

INVESTIGATION OF PHYSICAL COMFORT CONDITIONS AND USERS' SATISFACTION IN COTTAGE HOSPITALS: THE CASE OF NILUFER / BURSA, TURKEY

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Abstract: Health structures are institutions; which is designed to contribute to the health of a society and included necessary diagnosis and treatment units in this regard. Family health centers as known as cottage hospitals are established in the first step of these organizations in Turkey. Today, public family health center buildings provide the climatic, audial and visual comfort in some standarts. However, users are not satisfied from provided conditions and they always voice some problems. In this study is aimed assessment of indoor comfort conditions with the opinion of users regarding dimensional use, indoor temperature, thermal comfort, indoor air quality, audial comfort, natural ventilation and natural lighting condition. to determine user satisfaction during using buildings is a commonly used method in terms more efficient use of current buildings and to direct to future desings.

Research methods of this study; literature review of the subject which is analysed and reviewing on the information fields related to indoor space requirements, preparing a questionnaire for the user experience's feedback in designed area, evaluating the survey stage in order to understand the degree of satisfaction of space performance requirements was defined. Nilüfer is selected area for survey, is the province of Bursa which is the Turkey's 4th largest city. Selecting the most heavily used in 10 of a total of 26 family health centers in Nilufer district, 100 people of each center's as total 1,000 people were interviewed. 14 questions were asked to users. The data obtained from the questions which is related demographics features, dimensional use, indoor temperature, thermal comfort, indoor air quality, natural ventilation and natural lighting condition, audial comfort is evaluated by the chart. The obtained data under this study will open new horizons to design the new health centers and would help the designers and authorities about current arrangements is being considered.

Keywords: health building, cottage hospitals, comfort conditions, indoor air quality, natural lighting, thermal comfort, audial comfort

Introduction

Health establishments are structures, which are designed to contribute to the health of communities and contain diagnosis and treatment units. Because of their functions they are visited by many people every day. Because the users of health establishments are mostly people with health problems it becomes more important for the structures to ensure that they do not have a negative impact on the physical and mental health of the patients and at the same time provide physical comfort. Comfort in this case means ease that is made possible in a person's lifestyle with science and technology (Sirel, 1994).

The buildings where people live need to provide optimum comfort conditions to ensure that people live healthy and be productive. The factors which create these comfort conditions are examined by carrying our physical environment control research. When international studies related to physical environment controls that involve health establishments it was seen that some of them examine thermal comfort conditions (Hwang et.al, 2007; Balaras et al. 2007; Czarniecki et al. 1991; Skoog et al. 2005), some of them examine both thermal comfort conditions and also energy preservation and consumption (Santamouris et al. 1994). There are also many studies related to another aspect of physical environment control research, which is internal air quality and ventilation (Argiriou et al. 1994; Mendez et al. 2008; San Jose-Alonso et al. 1999; Wang et al. 2006; Cheong et al. 2006; Qian et al. 2008; Rui et al. 2008). Also there are studies on technical services such as power supply, heating, air conditioning installation in the literature (Sodha et al. 1985; Renedo et al. 2006; Schijndel, 2002; Smith and Rae, 1977). Also it can be seen in the literature that the importance of daylight and natural lighting are also some of the aspects studied in relation to optimum comfort conditions in health establishments (Ne'eman et al. 1976). Also

there are also studies that show the negative effect on patients of some factors that harms comfort conditions in health establishments such as crowd, noise, lack of privacy, improper lighting levels, color and fabric of materials (Winkel, 1986).

The smallest unit that provides health services in Turkey is family health centers, which are also known as cottage hospitals. Cottage hospitals defines risks and problems about health, makes and implements or enforces plans to resolve these problems; organizes primary healthcare services to protect, cure and rehabilitate people and that monitors, evaluates and supports these services to ensure they are effectively delivered, and provides coordination between health institutions and other institutions in its region with the aim of improving and protecting the health of the people. Cottage hospitals are located in residential areas or at places where people can easily reach them. These cottage hospitals provide preventative health services, primary diagnosis, treatment and rehabilitation services. Family health centers are classified as Type D for a population of 20.000; Type C for a population between 20.001 – 50.000; Type CB for a population between 50.001 – 100.000; and Type A for a population between 100.001 and more (Ministry of Health, 2014).

Cottage hospitals in our country are generally the first touch point for people, who are referred to hospitals if needed. Therefore it is important to create comfort conditions also in cottage hospitals. The minimum physical conditions for cottage hospitals are defined in article 19 of the Family Health Centers Implementation Regulations dated May 25, 2010. According to this article the minimum conditions required for cottage hospitals are as follows: An easily accessible and secure building with proper ventilation, heating and lighting conditions; necessary measures for ensuring easy entry and exit of elderly patients and patients with disabilities. The total area needs to be 60 square meters for a single family physician and should be increased 20 square meters more for each additional family physician. The examination room should be at least 10 square meters for each family physician. Waiting hall and registration desk, medical intervention room (with a suitable examination and intervention location for vaccination, injection, and minor operations, emergency care materials, gynecologic examination couch and equipment for disinfection and sterilization), an office or division to keep health records, and a lavatory and sink are also required for cottage hospitals. If the laboratory services will be delivered in the cottage hospitals by the family physician a suitable location for these services is also required.

Even though the requirements for cottage hospitals are explicitly defined, climatic, audiovisual comfort conditions are generally not provided fully and therefore cannot always satisfy users. However prolonging the treatment of patients due to lack of adequate comfort conditions in buildings where health services are provided is undesired. Therefore it is necessary to examine the internal comfort conditions in cottage hospitals. In this framework a study was carried out to find out if the cottage hospitals meet the desired physical comfort conditions by evaluating the opinions of the users on internal comfort. The data collected in the study was analyzed. It is believed that the results of this study will contribute to the improvement process of existing cottage hospitals and to the design processes of cottage hospitals which may be established.

The Study

The Scope and Purpose of the Study

This study aims to define the current comfort conditions in cottage hospitals and issues that need to be taken into consideration to provide optimum comfort conditions. To reach this goal a method was used in the study based on the following steps:

- Research on the literature related to the subject being analyzed and also review of the literature related to indoor requirements
- Preparation of a survey form to be used in the evaluation of the physical comfort conditions
- Transferring collected data into charts to understand users' level of satisfaction of comfort conditions in selected cottage hospitals
- Interpreting the outcomes of the surveys related to structural dimensions, indoor temperature and thermal comfort, indoor air quality and natural ventilation, natural lighting, audial comfort

Data Collection Tool

A survey form was prepared to collect user views with the aim of defining the current indoor comfort conditions in cottage hospitals in our country and to increase user satisfaction. 14 questions were asked to the users with the survey. The questions at the first part of the survey were designed to understand the demographic features of users. The second part of the survey asks the users to evaluate each of the cottage hospitals covered in this study for their spatial adequateness, indoor temperature and thermal comfort, indoor air quality and natural ventilation, daylight and natural lighting, and audial comfort. The perception of is comfort both influenced by personal and environmental factors and also psychosocial environment. However this is not included in the research. It should also be noted however that the persons covered in the survey have minor health problems.

Sample of the Research

The region selected for the survey was the Nilüfer District of Bursa, which is the 4th largest city in Turkey. There are 26 cottage hospitals in Nilüfer district as of 2015. According to the directive of the Ministry of Health related to the establishment and operation of cottage hospitals in cities where pilot cottage hospitals are established, the cottage hospitals in Nilüfer District of Bursa were designed based on the type D criteria. 10 of the most used cottage hospitals were selected as the sample for this research.

Analysis of Data

The data collected in the study was evaluated by compiling percentages from answers provided by users. The perception comfort in cottage hospitals was evaluated under six topics, which are spatial adequateness, indoor temperature and thermal comfort, indoor air quality and natural ventilation, daylight and natural lighting, and audial comfort.

Findings

Demographics

A total of 1000 persons were interviewed in 10 selected cottage hospitals (100 persons in each one). The 10 selected cottage hospitals give services to a total of 3500 people each day, 54% of the 1000 participants of the survey were women and 46% were men. 30% of the participants were aged between 35-50, 24% were 50 and over 24% were between 25-35, 15% were between 18-24 and 7% were younger than 18. 36% are high school graduates, 33% are primary school graduates, 31 % are university graduates. 47% use health services in these cottage hospitals once a month, 40% once a year, 13% once a week.

Spatial Adequateness

The spatial features, number of personnel and usage frequency of the cottage hospitals covered in the field survey are given below. (Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)

Sample 1: There are 7 examination rooms, 1 vaccination room, 1 laboratory, 1 lounge, 1 family planning section in the 125. Yıl Atatürk Cottage Hospital there are 7 doctors, 7 nurses and 1 personnel employed. The usage area is 600 m². 250 patients use this cottage hospital every day. (Figure 1)



Figure 1. Sample 1

Sample 2: There is a reception, immediate treatment room (injection and medical dressing room), family planning room, breast feeding room, 1 doctor's room, toilet for women, men and people with disabilities, storage at the ground floor, and there are 6 doctor's rooms, pregnancy and baby monitoring room, kitchen ve staff room at the first floor in Hamitler Cottage Hospital. The cottage hospital has 16 personnel namely 7 doctors, 7 midwives-nurses and 2 cleaning personnel. It serves 300 patients every day. (Figure 2)



Figure 2. Sample 2

Sample 3: There are 5 examination rooms, 1 vaccination room, 1 blood-letting room, 1 family planning room, 1 patient observation room and 1 toilet at Ataevler Cottage Hospital. The building has two stories but only the ground

floor is used as a cottage hospital. The ground floor has a cafeteria serving the last station at the back of the building. There are a total of 11 employees including 5 doctors, 5 nurses and 1 cleaning personnel. It serves approximately 550 patients daily. (Figure 3)



Figure 3. Sample 3

Sample 4: Fethiye Bulvar Cottage Hospital is a 2 story building. At the ground floor there are 4 examination rooms, a vaccination room, a pregnancy service room, a medical intervention room, and toilet for men, women and people with disabilities. At the first floor there is a secretary room, waiting room, vaccination room, 4 family physician rooms, family planning room, meeting and training hall, breast feeding room, toilet for men and women, and a kitchen. 7 doctors, 8 nurses, 1 medical secretary and 2 cleaning personnel work in this facility. A total of 400 people use this cottage hospital every day. (Figure 4)

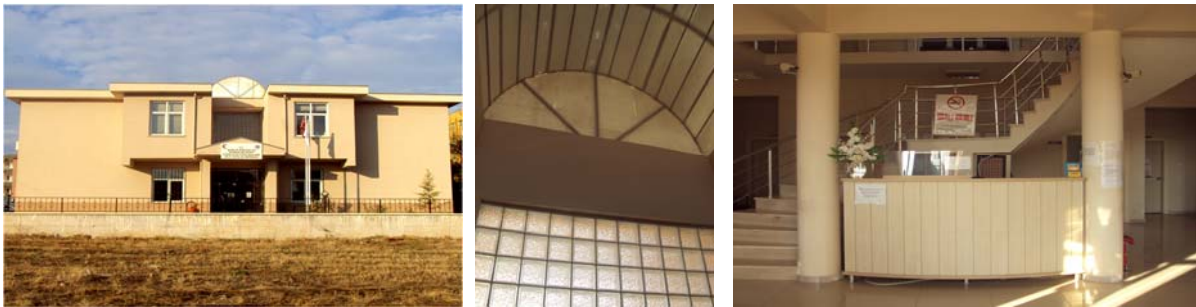


Figure 4. Sample 4

Sample 5: Beşevler Cottage Hospital is a two story building and has a galleried plan. The opening of the gallery is a waiting hall. At the ground floor there are 3 examination rooms, a vaccination room, a pregnancy service room, a medical intervention room and a laboratory. At the first floor there are 4 examination rooms, a pregnancy service and vaccination room, medical intervention room, family planning room, archive and toilets. 5 doctors, 4 nurses, 1 midwife, 1 laboratory assistant, 2 receptionists, 1 secretary and 1 attendant are employed in cottage hospital. It serves approximately 300 patients daily. (Figure 5)



Figure 5. Sample 5

Sample 6: Konak Cottage Hospital is also a two story building, health services are not given at the second floor. There is a waiting and registration, 4 examination rooms, one being at the ground floor and 3 at the first floor, a medical intervention room, an immediate treatment room, a sink for patients and a toilet. It serves 200 patients every day. (Figure 6)



Figure 6. Sample 6

Sample 7: Üçevler Cottage Hospital building is recently built and belongs to the municipality. The upper floor is used by emergency service personnel. The building is heated by natural gas and air conditioners. There are 4 doctors, 5 nurses, 1 attendant. It serves approximately 250 patients daily. (Figure 7)



Figure 7. Sample 7

Sample 8: Esentepe Cottage Hospital building has a ground floor and 4 stories; the ground floor and the first floor are used by the cottage hospital. The second and third floors are used by Nilufer Public Health Institution and the 4th floor is used by public health institutions. At the ground floor there is a room for elderly people and people with disabilities, 3 examination rooms, 1 breast feeding room, 1 examination room, storage and at the first floor there are 4 examination rooms, 1 pregnancy monitoring room, 1 injection room, 1 laboratory, 1 infant care - vaccination room, 1 staff toilet and 1 patient toilet. There are 16 employees in total; 7 doctors, 7 nurses and 2 personnel. It serves 300 patients every day. (Figure 8)



Figure 8. Sample 8

Sample 9: In Görükle Cottage Hospital there is a waiting hall, a patient-personnel toilet, medical intervention and vaccination room, 3 doctor rooms, a pregnancy service room, 2 archives, one laboratory, storage and medical dressing room. Approximately 300 patients are treated every day. (Figure 9)



Figure 9. Sample 9

Sample 10: Cumhuriyet Cottage Hospital has a waiting room, family physician units, registration and reception room, pregnancy monitoring and family planning room, medical intervention room, vaccination room, toilets and washbasins. Because the building was previously used as a neighborhood authority building it was not designed as a cottage hospital and therefore has some spatial shortcomings. Some of the important spatial shortcomings are the absence of a patient observation room, injection room, and laboratory. Because there is no laboratory, this service is provided from another center. There are 10 employees in total; 5 doctors, 3 nurses and 2 personnel. It serves approximately 200 patients daily. (Figure 10)



Figure 10. Sample 10

User views, which were used to define the spatial adequacy of the examined cottage hospitals are given in Figure 11. According to the user views examination rooms and waiting halls of cottage hospitals number 3 and 9 are seen as inadequate and worse than the average. The ratio of the size to the number of users in these two cottage hospitals is smaller when compared to the other cottage hospitals. It can be argued that the most important factor behind dissatisfaction of users from the spatial adequateness point of view is due to services given above the capacity of the cottage hospitals.

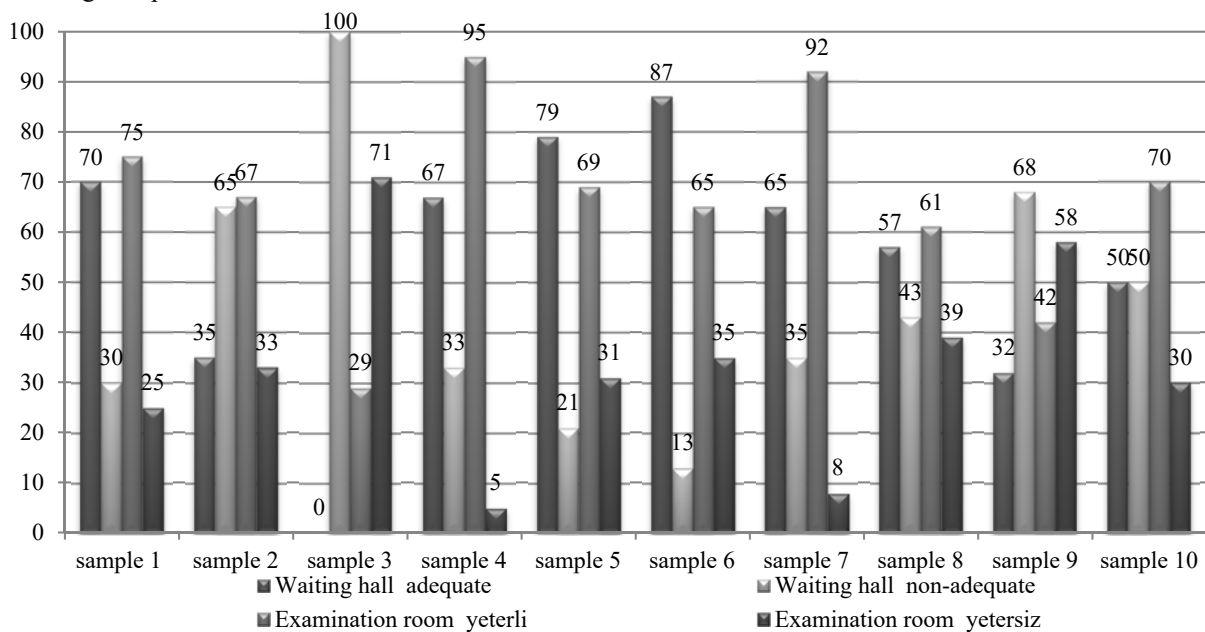


Figure 11. Satisfaction levels of the users' on spatial adequacy

Internal Temperature and Thermal Comfort

Thermal comfort indicates the satisfaction from the thermal environment [Ashrae, 2003]. Providing thermal parameters that makes a person healthy and productive is defined as thermal comfort. Thermal comfort at the same time is a condition that ensures 37 °C body temperature with gained and consumed energies of a person. It is possible to examine the factors that have an impact on thermal comfort in two groups, one being personal factors and the other being factors related to the indoor conditions [Fanger, 1970]. Personal factors are related to the dressing style and level of activity. Dressing creates a resistance against heat exchange. Activity level is the driver of metabolic speed based on the conversion of food and energy level produced in a unit of time. Indoor factors influencing thermal comfort are environment temperature, radiant temperature, air movement and moisture. Environmental temperature unit is dry bulb temperature expressed in °C or Kelvin. Average radiant temperature is the average of the surface temperature and the existing space. Increasing surface temperature is possible with correctly implemented heat insulation. Air movements also have an impact on the heat exchange between persons and the environment. Especially the location of air vents and their size affect the air movement speed in a closed environment. When the air movement increases the thickness of the stationary air layer around a person is reduced and which in turn increases cold feeling. Figure 12 and Figure 13 shows the satisfaction levels of the users of the internal temperature of cottage hospitals in winter and summer. According to the results of the survey users find temperature levels acceptable in summer months; however a large part of the users (90%) of the sample 5 have indicated that the indoor temperature is cold in the winter. The high level of dissatisfaction shows that there is a problem in the heating system.

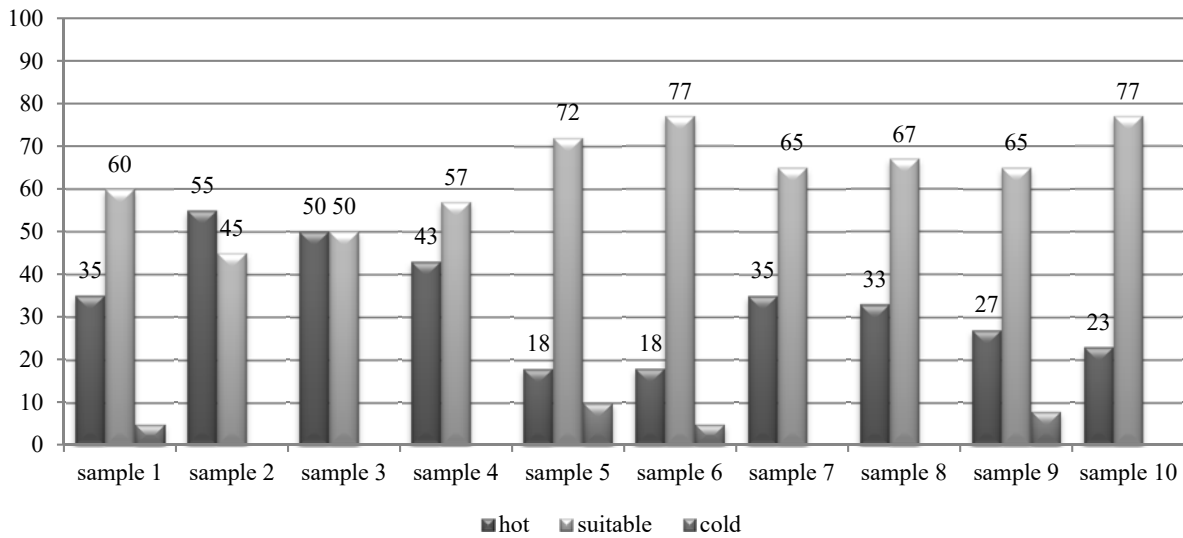


Figure 12. Satisfaction levels of the users’ on internal temperature in summer

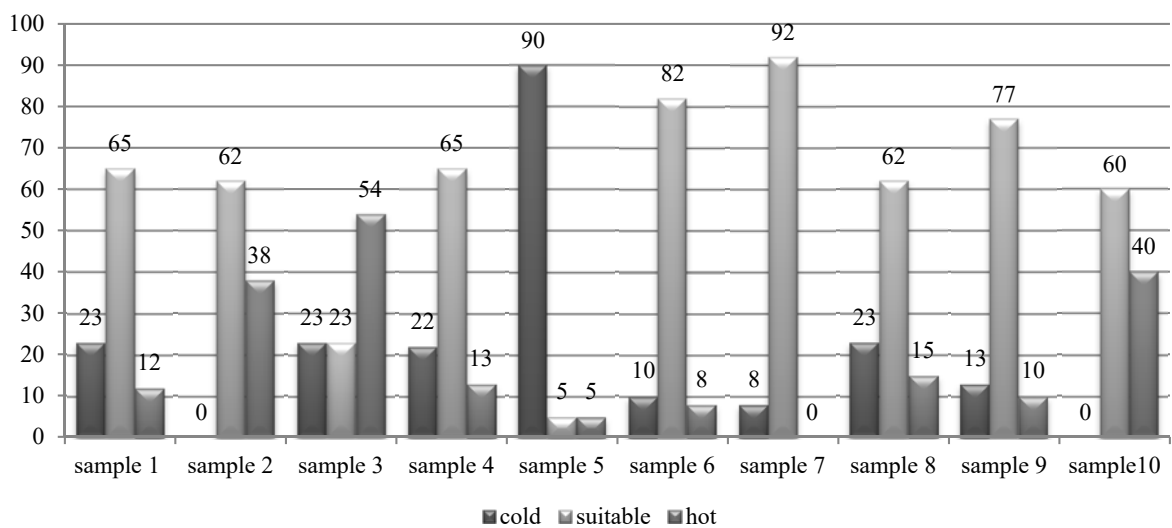


Figure 13. Satisfaction levels of the users’ on internal temperature in winter

The buildings in the scope of this work are heated with natural gas powered radiators in the winter. Because thermal comfort is not achieved the consumed fuel heats the atmosphere rather than the building, which means redundant fuel consumption. Therefore in our world, which has limited energy sources, cottage hospitals should be uniquely designed as health structures that reduce energy consumption and increase thermal comfort and should be correctly insulated. Almost all physician rooms have an air conditioner to reduce heat in the summer. Thermal comfort and energy consumption should be evaluated separately for summers and winters.

Indoor Air Quality and Natural Ventilation

Indoor air quality is defined by the level of dissatisfaction (odor and sensory discomfort) of the users [CEN, 1998]. Good air quality is considered as achieved if there are no harmful contaminating concentrations and the majority of the people (80%) are satisfied [Frontczak, 2011]. When the indoor air quality is adequate it has a positive impact on human health but when it is not adequate it may create health problems in the long and short term. Health problems related to the indoor air quality can be divided based on its biologic and psychologic impact. Biologic impact can be irritation in the eye, nose and throat, irritation in the skin, itching, dryness, pain, unexplained oversensitivity, asthma and similar symptoms, changes in the sense of smell and taste; and psychologic impact can be headaches, dizziness, nausea, vomiting, mental fatigue, loss of memory and lack of concentration.

Inadequate daylight and natural ventilation also negatively affect indoor air quality in cottage hospitals. The size of the waiting halls of all cottage hospitals subject to the survey was small and had direct connections to all physician rooms. Some of the waiting halls in the cottage hospitals had no connections with the building façade and these also had no natural ventilation and lighting. It was observed that the cottage hospitals which were adjacent to neighboring buildings or very close to them had limited natural ventilation and lighting conditions.

Limited size of waiting rooms in the cottage hospitals increases the density of users and reduces the quality and quantity of the breathed air. There are no separately located dining halls. Because there are no separate dining halls, food scent is spread to the cottage hospitals at certain hours. The small size and uselessness of windows at examination rooms negatively impact furnishing medical appliances and also create bad air quality due to medicine located in the rooms.

Users that participated in the survey indicated that indoors of sample 2, 3, 6, and 9 are inadequate in terms of natural ventilation (Figure 14). Users of sample 2 and 3 indicated that the cottage hospitals are inadequate in terms of clean air (Figure 15). According to this it has been concluded that when health structures are designed it has to be taken into consideration that they will be used by many people and therefore there is a need for adequate windows, which will provide sufficient natural air. Height of building stories directly related to the air amount inside a building and 78% of the participants surveyed indicated that 3 - 4 meters story height was suitable.

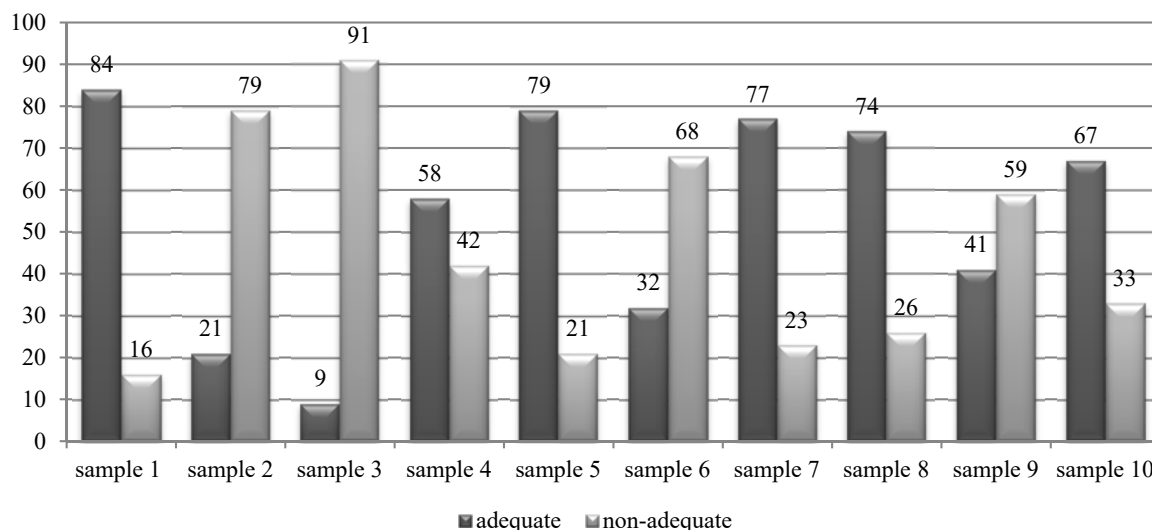


Figure 14. Satisfaction levels of the users' on natural ventilations

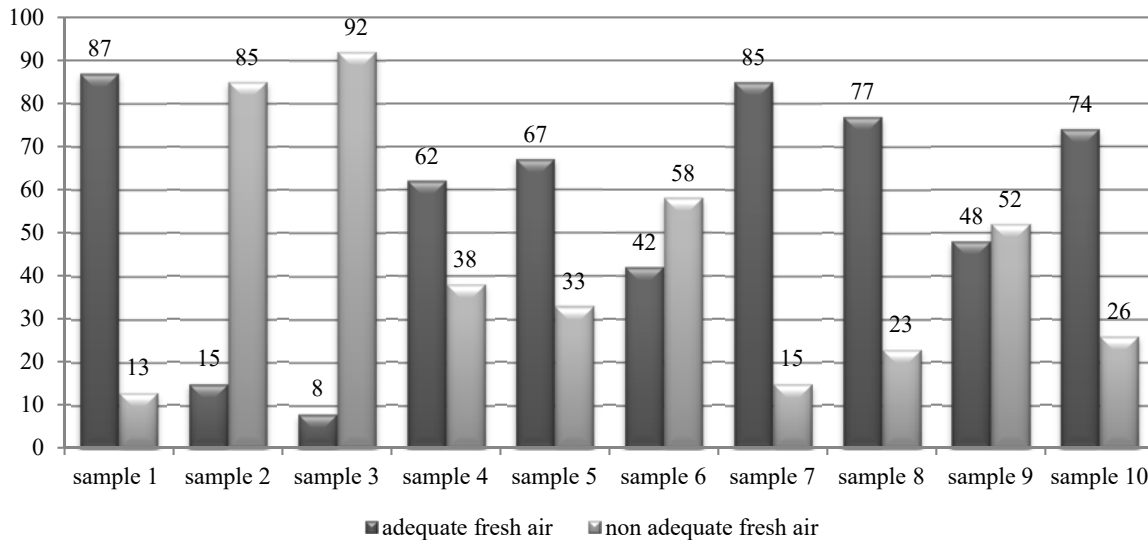


Figure 15. Satisfaction levels of the users' on indoor air quality

Daylight and Natural Lighting

Visual comfort is defined as a subjective condition depending on the stimulants of the environment. This definition takes into consideration the psychologic dimension of comfort and includes physical features which have an impact on visual comfort. Visual comfort parameters are the amount of daylight, distribution of brightness, amount of flares, color of light, and flickering rate of light and the level of light [Frontczak and Wargocki, 2011]. One of the most important conditions to achieve visual comfort is designing a building that is sustainable and ecologic and has a natural lighting level. Maximum usage of daylight, using natural ventilation as much as possible, using the least harmful technologies if natural ventilation and lighting is not adequate can be listed as important parameters for cottage hospitals.

The status of windows, which are an important factor in visual comfort, can be seen in Figure 16. According to view of users 77% of the users of sample 2, and 57% of the users of sample 3 indicate that the windows are not large enough. However considering that the size of windows of all cottage hospitals in the scope of the study is similar, the negative views may be related to their locations, directions and shadows.

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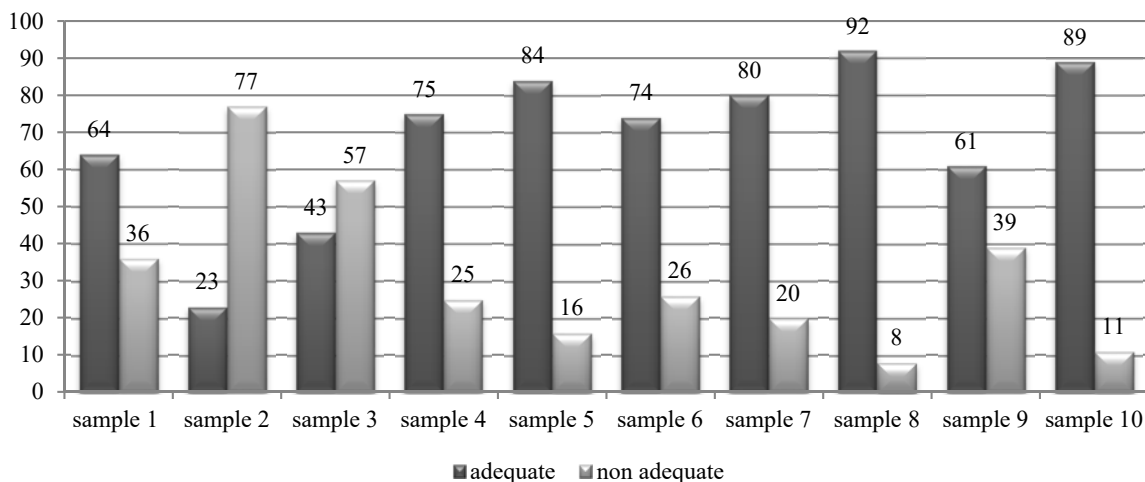


Figure 16. Satisfaction levels of the users' on daylight and natural lighting

Audial Comfort

Audial comfort is defined satisfaction from acoustic conditions [Navai and Veitch, 2014]. Audial comfort is not achieved only with creating a “good acoustic environment”; it also includes detecting all factors that “prevent acoustic comfort”. The views of users of the cottage hospitals on audial comfort are given in Figure 17. According to the data collected many of the cottage hospitals have a noise problem. This may be attributed to a large extent to the crowdedness of the waiting rooms and their inconvenient arrangement. At the same time it has been seen that mostly reflective materials are used in these locations. In new arrangements to be made in these location materials that absorb rather than reflect noise should be used to improve audial comfort conditions of users to a certain extent. Also good sound insulation can be used to reduce noise from outside. Audial comfort is a subject that needs to be taken into consideration when selecting a location for cottage hospitals. They should be located on streets with high pedestrian traffic rather than motorized vehicle traffic.

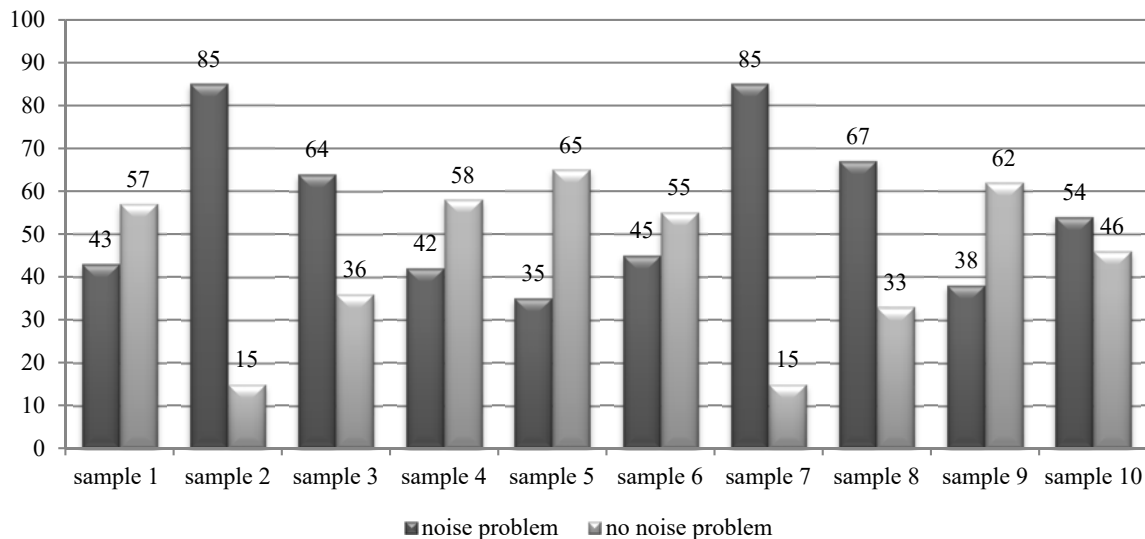


Figure 17. Satisfaction levels of the users’ on audial comfort

In the general evaluation in addition to the survey results observations were also used and the following conclusions were made:

- Because thermal comfort could not be achieved completely, air conditioners were installed in physicians' rooms to reduce heat in summers.
- There are noise sources close to cottage hospitals such as markets.
- The washbasins in physicians' rooms are not separated and therefore create hygiene problems.
- Waiting halls do not have natural ventilation and lighting possibilities.
- Because physician rooms are entered and exited directly from the waiting halls, these locations cannot carry out their functions properly and the current size of waiting halls does not serve their purpose.
- Rooms that are used as kitchens open to waiting halls causing hygiene risks.
- There are no separate service entrances to buildings. Therefore health personnel, patients and services use the same routes.
- Buildings are generally single story. However there are no elevators that increase accessibility of people with disabilities and patients in cottage hospitals which give services in more than one floor.
- Patients that require emergency services or normal examinations receive such services at the same locations.
- There is no help desk that welcome and direct patients.
- Using the same observation room for injections disturbs privacy of patients.
- Breast feeding room is also used as the kitchen of personnel.
- The number of toilets is not adequate. They are not separated for personnel, patients, men and women.
- There are no separate toilets for children and people with disabilities.
- Corridor wideness is not suitable for usage by people with disabilities.

Conclusions

Creating climatic, audial and visual comfort conditions in buildings is a factor increasing satisfaction of their users. Health structures have a more special position when compared to other building types. Because creating optimum comfort conditions in buildings, where health services are given, can make a positive contribution for the treatment of patients. It may also have a positive impact on health personnel, which work under very intense conditions in our country. The information received from surveys and observations made in 10 cottage hospitals were evaluated together in this study, which is the first step of health institutions. The evaluations, which are given below, were made with the aim of providing guidance for improvement of current cottage hospitals and for the design of new one: Accordingly;

- The arrangement and size of locations used as cottage hospitals do not fully satisfy their users. Special attention should be made to their design.
- Users evaluated indoor air quality as inadequate because of the crowdedness of waiting halls and lack of sufficient and natural ventilation. In design processes these locations should be planned with sufficient daylight and natural ventilation.
- There are no elevators for people with disabilities. The sizes of usage areas not adequate for usage by people with disabilities and there are no toilets for people with disabilities in any of the buildings examined.
- Materials that can be easily maintained, cleaned, that are stainless and dirt resistant should be used generally to increase hygiene.
- In order to achieve thermal comfort both in summers and winters due care should be exercised to ensure the building is situated to receive adequate sunlight and that protective design features are employed, the building is insulated and has an adequate heating system.
- Inadequate size of rooms for the number of users, absence of natural ventilation, and distribution of kitchen and food odor to the building creates discomfort. Windows should be situated to ensure effective air movement and window sizes should be reconsidered in places where the number of users increases.
- All spaces in the buildings should be designed to create natural lighting.
- Audial comfort cannot be achieved due to internal and external noise sources. Materials to be used in the building should not be noise dampening and also buildings should be planned in areas which do not have noise sources in their surroundings.

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