burns	25	22.3
Choking	2	1.8
Electric accident	2	1.8
Gas intoxication	1	0.9
Injured body parts (n=112*)		
Arm/upper limb	76	67.9
Leg/lower limb	40	35.7
Surface area	31	27.7
Head	18	16.1
Lower trunk	7	6.3
Thorax/chest/upper back	4	3.6
Neck/throat	1	0.9
Items involved in the accident (n=112*)		
Construction features ((walls, floor, doors, windows, indoor stairs, lift)	56	50.0
Kitchen equipment	53	47.3
Knives and silverware	38	33.9
Furniture/furnishing (carpets, curtains, etc.)	24	21.4
Heating/cooling equipment	14	12.5
Washing/cleaning products, detergents, liquids etc.	5	4.5
Repairs materials	4	3.6
Toys	3	2.7
Electric equipment	2	1.8
Water/sanitary system	1	0.9
Gasses and fumes	1	0.9
Food items	1	0.9

*Participants could select more than one factor

Table 2. Accidents in dwellings by some housing characteristics

Characteristics (n=528)	Accidents in the dwelling				OR (95% CI)	p
	Yes (n=112)		No (n=416)			
	n	%	n	%		
Gender						
Female	85	75.9	234	56.3	**2.5 (1.5-3.9)**	**<0.001**
Male	27	24.1	182	43.8		
Age group						
≤5	8	7.1	28	6.7		0.247
6-64	100	89.3	354	85.1		
≥65	4	3.6	34	8.2		
Number of rooms						
Insufficient	56	50.0	155	37.3	**1.7 (1.1-2.6)**	**0.015**
Sufficient	56	50.0	261	62.7		
Enough workspace in kitchen						
No	16	14.3	34	8.2	**1.9 (1.0-3.5)**	**0.050**
Yes	96	85.7	382	91.8		
Satisfied with the size of the house						
No	57	50.9	164	39.4	**1.6 (1.1-2.4)**	**0.029**
Yes	55	49.1	252	60.6		
Sleep disturbed by noise						
Yes	49	43.8	154	37.0	1.3 (0.9-2.0)	0.194
No	63	56.3	262	63.0		
Residential natural lighting						
Insufficient	13	11.6	47	11.3	1.0 (0.5-2.0)	0.927
Sufficient	99	88.4	369	88.7		
Adaptations for specific needs						
No	96	85.7	274	65.9	**3.1 (1.8-5.5)**	**<0.001**
Yes	16	14.3	142	34.1		
Accessibility of the house for handicapped people						
No	78	69.6	186	44.7	**2.8 (1.8-4.3)**	**<0.001**
Yes	34	30.4	230	55.3		
Tiredness						
Yes	66	58.9	181	43.5	**1.9 (1.2-2.5)**	**0.004**
No	46	41.1	235	56.5		
Total	**112**	**21.2**	**416**	**78.8**		

Table 3. Odds of home accidents by housing conditions

Housing conditions	Accidents in the dwelling				OR (95% CI)	p
	Yes		No			
	n	%	n	%		
Inadequate	77	68.8	231	55.5	**1.8 (1.1-2.8)**	**0.012**
Adequate	35	31.3	185	44.5		
Total	**112**	**21.2**	**416**	**78.8**		

Table 4. Risk factors for home accidents

Risk factors	OR_{adj} (95% CI)	Wald test p
Female	**1.9 (1.1-3.3)**	**0,025**
Inadequate housing conditions	**1.9 (1.1-3.3)**	**0,028**
Low psychosocial benefit score of home	0.7 (0.4-1.1)	0,118
Bad immediate environment	1.6 (1.0-2.7)	0,099
Insufficient residential lighting	0.9 (0.4-2.2)	0,881
Insufficient space in kitchen	1.5 (0.7-3.1)	0,304
No adaptations for specific needs	**2.1 (1.1-4.2)**	**0,042**
Not easily accessible for handicapped people	1.7 (1.0-3.1)	0,056

Discussion

In recent years, housing conditions have been demonstrated to be one of the major environmental and social determinants of population health. World Health Organization/Europe tasked an international group to measure the health impacts of selected housing risk factors. The findings confirmed that housing is a significant public health issue and that policy-makers need to address it as a priority (WHO, 2011).

Home injuries are also a serious public health problem and rank fifth among the leading causes of death. Nearly 20 million home and leisure injuries requiring medical attention occur each year in the European Union. These injuries lead to hospital admissions and even deaths. Data from the WHO European Region showed that accidents account for the largest number of deaths among young people (WHO, 2007; WHO, 2011).

Human behaviour and dwelling design are the two causal factors that are relevant to home accidents. Residents' behaviour can contribute to home accidents by creating hazards like having loose carpets, leaving medicines and cleaning products easily accessible (WHO, 2007).

The other causal factor in home accidents is the quality of housing conditions. Many health problems are directly or indirectly related to the building itself, because of the construction materials that were used and the equipment installed, or the size or design of the dwellings (Bonnefoy, 2007). In our study, we found that nearly one out of five residents reported a home accident in one year. These accidents were more common among females, and the people who did not have enough kitchen space and who reported fatigue.

Results of LARES, a large cross-sectional study of housing and health in representative populations from eight European cities showed that accidents increase in houses that have crowded households and lack of kitchen workspace. The youngest, the oldest, female residents, and people with functional limitations experience relatively more accidents. Noise and less sleep was also related to more accidents (Bonnefoy et al., 2003; Ellaway et al., 2005; Bonnefoy, 2007; WHO, 2007).

Results of a community-based cross-sectional study of 796 households consisting of 4086 individuals residing in a semi-urban area conducted by Bhanderi and Choudhary showed that crowding was also an important factor for accidents. The incidence of domestic accidents was 1.7%, and the most common accident reported was falls. Occurrence of falls was found to be associated with age and overcrowding. Other accidents noted were burns, scalds, electrocution, injuries and accidental poisoning (Bhanderi and Choudhary, 2008). In our study, we also found that people who thought that they did not have enough rooms in the house and were not satisfied with the size of the house were more likely to suffer from accidents.

Braubach and Savelsberg looked at the households that lived in crowded conditions (less than one room per person), and found that the frequency of fall accidents in low-income households was much more and the rate of reporting a fall accident households was 16%. They concluded that inadequate housing conditions had a significant impact on the frequency of accidents and therefore housing conditions could be considered as one of the mechanisms through which social inequalities may translate into health inequalities (Braubach and Savelsberg, 2009).

Age is regularly identified as the major risk factor for the occurrence of home accidents (Bonnefoy, 2007; Braubach and Savelsberg, 2009; Braubach and Power, 2011). However, in our study, we did not find any significant associations between age and home accidents. These results might be due to the age characteristics of our study participants. We had few elderly people and few children under 5 years old. Bonnefoy et al. found that accidents were more frequent in females and in people under 5 years and over 80 years old when there was not enough kitchen space, poor lighting, few rooms (Bonnefoy et al., 2003; WHO, 2007; Bonnefoy, 2007).

Adequate daylight is one of the basic features of healthy homes (Krieger and Higgins, 2002; CDC and US HUD, 2008; Guler, 2008; DiGuiseppi et al., 2010]. It has been shown that the accident prevalence was higher in houses without enough sunlight (Guler, 2008; Brown and Jacobs, 2011). Brown and Jacobs found that people reporting inadequate natural light in their dwellings were 1.5 times (95% CI: 1.2-1.9) as likely to report a fall compared with those satisfied with their dwelling's light. After adjustment for major confounders, the likelihood of a fall increased to 2.5 (95% CI: 1.5-4.2) (Brown and Jacobs, 2011).

In our study, the lighting characteristics of the dwelling were evaluated by asking if the residents needed to turn on the lights when entering the house in daylight. The daytime lighting was accepted as the evaluation criteria. Most of the residents reported that there was enough daylight entering the house and it was not necessary to turn on the lights during

the day. We evaluated the features related to the lighting in the house only with the criterion of sunlight entry. The use of quantitative methods in determining lighting properties in homes will make it possible to evaluate this relationship more accurately.

Scientific evidence shows that the most frequent types of home accidents are falls and other ones are mechanical contact and collisions and cuts from materials such as glass. Falls account for 45% of all injuries in the home that require medical attention. Among persons 65 years and older, 60% of falls resulting in emergency department visits occurred at home (Bonnefoy, 2007; WHO, 2007a, 2007b; DiGuiseppiet al., 2010). Our results also showed that falls were the most common types of injuries and the most common causes of injury were building materials, kitchen utensils, knives and furniture, flooring materials. In LARES study, of the 13 housing factors listed as related to a fall, most were related to structural factors (48.6%) such as stairs or cracks in flooring, knives/silverware (22.5%), and furniture/furnishings (18.8%) (DiGuiseppi et al., 2010). Besides these structural factors, tiredness was also found to be a risk factor in home accidents. Bonnefoy explained this association by badly designed staircases, slippery floor materials and unfixed carpets, electrical installations, poor lighting, crowding and too little workspace, and noise exposure leading to tiredness and decreased attention (Bonnefoy, 2007). In our study, before adjustment for other housing related factors, we found that participants who reported fatigue were twice more likely to have an accident.

There are many features of dwellings that increase the risk and the severity of injuries. The injury outcomes may vary from minor cuts or bruises and broken bones to paralysis, long-term physical constraints and even death. They can also include burns and drowning or near drowning (WHO, 2011).

The overall evaluation of housing factors may be a better indicator as injuries occur as a result of complex interactions between individuals and the environment and can always be considered multi-factorial in nature. Unfortunately, it is difficult to quantify the individual effect of each of the housing conditions and to calculate the total effect for accident occurrence. In our study, we tried to evaluate housing conditions as a whole by scoring each factor and calculated a total score. However, it is difficult to reveal environmental health associations because environmental impact is multi-factorial and non-specificity of the effect, individual vulnerability, and late appearance of the environmental effects make it more difficult. Some indexes we created may not include some of the determinants and features that would affect these associations. We may not have been able to assess all the relevant factors that could affect this relationship. The health effects of each factor used in the composite index to evaluate the overall housing conditions may not be equal. For this reason, in further analyses, the factors that might be confounders like age, gender, education etc. were controlled and the possible risk factors for accidents were evaluated separately, as well.

Our results showed that residents in dwellings with no adaptations for specific needs was twice likely to report accidents. Howden-Chapman et al. summarized the results of the available research evidence in their systematic review. In order to establish clear guidance on maximising the health gains associated with accessible housing, MacLachlan et al. reviewed the scientific research and looked at whether residents with functional or cognitive impairments living in accessible home environments have better health and social outcomes than residents with functional or cognitive impairments living in conventional or unmodified home environments. They came to the decision that there was sufficient evidence to make a guideline recommendation concerning accessible housing. Home environments that lack accessibility modifications appropriate to the needs of their users were likely to result in people with physical impairments becoming disabled at home (Cho et al., 2016; Howden-Chapman et al., 2017).

Evci et al. conducted a study on 3277 people over 60 years of age living in Aydin province of Turkey. This cross-sectional study results showed that poor housing conditions, being female, living alone, having a chronic illness, physical and hearing disability, wearing eyeglasses, inactivity, use of assistive devices and more than four drugs were associated with having a home accident in the elderly (Evci et al., 2006). In our study, as we had few elderly participants we could not evaluate the risk factors for accidents in the elderly separately. However, our results on the most frequent type and cause of the accidents were similar with the elderly. Sahin and Erkal conducted a study in Kırıkkale Province and 175 elderly participated. They found that more than half of the elderly (59.4%) sustained home accidents in the previous year, and elderly who sustained fall accidents (70.2%) and those who

sustained accidents in the kitchen (31.7%) ranked in first place (Sahin and Erkal, 2016).

The characteristics of the houses located in the area where we conducted the survey were similar. Housing and health research should be conducted with a representative sample of Ankara, and then in other provinces. This could help to fulfil the gap in scientific evidence on housing health in our country and it will make it possible to make national and international comparisons.

Lyons et al in their systematic review in 2006, concluded that there was insufficient evidence to conclude that modifying the physical environment in the home will definitely reduce the injuries (with the exception of the provision and promotion of smoke alarm ownership, which was excluded from the review) as injuries occur as a result of complex interactions between individuals and the environment and can always be considered multi-factorial in nature. They stated that the quality and size of the studies were not sufficiently good or large to reach definitive conclusions (Lyons et al., 2006). DiGuiseppi et al, in their scientific review in 2010, aimed to inform decisions about which policies were likely to result in the best and most efficient use of resources to address structural deficiencies and to illuminate where further research was needed to allow informed policy decisions to be made. They concluded that interventions like installed, working smoke alarms; 4-sided isolation pool fencing; and hot water heaters that are preset by the manufacturer at a safe temperature were likely to significantly reduce residential morbidity and mortality if effectively implemented. They thought that addressing structural deficiencies to reduce unintentional injuries that occur in unsafe homes was likely to require concerted efforts from a broad range of agencies, organizations, and industries (DiGuiseppi et al., 2010).

Conclusion

In our study, we recommended that factors that can cause accidents in residential buildings be taken into consideration during the construction phase, which will enable everyone to benefit from these arrangements in the house. Permission to build houses is the responsibility of the municipalities. In the municipalities, it is necessary to employ trained personnel to make this task more conscious and in accordance with the health conditions. The formation of healthy housing and residential surroundings is possible through cooperation of the municipality, the construction sector and the health personnel. In the past years, in our country, although the licenses for housing have been supervised by physicians, this practice has been abolished. Re-enactment of this practice may contribute to healthy housing conditions. Healthy housing is possible through cooperation of the municipality, the construction sector and the health personnel. Increased awareness will also contribute to the establishment and implementation of adequate housing conditions.

It will be appropriate to use some environmental health indicators in future studies in order to standardize the studies that investigate housing health relationships, and to make comparisons between regions and over time.7

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