

Assessment of Safety Status by Audit Method in Student Dormitories of Kashan University of Medical Sciences (2017)

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Abstract

Aims: Dormitories as the second home of students are very decisive in increasing their academic quality. Unfortunately, dormitories of the universities in Iran are not safe due to a large number of causes. Therefore, the present study was conducted to determine the level of safety of the dormitories at Kashan University of Medical Sciences using the audit method. **Materials and Methods:** This descriptive study was conducted by the safety audit checklist at Kashan University of Medical Sciences. The checklists were completed by observation, interviewing, and document control. The safety status index (SSI) was then used to evaluate the safety of the student dormitories. The SSI was then graded based on the three scales of undesirable (below 50), moderate (50–75), and desirable (above 75). **Results:** According to the results, the highest percentage of noncompliance with the safety dimensions and the different parts of the dormitory building was related to the safety signs (99.12%) and warehouse (83.95%), respectively. Furthermore, the lowest percentage of noncompliance with the safety dimensions was related to housekeeping and surface safety and public safety (33.3%). Such a noncompliance was related to staircases (53.84%) in different parts of the dormitory building. **Conclusion:** This study showed that the safety was not desirable in the dormitories studied. Therefore, it is recommended that a safety and health management system should be established to both improve the level of safety and eliminate the deficiencies in the student dormitories.

Keywords: Checklist, dormitory, safety audit

INTRODUCTION

Safety is the degree of being away from hazards, and in practice, it means using a set of requirements and measures to prevent and mitigate adverse events by eliminating or reducing the risk level of hazards.^[1] In all organizations, especially universities which include a vast majority of the young future makers, there should be an environment in which the individuals are protected against harms and damages.^[2] Undoubtedly, entering a university is a very sensitive period in the lives of the youths in any country.^[3] Most students are residing in student dormitories as their second home, which is particularly important in promoting their academic quality.^[1] The house is not a place for any person, but a number of places can fill this role simultaneously. Susilawati and Khozaei *et al.*

define student housing as a densely populated building with a large number of rooms, each with multiple beds.^[4,5] According to the definition of Melnikas, Bello and Bello, Olujimi and Bello, student housing has rooms equipped with facilities suitable for social activities and a particular lifestyle.^[6-8]

Some writers argue that the students can succeed in their studies if they have comfortable living conditions in their student housing.^[6,9-12] They also emphasize that valuation and rehabilitation of the housing are necessary to improve the living

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Received: 18-Jan-2019
Accepted: 10-Jul-2019

Revised: 05-May-2019
Published: 08-Nov-2019

Access this article online

Quick Response Code:



Website:
<http://iahs.kaums.ac.ir>

DOI:
10.4103/iahs.iahs_3_19

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How to cite this article: Khajehvandi AA, Karamali F, Mousavi SG, Saberi HR, Zabeti F, Kaveh M, *et al.* Assessment of safety status by audit method in student dormitories of Kashan University of Medical Sciences (2017). *Int Arch Health Sci* 2019;6:154-9.

standards of the residents as well as to correct any deficiencies in the facilities.^[12]

Unfortunately, dormitories in the universities and higher education institutions in the country are not suitable in terms of safety, risk-taking, and preparedness for unforeseen risks due to a large number of students residing in them. Majority of the student dormitories are vulnerable due to building characteristics, the use of elevators and electrical equipment, cooking activities, repairs, maintenance, and cleaning, and the use of ventilation systems in varying degrees. Furthermore, lack of awareness of most of the students about how to respond appropriately during an accident, and the blockage of most of the emergency exits has caused the residents always to be exposed to various risks, and some other problems are created for students during their studies.^[13-15] These hazards may sometimes lead to various accidents such as fire, electric shock, food poisoning, heatstroke, fall of elevators, and adverse health effects which will have serious consequences if safety regulations are not observed.^[16] According to the US firefighting department, the number of fire events in the university dormitories reached from 1800 to 3300 during 1998–2005. According to the report, although 90% of the dormitories have had a smoke warning system, only 27% were equipped with automatic sprinkler. After the dormitory fire at the US University of Delaware in 1987, the crisis management group was formed at the university and the readiness of residents, and the personnel was increased by providing emergency response plans and maneuvers. It resulted in a reduction of vulnerability in the next events in the dormitories.^[14] Therefore, safety creation and compliance with the safety requirements in the dormitories are essential, and it is imperative that all the dormitories review their level of safety before any action and try to improve it.^[15]

Few studies have been conducted regarding the assessment of the safety status of student dormitories. Sanni Anibire and Hassanain conducted a study aimed at assessing the status of fire safety and preparedness in emergencies. The results of this study have estimated firefighting equipment at a suitable level and the safe discharge time of the students at 190 s. Architectural problems and design improper of exit doors have been declared as the inconsistencies in this evaluation.^[17] In the study of Bashiri and Khajehei on assessing the married students residing in the dormitory of Shahid Beheshti University, there were revealed some deficiencies such as presence of some furniture reducing the width of the paths during any emergency escape, presence of the glass wall of the emergency stairs that may collapse during the earthquake and the fire, improper connections of the dropped ceilings which may collapse during any earthquake, inappropriate connection of the fire extinguishers and lack of rapid access to them during fire, and absence of fences for stairs and fractures of some of the interior stairs of the building.^[18] In the study of Arghami *et al.* (2016) on the dormitory of Zanjan University of Medical Sciences, The total state of fire safety in dormitory buildings was evaluated 58.6 percent. According to this study, In none of the dormitory buildings, the manual fire alarm system

was used and other fire equipment was not also used except fire extinguishers. Besides, computer sites and libraries of dormitories were not equipped with fire extinguishers.^[2] In the study of Jahangiri *et al.* on the 14 student dormitories of Shiraz University of Medical Sciences, the mean score for the safety requirements index (SRI) was 71.13%, while the safety status of the dormitories was relatively safe. According to the results, the highest score of SRI was related to the public health among the various aspects of safety (94.11%), whereas the elevator safety (47.70%) had the lowest SRI score due to the absence of emergency power supply, telephone, and periodic control over the earth system.^[15] Given that the universities have faced increasing demand for dormitory, students' satisfaction with their housing should be considered as a determinant factor in improving their living environment. However, it is difficult to provide such satisfaction due to the general nature of such spaces.^[19]

Regarding the above-mentioned matters and given that no study has been conducted on compliance with the safety standards and requirements of the dormitories in Kashan University of Medical Sciences, this study was conducted to assess the safety of the female and male student dormitories in the university.

MATERIALS AND METHODS

This applied, descriptive, and cross-sectional study was carried out in all dormitories of Kashan University of Medical Sciences by a safety audit checklist during 2017. In the first step, the most important hazards and risks associated with the student dormitories were identified through interview and observation. Then, for each of the safety dimensions and each section of the dormitories, audit checklists were prepared according to the national protection standards and regulations as along with guidelines for the assessment of the safety of the buildings and the residential centers in the Ministry of Industry, Mining, and Commerce. The checklist contains a total of 266 evaluation indexes including nine locations of administrative part (30 items), room (38 items), staircase (25 items), elevator (16 items), parking (34 items), store (30 items), the powerhouse (34 items), the roof (25 items), and the kitchen (34 items). Each of these locations includes some evaluation dimensions such as electricity, fire, lighting, emergency response preparedness, housekeeping, surfaces safety, safety signs, and public safety [Table 1].^[20] Validity of the checklists has been reviewed by five experts in the field of safety. The information required for the research and completion of the checklists was collected through a personal referral, observation, interviews with students, facility and dormitory authorities, records and documentation controls, and measurements of some factors such as lighting. For each question, if the audit terms are in compliance with the safety standards and requirements, the answer is “yes” otherwise “no.” To calculate the level of the provided safety measures in the dormitories studied, an index called the safety status index (SSI) was created as follows:

$$SSI = (\sum X / \sum n) \times 100$$

- SSI; Safety status index for each dimension

- X: The score obtained for noncompliance each item
- n = Maximum score of each item.

In general, the SSI was then graded on three scales as undesirable (<50), moderate (50–75), and desirable (>75). This categorical classification was applied to judge the level of the provided safety measures in the safety audit studied.^[21]

RESULTS

Tables 2 and 3 show the percentage of the noncompliance of the safety requirements for different safety dimensions and sections in the four dormitories under the study. The results showed dorms 3, and two had the highest (66.8%)

and lowest (62.32%) percentages of the safety requirement noncompliance, respectively.

Based on the calculations, the highest safety noncompliances are related to the safety signs (99.12%), and the lowest noncompliances are related to housekeeping and surfaces safety as well as the public safety (33.3%). Furthermore, based on the evaluated sections, the highest percentage of the noncompliance is associated with the store (83.95%), and the lowest percentage of the noncompliance is related to the staircase (53.84%).

Figure 1 indicates the quality level of different safety dimensions in the studied dormitories. The diagram shows that the best safety status is related to the public safety, so that

Table 1: The main issues investigated for each dimension of the safety checklist used in the study

Dimensions	Items
Electricity safety	Inspection of the electrical panel, insulating floor covering in the vicinity of the electrical panel, standard socket, keys and wiring, existence of grounding, guards of electric lines, existence of instructions for working with electrical equipment, existence of emergency power supply, and existence of lightning protection system and personal protective equipment to work with the electrical equipment
Fire safety	Evaluating of the fire extinguisher, fireboxes, fire door, automatic fire extinguishing, alarm system at the critical points, firefighting training, and periodic inspection of the equipment annunciation
Lighting system	Emergency lighting, lighting appropriate to the type of the activity, etc.
Emergency response preparedness	Emergency response plan, emergency response team, perform periodic maneuvers, muster points, emergency exit way, and emergency response training.
Housekeeping and surfaces safety	Housekeeping, stability and standard of commute areas such as staircases, corridors, and so on. Protecting hazardous areas, etc.
Safety signs	Mandatory signs, prohibition signs, warning signs and emergency exit safety signs, safe condition safety signs, and fire safety signs.
Public safety	Noise, atmospheric conditions, humidity, heat, and existence of a public ventilation system and some specific for hazardous areas

Table 2: Percentage of noncompliance of the safety requirements for different dimensions in the four dormitories under study

Dormitories	Safety dimensions							Total (%)
	Electricity safety (%)	Fire safety (%)	Lighting system (%)	Emergency response preparedness (%)	Housekeeping and surfaces safety (%)	Safety signs (%)	Public safety (%)	
1	69.4	81	56.2	100	33.3	100	0	66.67
2	54.5	71.2	55.6	78.8	25	100	25	62.32
3	60.3	81.3	33.3	73.7	40.5	96.9	40	66.8
4	51.7	79.2	28.6	72.2	33.3	100	60	63.11
Total	58.55	78.22	42.1	78.12	33.3	99.12	33.3	

Table 3: Percentage of noncompliance of the safety requirements for different dormitory sections in the four dormitories under study

Dormitories	Dormitory sections									Total (%)
	Administrative part (%)	Room (%)	Staircase (%)	Store (%)	Kitchen (%)	Roof (%)	Power house (%)	Elevator (%)	Parking (%)	
1	57.14	66.66	56	85.18	61.29	76.19	-	-	-	66.67
2	50	64.51	44.44	-	55.88	71.42	73.91	-	71.42	62.32
3	60	59.45	48.14	85.18	67.64	90.47	58.33	66.66	75	66.8
4	52	58.33	68	81.48	64.70	76.19	52.08	60	64.28	62.93
Total	54.71	61.94	53.84	83.95	62.40	78.57	61.26	63.3	71.42	

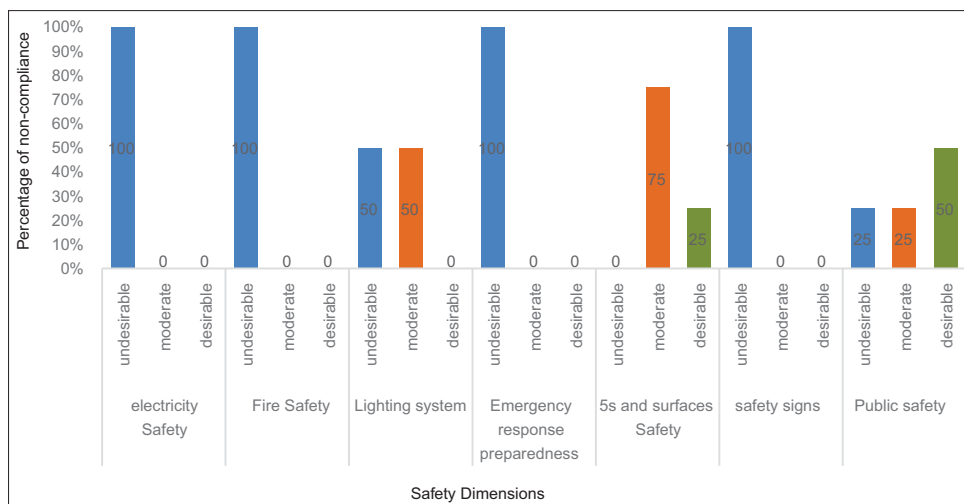


Figure 1: The quality level of different safety dimensions in the studied dormitories

50% of the dormitories are in a favorable position, 25% in the moderate condition, and 25% in the undesirable condition. On the other hand, the worst safety conditions are related to the safety signs, electrical, fire safety, and emergency response preparedness so that in all the dormitories, these aspects were all in undesirable condition.

DISCUSSION

The results showed that the studied dormitories were in poor safety condition. The highest percentage of noncompliance based on the safety dimensions and the physical sections of the dormitories are the safety signs (99.12%) and the store (83.95%), respectively. The lack of an integrated safety management system in organizing the safety actions such as risk management program, safety monitoring and inspections, recording and reporting of accidents and near miss, providing safety instructions, purchasing and installing safety signs, training safety, tracking safety requirements in new construction and development projects, determining an authority for dormitory safety to track, and address the safety issues are the most important challenges identified in this study. In the study of Jahangiri *et al.* on 14 dormitories at Shiraz University of Medical Sciences with the safety audit technique, the elevators with a mean score of 47.70% had the lowest safety level due to the lack of an efficient system to support the elevator cabin in the emergencies such as emergency power supply, telephone, and lack of inspection of the earthing system. The highest mean score (94.11%) is related to the compliance with the public health requirements.^[15] In the present study, the lowest percentage of the noncompliance with the safety dimensions is related to the two dimensions of the housekeeping and surfaces safety and public safety (33.3%). In various sections of the dormitory building, such noncompliance may be related to the staircase (53.84%). The results of this study showed that none of the evaluated dormitories are in desirable condition meeting the requirements of the emergency response preparedness, especially in the event of fire that is

due to the lack of emergency exits, lack of emergency response maneuvers, lack of muster points, and inappropriateness of the fire extinguishers with the possible fire load. These results support the results study of Bashiri and Khajehei that assessment of the equipment to deal with earthquake and fire in the married student dormitory of Shahid Beheshti University. In this study, deficiencies such as blockage of the emergency exit, hazardous collapse of the glass wall of the emergency staircase due to fracture during earthquake and fire, nonstandard wiring, inappropriate layout of the fire extinguishing equipment, nonstandard fence and fracture of some staircases, and lack of knowledge of the students about the appropriate measures during an emergency have been all identified.^[18] Smeal *et al.* conducted a study on the safety assessment of the student dormitories. The results of the study showed that 83% of the student rooms were equipped with fire smoke detectors, and only 44% of the students knew how to use these devices and most of the students could not use fire extinguishers in the event of a fire. The international students were asked to register emergency call numbers of whom approximately 18% responded incorrectly.^[22] This result is relatively consistent with that of the present study regarding the level of awareness of the students about the safety issues. The monitoring of the level of awareness of the individuals in this study was one of the dimensions in the fields of electrical, fire safety, and emergencies where it has not been defined as a distinct dimension. However, due to the different instruments and the scoring, the level of the awareness about the safety dimensions cannot be compared accurately with the above-mentioned study. The results of the measurement of lighting at day and night in the present study were different from the existing standards in more crowded parts of the dormitory such as rooms, staircases, kitchens, parking lots, and warehouses. By observing the inappropriate connection of the dropped ceilings and holes in the surfaces, the status of surfaces, floors, and ceilings in the kitchen, bathroom, and toilet was in poor condition. Furthermore, in a study by Gatua, the safety of different parts of the public schools including

dormitories in Kenya was assessed by interview, questionnaire, and observation. Majority of the respondents stated that their dormitories lacked the necessary safety standards. The lack of emergency exits in most dormitories, closure of emergency routes, inappropriateness of the fire extinguishing equipment with the fire load, inadequate ventilation, lack of lattice for doors and windows, inadequate lighting, inappropriate sanitary conditions in bathrooms and toilet, and the structure erosion are among the most important inconsistencies recorded in this study.^[23] In the present study, similar unsatisfactory conditions were observed for safety and health.

In the study of Hassanain, buildings of the student dormitories were considered as fire high-risk buildings. The main reasons include accommodation of a large number of students in one place, extreme fire load of the furnitures, books, and so on, and existence of multi-floor dormitories which will put residents of the upper floors in trouble when using the escaped stairs in an emergency.^[24] The capacity of the male and female dormitories is about 1120 people which occupies 90% of the building of the dormitories. Furthermore, these dormitories have three or four floors which according to the arguments of Hassanain have created a dangerous environment in terms of fire safety.

In the study by Rahouti *et al.* on the student dormitories at the University of Mons (Belgium), the results showed that the use of stairs leads to faster evacuation (03:14 min for total evacuation) compared to the combination of the stairs and the ladders outside the building (16:47 min for total evacuation). Another result for the necessity of the fire doors is the rapid discharge of the building. Without fire doors, only about 30% of the students use the stairs to evacuate, while in the presence of fire doors, about 60% of the students use the stairs to evacuate.^[25] Unfortunately, in the studied dormitories, the emergency exit was not in a desirable condition, and there was provided no fire doors in the dormitories.

It is worth noting that due to the limited studies conducted in the field of assessing the safety of student dormitories, it is not possible to compare our results with the other studies. The safety audit method is based on predesigned checklists and questions that because of the content constraints and information gathering, may not provide a comprehensive assessment despite the simplicity and speed of the data collection. Therefore, for more detailed studies, it is recommended that a risk management program be used.

CONCLUSION

The safety of the studied dormitories appeared poor, particularly in the important issues as follow: installation of the safety signs, planning, preparedness for the emergencies, fire, and electricity safety. The main cause can be seen in the absence of an integrated safety management system. Based on the evaluations carried out and the results obtained in the present study, it is suggested that a safety committee in the dormitories should be responsible to assess the risks and needs, conduct the training courses, determine the safety interface for

each dormitory, formulate scenarios and practice emergency situations, purchase and install safety signs in accordance with section 20 of the National Building Regulations, modify the status of firefighting equipment in accordance with the section 3 of the National Building Regulations in Iran; inspect periodically, the electrical equipment according to the section 13 of the National Building Regulations, and modify the public ventilation system to improve the indoor air quality in the dormitories.

Acknowledgment

We would like to thank Kashan University of Medical Sciences and authorities of the student dormitories who have provided the necessary support and collaboration in the process of this research.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Habibi E, Soleymanei B, Nateghei R, Lotfirosbehani M, Yarmohammadian MH. Risk Management in radiology units of Isfahan University of Medical Sciences hospitals. *Health Inf Manag J* 2007;4:133-41.
- Arghami S, Kamali K, Mahboubi M. Development of a Fire Safety Checklist for Dormitories. *Journal of Human, Environment and Health Promotion*. 2016;2:20-31.
- Roseman IJ, Dhawan N, Rettok SI, Naidu R, Thapa K. Cultural differences and cross-cultural similarities in appraisals and emotional responses. *J Cross Cult Psychol* 1995;26:23-48.
- Susilawati C. Student dormitory development plan with linear programming method. *Proceeding of the PRREs 7th Annual Conference, (PRREsAC 01), Surabaya, Indonesia; 2001*. p. 1-8.
- Khozaei F, Hassan AS, Khozaei Z. Undergraduate students' satisfaction with hostel and sense of attachment to place: Case study of university Sains Malaysia. *Am J Eng* 2010;3:516-20.
- Melnikas B. Management and modernization of housing facilities: Specific features of central and Eastern European countries. *Facilities* 1998;16:326-33.
- Bello M, Bello V. The influence of consumers' behaviour on the variables determining residential property values in Lagos, Nigeria. *Am J Appl Sci* 2007;4:774-8.
- Olujimi J, Bello M. Effects of infrastructural facilities on the rental values of residential property. *J Soc Sci* 2009;5:332-41.
- Krishnan AR, Nazri EM, Bakar EA, Mat Kasim M. A hybrid multiattribute decision making model for evaluating students satisfaction towards hostels. *Adv Decision Sci* 2015;(2015):1-14.
- Amole D. Coping strategies for living in student residential facilities in Nigeria. *Sage J* 2005;37:201-19.
- Hassanain MA. On the performance evaluation of sustainable student housing facilities. *J Facil Manag* 2008;6:14.
- Sitar M, Krajnc K. Sustainable housing renewal. *Am J Appl Sci* 2008;5:61-6.
- Guthrie E, Black D, Bagalkote H, Shaw C, Campbell M, Creed F. Psychological stress and burnout in medical students: A five-year prospective longitudinal study. *J R Soc Med* 1998;91:237-43.
- Fallahi A. Reducing the vulnerability of Shahid Beheshti University student dormitories to fire and earthquake. *Sofeh* 2014;24:77-100.
- Jahangiri M, Azizi K, Yekzamani P, Ahmadi SF, Mahmoudabadi B, Behbood F, *et al.* A survey of the safety conditions of student housings: A case study in a type one university in Shiraz, Iran. *J Health Sci Surveill Syst* 2017;5:38-42.

16. Johnson E, Cole EC, Merrill R. Environmental health risks associated with off-campus student-tenant housing. *J Environ Health* 2009;71:43-9.
17. Sanni-Anibire M, Hassanain M. An integrated fire safety assessment of a student housing facility. *Structural Survey* 2015;33:354-71.
18. Bashiri M, Khajehei S. Seismic vulnerability reduction and fire risk mitigation in dormitories. *J Emerg Manag* 2013;2:15-25.
19. Kaya N, Erkip F. Satisfaction in a dormitory building: The effects of floor height on the perception of room size and crowding. *Environ Behav* 2001;33:35-53.
20. Checklist of Buildings Safety Assessment Instruction, Affairs Office of Health, Safety, Environment and Energy in Ministry of Industry, Mining and Trade, Tehran; 2015.
21. Norozi MA, Jahangiri M, Ahmadinezhad P, Zare Derisi F. Evaluation of the safety conditions of Shiraz University of Medical Sciences educational hospitals using safety audit technique. *Payavard* 2012;6:42-51.
22. Smeal AR, Renda BA, Mittelman DF, Argueta JE, Brown NA, Grau RJ. An Assessment of Fire Safety in Australia's International Student Housing. 2009. Available from: <https://digitalcommons.wpi.edu/iqp-all/116>.
23. Gatua JW. Assessment of safety status of physical infrastructure (classrooms, dormitories, sanitation facilities, laboratories and kitchen) in public secondary schools in Nairobi West Region, Kenya. *Res Hum Soc Sci* 2015;5:1-9.
24. Hassanain MA. Fire safety in the design and operation of student housing facilities. *Struct Surv* 1998;26:55-62.
25. Rahouti A, Datoussaid S, Descamps T. Safety assessment of a high-rise dormitory in case of fire. *Int J Disaster Resil Built Environ* 2018;9:84-95.