
**International Journal of Environmental Health Research**
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713425582

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Online publication date: 12 May 2010

**To cite this Article** Al-Khatib, Issam A. , Ju'ba, Ahmad , Kamal, Nadine , Hamed, Nihad , Hmeidan, Nuha and Massad, Salwa(2003) 'Impact of housing conditions on the health of the people at al-Ama'ri refugee camp in the West Bank of Palestine', International Journal of Environmental Health Research, 13: 4, 315 — 326
**To link to this Article: DOI:** 10.1080/0960312031000161609 2
**URL:** http://dx.doi.org/10.1080/09603120310001616092

*International Journal of Environmental Health Research* **13(4)**, 315 – 326 (December 2003)

Taylor & Francis healthsciences

# Impact of housing conditions on the health of the people at al-Ama'ri refugee camp in the West Bank of Palestine

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Al-Ama'ri camp is situated to the south of Ramallah city in the West Bank of Palestine. It is densely populated, with a total population of 4,046, divided into 760 households, on a surface area of 93 dunums (93,000 $m^2$). In this research, the relationship between the housing conditions at Ama'ri camp and the prevalence and incidence rates of upper respiratory tract diseases has been studied. The diseases and symptoms most encountered in winter, and those include: common cold, cough, pharyngitis, influenza, ear infection, asthma and bronchitis have been studied. It was found that these are diseases directly related to poor housing conditions. Cold housing, presence of dampness and moulds, dust and smoke, burning of biomass fuel, crowding, poor ventilation and inadequate lighting problems are commonly found in the houses of this refugee camp.

*Keywords*: Housing; health; refugee camps; developing countries; Palestine.

## Introduction

When attempting to study the history of Palestine and the Palestinian people, the question of refugees is a major issue. After the disaster (An-Nakba) of 1948, hundreds of thousands of Palestinians were forced out of their homes to be displaced into refugee camps scattered in the cities of the West Bank and Gaza Strip of Palestine, in Jordan, Lebanon, Egypt and Syria. Fifty-three years later, Palestinian refugees are still in a vicious struggle for their right to return to their homes, in Haifa, Jaffa, Akko, Lud and tens of other cities, towns and villages confiscated in 1948.

Displaced into tents at first, those families are now settled down in the camps, where they have constructed houses and expanded into large families. This evolution, however, took place under the limitations of the same piece of land that was offered to the refugees at that time. Housing in refugee camps is thus now characterized by high population density, lack of adequate set back line in all directions, small size homes, inadequate ventilation and sunlight into the house. This situation is assumed to be coupled with poverty, unemployment or unskilled labour work of the people living in the camp.

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ISSN 0960-3123 printed/ISSN 1369-1619 online/03/040315-12 © 2003 Taylor & Francis Ltd
*DOI: 10.1080/09603120310001616092*

Abu Sitta (1999) mentions that there are 4.8 million Palestinian refugees, of whom 3.6 are registered with the United Nations Relief and Works Agency (UNRWA). About one-third live in the West Bank and Gaza, slightly more than one-third live in Jordan, and 17% in Syria and Lebanon. In total, over 1.1 million Palestinian refugees live in 59 camps in the West Bank, Gaza Strip, Jordan, Lebanon and Syria. Thus, 85% of refugees reside in and around historic Palestine, while 1% are spread equally between other Arab countries and the West.

Marshy (1999) describes the physical condition of the camp as follows: all Palestinian refugee camps started with tents. In the mid-50s, the UNRWA began to encourage refugees to build their own shelters in the camps to replace the tents. Bricks and asbestos were provided for camp residents to build units of uniform specified dimension: as following based on the family size.

- 'A units' measuring 3 × 3 metres housed families with 1 – 5 members;
- 'B units' measuring 4 × 3.75 metres housed families with 6 – 9 members;
- 'C units' measuring 4 × 4.45 metres housed families with 9 – 11 members;
- 'AA units' were 6 × 3 metres, comprising two rooms connected with an inside corridor, and housed 11 – 12 member families; finally,
- 'BB units' measured 8 × 4 metres, which housed families of more than 12 members in two rooms.

By the end of the 1950s and in the early 1960s, refugees began constructing additional rooms next to their units, as well as indoor toilets. The old units were substituted by block rooms, with a small courtyard to grow a vine or lemon tree or vegetables. Some refugees gave up some of their plot and converted it into shops which lined the main streets. As families grew, still more space was needed and the ground floor was expanded, eliminating the courtyard.

By the beginning of the 1980s, the housing units had become stabilized in terms of space but the population continued to increase, precipitating a housing crisis. Refugees at this time began to rehabilitate their shelters and construct new, more spacious ones with cement and iron bars (though some poorer refugees still live in the dwellings built in the mid-1950s). UNRWA provided building permits but did not supervise the construction itself. In the camps situated adjacent to towns, construction of homes was not able to spill over the boundaries of the refugee camps; hence, these camps' residents were the first to add a second storey onto their shelters. UNRWA approves the two-storey constructions but will not authorize construction of third and fourth storeys.

The absence of laws during the Intifada (the first Palestinian uprising in 1987 – 1993) encouraged the process of encroachment on public yards and by-roads. Public squares disappeared, the main asphalt public roads became very constricted, and the smaller roads became extremely narrow. Gardens and trees, planted in initial attempts to mimic the environment of refugees' original homes, were replaced by room additions or extensions.

Zeidan (1999) emphasizes what Marshy mentioned by saying camps become a model of poor environmental conditions and lack of open spaces or green and planted areas. Farah (2000) indicated that approximately 40% of households have a density of three persons or more per room. Also she mentioned that in most shelters, one room is utilized more than others, and in some shelters there might be four or six people in the same room. She also

indicated that poverty hinders most families from improving, relocating or expanding their habitats.

According to the UNRWA surveys, respiratory infections are still considered the third leading cause of death in infants (0–1 years) and children (1–5 years), with mortality rates equal to 19% and 12.9% respectively (UNRWA 1998).

In a survey conducted in the Kingdom of Saudi Arabia in 1995, physicians estimated that acute respiratory infections were the cause of morbidity in 50% of ill children below 5 years (Khoja *et al*. 1999).

Several studies in the available literature have pointed to the relationship between house dampness, moulds, and respiratory health status in children, as follows:

In a European study examining the association between home dampness, peak flow variability and frequency of respiratory symptoms during the winter of 1993–1994; it was shown that the prevalence of cough and upper respiratory symptoms was significantly higher in children living in houses with reported moulds, than in dry homes. Also there was a positive correlation between the peak flow variability of respiratory symptoms and the existence of moulds. Reported moisture stains and moulds were used as indicators for home dampness (Andriessen *et al*. 1998).

An empirical study was conducted to identify the association between measures of house dampness, levels of airborne fungal spores, housing factors and the health outcomes in children. This study was conducted in Australia on 80 households with 148 children aged 7–14 years for the period between March 1994 and February 1995. Samples for airborne fungal spores were collected six times from bedrooms, living rooms, kitchens, and outdoors. The findings indicated that indoor exposure to certain fungal kinds in winter was a risk factor for asthma, allergy, and respiratory symptoms (Garrett *et al*. 1998).

Another suggested risk factor is environmental tobacco smoke (ETS). In several studies, researchers have demonstrated an association between exposure to ETS in the home and the incidence of pneumonia, bronchitis, cough, and otitis (Shephard 1992; Kitchens 1995; and Stenstorm *et al*. 1993).

Many authors have studied the effects of the indoor air quality (environmental tobacco smoke, home heating, indoor fungi, incense burning, mosquito repellant burning and damp or mouldy houses) on the respiratory symptoms (cough, wheezing, pneumonia, bronchitis and asthma) among schoolchildren. Similar results showed that there is a strong positive relation between dampness, indoor pollution and the respiratory health symptoms which became a new public health issue (Samet *et al*. 1987; Xu 1991; Jedrychowski and Flake 1998; Yang *et al*. 1997a,b; Dales *et al*. 1997; Williamson *et al*. 1997; Wan and Li 1999; and Legal Services Agency (LSA) 2001).

Respiratory health is determined by several other factors, such as genetic make up (Higgins and Keller 1975), respiratory infections during childhood (Samet *et al*. 1983), and active and passive tobacco smoke exposure (Niewoehner *et al*. 1974 and Beck *et al*. 1981).

To reveal the importance of this issue, it is worth noting that western countries addressed the problems of damp, mould and cold in houses as an aspect of care in their rules, regulations and laws. For example, in the case of Scotland, where for centuries 'common law' obliged landlords to put and keep rented housing in a 'tenantable and habitable condition', and more that 'the house must be capable of being lived in with reasonable comfort'. Otherwise, the landlord would be obliged by the court to do the repairs and pay compensation (LSA 2001).

Many researchers have confirmed the relation between housing conditions and health (Benenson 1981; Simmonds *et al.* 1983; Giacaman 1985; Bierman-Lytle 1995; Mara and Alabaster 1995; Khader 1996). Direct factors include site of residential area, building materials, natural lighting and ventilation, crowding, availability and access to water and sanitation. Indirect factors include proximity to health care, access to education, transportation and place of employment, and the tenure.

Crowding is still one of the major risks to both physical and mental health. Overcrowding as a public health problem is manifested by two aspects. First, the crowding within the household, which is estimated according to the general registry to be more than two people in each habitable room, i.e. bedrooms and living rooms. The second aspect, overcrowding between the households, is reflected by the densely populated area. The housing patterns in the refugee camps in Palestine consist of wall to wall housing with narrow paths and streets in between (The Community Health Unit 1987; Heiberg and Ovensen 1994; Filfil 1999)

The number of years at a day-care centre was associated with an increased risk for cold and bronchitis, and this is supported by previous studies. This is a well-known phenomenon that results in all likelihood from the increased number of contacts with other persons. No one can exclude the fact that children with moulds at home are at greater risk in day-care centres than children without moulds at home (Fleming *et al.* 1987 and Marbury *et al.* 1997)

The aims of this study were to evaluate the impact of housing conditions on the health of the people at al-Ama'ri Camp in Ramallah district, and to investigate the incidence and prevalence rates of upper respiratory tract diseases and symptoms that are known to be related to poor housing conditions. Those include common colds, bronchitis, cough, pharyngitis, asthma, ear infections, and influenza. This survey will consider the first type of overcrowding, i.e. overcrowding within the households.

## Methodology and limitation

The population includes all the households in al-Ama'ri refugee camp. Therefore, the unit of study is the household as a whole, regardless of how many people live in it. A cross sectional survey using a preset questionnaire was done: structured interviews, visiting a randomly selected sample of 188 households ($n = 188$) out of 760 households in the camp ($N = 760$). Total number of respondents was 1324 of the total 4046 family members living in the camp (Palestinian Central Bureau of Statistics (PCBS) 1999). Households were selected according to simple random sampling in one step; not on the individual level, but by randomly choosing 188 households with all members included in these households.

The analysis was performed using SPSS, Anova and both simple and multiple regression methods.

The tested variables in the questionnaire were mainly age, work of the head of the household, monthly income of the household, ownership of the residence, number of rooms in the house, maximum number of children sleeping in one room and in one bed, material and cover of the floor, exposure of the home to the sun, existence of dampness, leaking or mould at home, existence of windows, sanitation system, smokers at home, source of energy, prevalence of acute respiratory infections and asthma between the household members and the reason for that.

The main measures of housing quality that have been measured in this study were the number of rooms in the house, construction material which is an indicator of structure stability, provision of natural lighting through windows and setback line for ventilation and heating,

source of water used in the house and source of energy for water heating, toilet facilities and their locations within the house, and drainage system for wastewater.

Some limitations in this study pertain to the fact that it considered cases that patients themselves will be able to recall; thus the results will possibly be subject to a recall bias. To minimize this bias, cases counted in were those experienced during no longer than 2 weeks away from the day of the visit. This study, although not necessarily reflective of the general housing conditions in Palestine, is representative of the very special characteristics of Palestinian refugee camps.

## Results

### *Characteristics of the surveyed population*

Family size ranges from 1–20 members, and the average family size found in the course of this survey was seven. The age and distribution of the population is shown in Table 1.

The relatively youthful age structure of the sample population (44.7% aged 14 years or younger) is higher than that found in the total population in West Bank.

Regarding the work of the male head of the household, 11.7% had no job, 22.9% work as employee, 43.6% are unskilled labourers and 12.8% are businessmen. Out of the mothers interviewed 92% are housewives, 3.7% are employees, 1.1% are labourers and 1.1% are businesswomen.

### *Housing characteristics*

Results indicated that the majority of residential units are on the first floor (71.8%), 21.2% live in second and third floors, and 7% live in basements. It was found that approximately 95% of all families believe that they own their homes (in reality, the land on which the refugee camp has been built is owned by somebody else and not by the refugees). The residential units in al-Amari camp are generally small, 66% of the interviewed families have three rooms or less. While 86.2% of the households have their sanitary facilities inside their homes, 8.5% have it outside, and 5.3% have them both inside and outside.

Al-Ama'ri camp has quite a high housing density rate. This is due to the high birth rate, the limited number of houses available, the low-income levels of many families, and shortage of land.

Worldwide, the accepted standards for human crowdedness rates consider one person/ room as low density, 3–5 persons/room as high density and 5 + persons/room as overcrowded (Lowry 1991). Out of the households surveyed, 80.9% had three or more persons/room as shown in Table 2.

**Table 1.** Age distribution of the sample

| *Age in years* | *Frequency* | *%* | *Cumulative %* |
|---|---|---|---|
| < 1 | 42 | 3.1 | 3.1 |
| 1–5 | 180 | 13.6 | 16.7 |
| 6–14 | 371 | 28 | 44.7 |
| > or = 15 | 733 | 55.3 | 100.0 |

**Table 2.** Room density rates (%)

| *Room density* | *Frequency* | *Percentage* | *Cumulative %* |
|---|---|---|---|
| Low density | 36 | 19.1 | 19.1 |
| High density | 128 | 68.1 | 87.2 |
| Overcrowded | 24 | 12.8 | 100.0 |
| Total | 188 | 100.0 | 100.0 |

**Table 3.** Type of floors in house

| *Type of floor* | *Frequency* | *Percentage* |
|---|---|---|
| Tiles | 159 | 84.6 |
| Concrete layer | 15 | 8 |
| Tiles and concrete | 14 | 7.4 |
| Total | 188 | 100 |



The study showed that 84% of the households had constructed their floors of marble, as shown in Table 3.

It was found that in 17.6% of the houses, the floor was uncovered, 47.3% was covered with carpet, 10.6% with fitted carpeting (moquette), 17% with straw mat '*haseer'* and 7.4% with carpet and '*haseer'*.

Out of the homes in the survey 98.4% are connected to the sewage system. All homes are connected to a piped water supply. In 89.4% of the homes, the set back line in all directions was equal or less than 3 metres. Most buildings are made of block slap as shown in Fig. 1.

In order to gain better insight to the environment of the houses, certain indicators relating to the habitability of the houses were measured. Only 57.4% of the homes were altogether exposed to sun, and 77.2% have windows in all rooms. A total of 78.2% have dampness, leaking or mould at home. Only 9% have birds at home while only 1.1% have pets.

The monthly income of the surveyed households ranged from 10 – 3,600 US$. A total of 35.1% have income less than 240 US$, and 79.8% have income less than 480 US$. According to PCBS (1999), about 52% of Palestinians in West Bank and Gaza are below the poverty line.

*Prevalence of acute respiratory infections and asthma*

In stratifying acute respiratory infections and asthma by age-specific groups, it was found that the highest proportion was among children as shown in Table 4.

The table shows the frequency and the prevalence among the age groups, respectively.

It indicates the frequency of these diseases and symptoms during the previous two weeks.

As shown above, cold is the most prevalent disease among the different age groups. More than half of the children below 5 years of age suffered from cold and cough. Asthma was also most prevalent among the age group of 1 – 5 years. Ear infection was most prevalent among the age group of $< 1$ year.

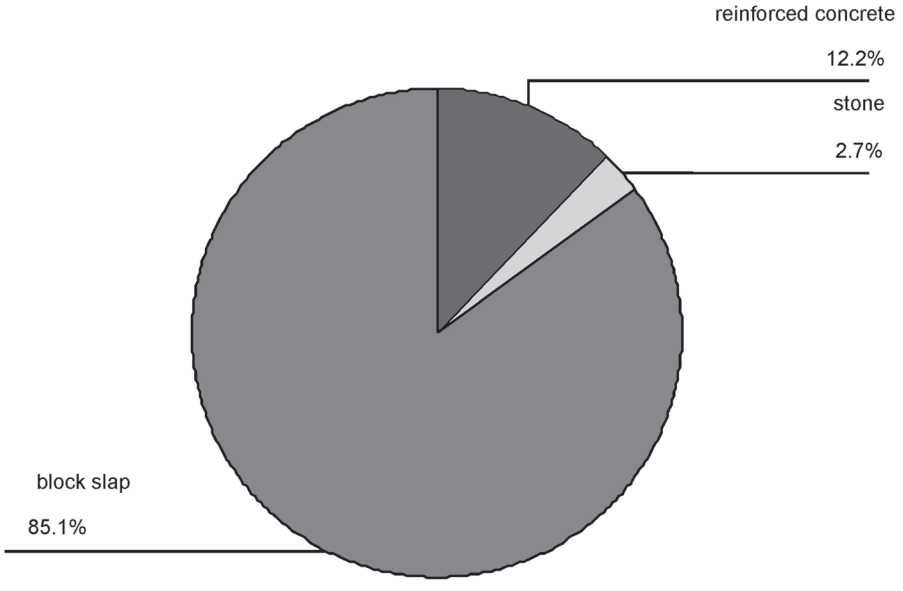


**Fig. 1.** Percentage distribution of building materials.

**Table 4.** Prevalence of acute respiratory infections, symptoms and asthma among the different age groups

| *Disease/Symptom* | < 1 year | *1–5* | *6–14* | *> 15* | *Total* | *Prevalence %* |
|---|---|---|---|---|---|---|
| Asthma | 0 (0%) | 14 (8%) | 5 (1%) | 19 (3%) | 38 | 2.9 |
| Bronchitis | 4 (10%) | 10 (6%) | 4 (1%) | 20 (3%) | 38 | 2.9 |
| Cold | 29 (69%) | 123 (68%) | 153 (41%) | 263 (36%) | 568 | 42.9 |
| Cough | 23 (55%) | 95 (53%) | 92 (25%) | 152 (21%) | 362 | 27.3 |
| Ear infection | 6 (14%) | 17 (4%) | 15 (4%) | 31 (4%) | 69 | 5.2 |
| Influenza | 15 (36%) | 78 (43%) | 76 (20%) | 169 (23%) | 338 | 25.5 |
| Pharyngitis | 16 (38%) | 92 (51%) | 90 (24%) | 121 (17%) | 319 | 24.1 |

As an indicator of the lay knowledge of respondents, they were asked about the reasons behind the infection (Table 5). While 53.7% think that the occurrence of respiratory diseases is associated with weather change, 17.7% think that it can be attributed to poor housing conditions.

*Smoking*

Smoking is a well-known risk factor for a number of communicable and non-communicable diseases, among which are respiratory infections and asthma.

Smoking comprised 26.6% of the sample population (excluding those below 15 years of age) as shown in Fig. 2.

**Table 5.** The reason behind the infection according to the answers of respondents

| *Infection reason* | *Frequency* | *Percent* |
|---|---|---|
| Do not know | 19 | 10.1 |
| Weather changes | 61 | 32.4 |
| Weather cough | 26 | 13.8 |
| Infection from others | 15 | 8.0 |
| Dampness and mould | 21 | 11.2 |
| Overcrowding | 8 | 4.3 |
| Go from warm place to cold one | 4 | 7.4 |
| Cold | 4 | 2.1 |
| Unhealthy house | 2 | 1.1 |
| Smoking | 2 | 1.1 |
| Others | 7 | 3.7 |
| Not applicable | 9 | 4.8 |
| Total | 188 | 100 |



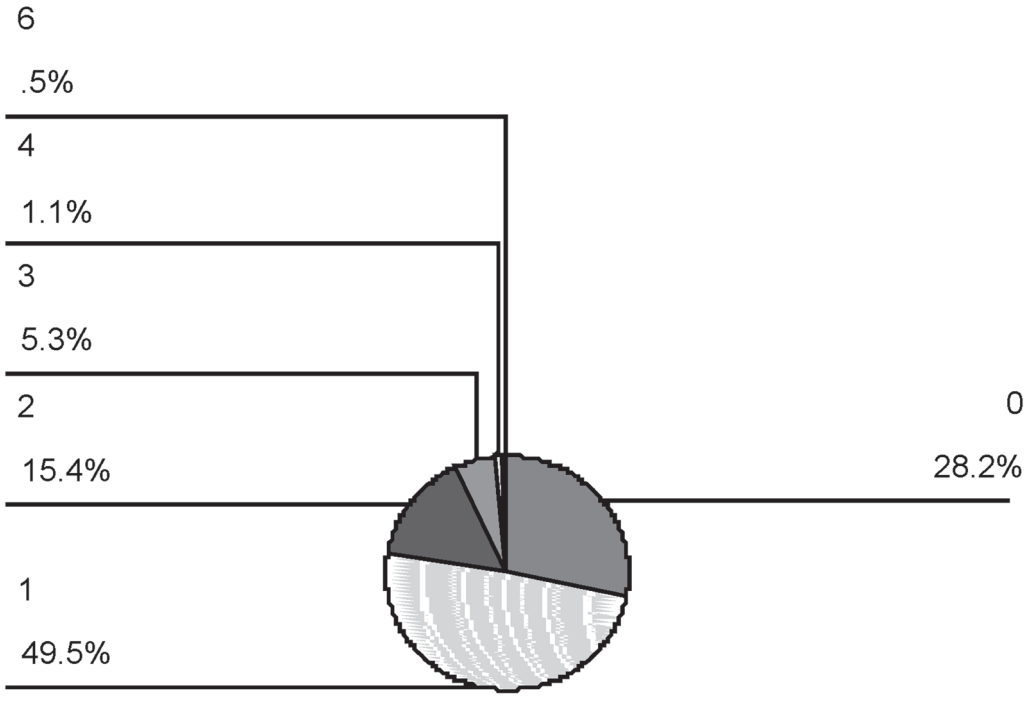


**Fig. 2.** Number of smokers per home in the households surveyed.

*Predictors of respiratory infections*

*Cold* Using simple linear regression, the following factors were identified as probable risk factors of cold:

| *Predictor* | *Significance* |
|---|---|
| Number of members living at home | 0.000 |
| Number of rooms | 0.001 |
| Persons per room | 0.015 |
| Maximum number of children sleeping in one room | 0.000 |
| Maximum number of children sleeping in one bed | 0.022 |
| Number of smokers at home | 0.000 |

To improve the predicting ability, multiple regression was used. The only predictors of cold that were found to be significant were number of smokers at home (0.001 sig.) and presence of dampness, leaking or cold (0.003 sig.).

*Ear infection*

| *Predictor* | *Significance* |
|---|---|
| Number of members living at home | 0.01 |
| Persons per room | 0.016 |
| Maximum children sleeping in one bed | 0.042 |
| Dampness | 0.022 |

*Bronchitis*

| *Predictor* | *Significance* |
|---|---|
| Dampness | 0.045 |
| Number of smokers at home | 0.018 |

*Pharyngitis*

| *Predictor* | *Significance* |
|---|---|
| Maximum children sleeping in one bed | 0.040 |
| Dampness | 0.019 |
| Persons per room | 0.024 |

*Cough*

| *Predictor* | *Significance* |
|---|---|
| Dampness | 0.002 |
| Number of members living at home | 0.001 |
| Maximum children sleeping in one bed | 0.013 |
| Persons per room | 0.022 |
| Number of smokers at home | 0.044 |

*Influenza*

| *Predictor* | *Significance* |
|---|---|
| Number of smokers at home | 0.009 |
| Number of members living at home | 0.036 |

| | |
|---|---|
| Persons per room | 0.037 |
| Maximum children sleeping in one bed | 0.056 |

*Asthma*

| *Predictor* | *Significance* |
|---|---|
| Setback in all directions | 0.03 |

## Discussion

While most of the residential houses examined were owned by the people living in them, the sizes of the houses were generally classified as small, and room density rate was recorded as high in 68.1% of the houses.

In the meantime, the majority of the houses are constructed of block slaps, with the floor made of marble; around half of the visited households had their floor covered with some sort of carpets.

These descriptive elements reflect the fact that the major problem here is not merely a financial or economic one, but rather, is due to the lack of adequate land for construction; and thus people are hardly, and only capable of vertical expansion. People are forced to live in crowded houses, especially with the significantly high birth rate occurring at the camp.

The impact of the lack of land was clearly observed as well, when looking at measures of exposure to sunlight, dampness, leakage and the presence of moulds at the house.

Around half of the households visited, said that their houses are not exposed to sunlight and over 78% reported dampness, leakage or mould in their houses. This is also emphasized, by the fact that almost 90% of the houses had a set back line in all directions not exceeding 3 metres; thus preventing sun light and adequate ventilation, although 77% of the houses had windows in all rooms and most were first floor flats.

The disease having the highest prevalence rate (PR) was found to be the common cold, with a PR of 42.9%, mostly children. More than half of the children aged 1 to 5 years old reported having cold and/or cough during the last 2 weeks.

With regard to people's perceptions of the reasons for catching a respiratory disease, more than half of the respondents explained that it may be due to weather related factors and changes in temperature, whereas a much smaller proportion (around 25%) indicated that the unhealthy housing conditions, smoking and/or transmission of infection from others are a possible cause for the disease.

This highlights the necessity of organizing efforts towards increasing awareness for the importance of healthy housing in the prevention of disease. There is also a need to attempt to change perceptions on smoking and to stress the point of its association with respiratory diseases. Only 1.1% of the respondents stated that smoking is a possible cause of respiratory diseases.

Only 8% of the sample mentioned that infection from others is a factor in catching the disease, and therefore educating people on the routes of transmission is crucial; especially when the houses' density rates are as high and ventilation is as low as in this sample.

When correlating the prevalent diseases with the factors predicted to be associated with its causation, crowdedness in one room and number of persons sleeping in one bed were the major factors significantly associated with all diseases. This stresses the fact that one-to-one transmission is the main direct cause for respiratory infections.

In addition, dampness and number of smokers were strongly correlated with most diseases and symptoms, especially with regard to bronchitis and cough. For asthma, the only significant predictor was the small set back distance between the buildings. This may be explained by the absence of adequate ventilation and sunlight into the house, and thus allowing for irritants to accumulate and for pollutants to flourish. However, with the small number of reported patients suffering from asthma, it has been properly difficult to detect other associations. No significant association was seen with availability of pets, birds, type of carpeting used, type of fuel used for heating and warming water or building material used.

## Conclusion

In this research the poor housing conditions that the Palestinian refugees are living in was clearly noticed. Al-Ama'ri refugee camp is only one of many, spread throughout Palestine and in other countries of the Near East. Houses are overcrowded, camps are over-burdened with close buildings, and there is not a single space for ameliorating the situation. This was clearly associated with high rates of disease transmission especially among children, and residents appeared to ignore the true risk factors for the examined diseases. Raising awareness for preventing respiratory diseases even in the worst housing conditions is essential. It may even be considered as the only affordable way to improve measures of disease morbidity in this situation.



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