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**ASSESSMENT OF INTERIOR GENERAL AND LOCAL LIGHTING AND UVRADIATION
IN THE LIBRARIES OF THE FACULTIES IN THE KERMANSHAH UNIVERSITY OF
MEDICAL SCIENCES (2016)**

Amir Hossein Nafez¹, Sogand Abbasi Azizi², Sohila Lotfi², Reza Rostami^{2*}

¹Department of Environmental Health Engineering, School of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran.

²Students Research Committee Kermanshah University of Medical Sciences, Kermanshah, Iran.

Email: Rezarostami745@gmail.com

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Abstract

Library is one of the important places where people who are interested in studying often spend long hours of the day and the importance of this issue is much more visible in student activities. Good lighting and its optimal distribution in such an environment can greatly reduce the incidence of various disorders. The aim of this study was to assess local and general lightening and UV radiation in the libraries of Kermanshah University of Medical Sciences in 2016. This study was a cross-sectional study, which was carried out in the spring of 2016 in libraries, study halls, and computer sites of Kermanshah University of Medical Sciences' faculties. Hagner device (screen master) made in Sweden in height of 30 inches (76 cm) from the floor and in the center of the measuring stations was used to measure the light intensity. The light intensity for each station was recorded in Lux. To measure ultraviolet radiation using the EC1-Hagner made in Sweden, and according to local standards brightness measured, it was tried to measure ultraviolet radiation in the library and any college sites monitors. From 15 reading rooms in this study, 8 rooms (53.3%) in terms of general light intensity were in favorable conditions, three halls (20%) in terms of distribution of natural lighting intensity were in good conditions. And of five bookshelves in the faculties under study, 3 halls (60%) in terms of the intensity distribution of local lighting were in good conditions. The values measured of UV radiation were less than standard mode. According to the results, it can be said that, poor lighting in the mentioned libraries is primarily due to the change in user. In addition, measurements indicate that, at some stations, the intensity is recommended higher than standard, but their average shows improper situation of lightening, so that improper alignment of the lamps causes this unfavorable situation. Library has been studied as case study and lack of proper design, improper selection of lighting sources, as well as the lack of timely maintenance lead to reduce lightening

intensity and given the high importance of this issue, follow-up and regular proceedings of the relevant authorities could ultimately lead to create a desirable space in these places.

Key words: Assessment, Lightening Intensity, Library, UV Radiation.

Introduction

Vision is one of the most important human senses and optimal lighting is considered as one of the most important issues to provide the physical condition of different places. Clear vision depends on optimal lightening (1 and 2) and optimal lighting can provide conditions to do work easily. Optimal lighting includes quantitative and qualitative characteristics, which lack of each of them in addition to the eye fatigue leads to headaches, hormonal differences, and musculoskeletal Disorders, which could affect the efficiency and productivity of people (3). Library is a place where students usually study for a long time. Good lighting and its optimum distribution in such environments can greatly reduce the incidence of abnormalities expressed. Paying attention to the lightening, as an important physical factor of workplace plays an important role to protect human health and the prevention of accidents and enhance operational efficiency and improve the country's economy. There is need to pay attention and do further research in this area (4).

Light measurement methods, which have been common in such surveys, include suggested patterns by Illuminating Engineering Society of North America (IESNA). The association has compiled and published patterns for the measurement points to determine the average assessment of lightening intensity in the studied places. IESNA has proposed the lightening values of 300 and 500 lux in order to use the computer, reading and writing. In this standard, the lightening intensity on the studying table is at least 500 lux and proposed value is 300, while, the standard in America is equal to 750 lux and in the UK is higher than this value (5). UV radiation is a part of the electromagnetic spectrum, which covers wavelengths between 100 to 400 nm, and is divided into three groups: UVA, UVB, and UVC. The spectrums A, B, has longer wavelength and create the biological effects. Main source of ultraviolet in nature is the sun, which the vast majority of it is absorbed by stratospheric ozone layer. The other major sources include high-pressure or low-pressure mercury vapor lamps, fluorescents, plasma tubes, and laser. UV radiation in the range 290-320 nm has a close relationship with sunburn and skin cancer (6). Fluorescent lamps are used in the library (producing UV).

In this study, the researchers also measured the amount of UVA radiation in the range of 280-400 nm in addition to measure their lightening intensity. It should be noted, as an effective UV radiation received in accordance with Iran standard per day is 30 joules per square meter (6, 7). This study was developed aimed to assess the severity of local and general lighting in the libraries of Kermanshah University of Medical Sciences in 2016.

Materials and methods

This study was a cross-sectional study which was carried out in the spring of 2016 in the libraries, reading rooms, computer sites in the faculties of Kermanshah University of Medical Sciences, and in general, the number 5 libraries, 5 computer laboratories, 5 study halls, were measured. Measurements were done in three modes: general lighting (artificial + natural lighting), natural lighting, and local lighting. To determine the station, the target level was divided into 3m * 3m squares. In this manner, it was specified that (5). Hagner device (screen master) made in Sweden in height of 30 inches (76 cm) from the floor and in the center of the measuring stations was used to measure the light intensity. The light intensity for each station was recorded in Lux. Daylight is affected by the time of measurement and the situation of the sky in terms of cloud cover (cloudy, partly cloudy, and clear). During the day, the intensity of lightening changes. For this reason, measurement on clear days was conducted in the morning at 10 to 11 AM and afternoon at 15 to 16 PM, and the measured values were averaged. During measuring natural light, all the lamps (artificial lightning sources) were turned off. After measuring, with turning on the lamps again, the general lightening (natural and synthetic) were measured. And also according to the standard instructions and a pattern arrangement about arrangement of lamps, the local lightening inside books shelves were measured (6.5). For the measurement of UV radiation, using the EC1-Hagner made in Sweden based on calibration certificate, device sensor was calibrated, and based on standards related to measuring local lightening, ultraviolet radiation was measured in the library and monitors in sites of each faculty on clear days and at 10 pm to 11 am and from 15 to 16 PM in both natural lighting and general lighting modes(6).

Results: According to Table, of 15 reading rooms under study, 8 study halls equivalent to 53.3% were in favorable conditions in terms of general lightning intensity, 3 study halls, nearly 20 percent were in favorable conditions in terms of the distribution of light intensity (lighting more than 300 lux) which Paramedical computer hall, in terms of total and natural light had the highest rank, and reading room of Paramedical faculty and computer hall of the Medical and Dental School had the lowest rank in terms of total lightening and natural lighting is included.

Table-1: Measuring the intensity of light and natural values of the Libraries, schools of Kermanshah University of Medical Sciences

Name of The Center	Average Entire Lighting (Lux)	Min	Max	Average Natural Lighting (Lux)	Min	Max
Book Reservoir Medicine	195.75	138	258	76.4	63	122

Computer Hall Medicine	315.26	232	411	202.7	114	216
Study Hall Dentistry	327.71	161	411	202.7	114	216
Book Reservoir Dentistry	214	182	239	119.7	102	149
Study Hall Paramedical	65.16	34	138	43.7	15	114
Study Hall Pharmacy	328.6	190	608	216.7	96	409
Computer Hall Pharmacy	289.33	164	501	132.7	96	405
Book Reservoir Hygiene	253.41	87	690	180.25	36	650
Computer Hall Hygiene	587.6	220	1123	367.25	152	668
Book Reservoir Paramedical	235.6	60	865	112.4	33	562
Study Hall Hygiene	512.25	193	1125	347.16	100	731
Study Hall Medicin	503.9	226	969	228.6	97	663
Computer Hall Paramedical	627.5	311	1251	473.17	160	1050
Computer Hall Dentistry	214	182	239	25.12	15	52
Book Reservoir Pharmacy	339.9	105	981	123.7	80	130

As shown in Table 2, from 5 reading rooms, 3 halls (bookshelves), accounting for 60% were in favorable conditions in terms of local lightning intensity distribution that in terms of local lightening, bookshelves in Medical school had the highest value. In addition, the bookshelves in Medical School had the lowest value in terms of local lightening.

Table-2: The measured values luminous intensity topical Libraries schools of Kermanshah University of Medical Sciences.

Name of the center	Average entire lighting (Lux)	Min	Max	Average natural lighting (Lux)	Min	Max
Bookshelves In Hygiene School	334.3	107	1023	231.7	30	540
Bookshelves In Dentistry School	345.9	112	981	130	45	123
Bookshelves In Medical School	161.75	43	295	88.7	28	260
Bookshelves In Pharmacy school	232	36	469	198	32	388
Bookshelves In Paramedical School	370	47	1190	236	36	590

School of Health had a higher amount of UVA radiation in both total and natural lightning measurements. In total, given that, the amount of ultraviolet radiation in the library is much less, than the standard amount, but the library lamps must be selected carefully (Table3).

Table-3: The measured UV Libraries schools of Kermanshah University of Medical Sciences.

Name of the center	Average UV halls libraries (W/m ²)		Average UV monitors of libraries (W/m ²)	
	Average total UV	Average natural UV	Average total UV	Average natural UV
LibraryHygiene School	0.25	0.24	0.011	0.008
LibraryDentistry School	0.12	0.08	0.005	0.001
LibraryMedical School	0.15	0.15	0.004	0.003
Library Paramedical School	0.13	0.06	0.004	0.001
LibraryPharmacy School	0.09	0.04	0.003	0.001

Discussion

According to the results and comparison of the intensity of general lightening of the libraries with standard values, the minimum proposed by the IESNA was determined that in general, 47.7% of the units and in the natural state, 80 percent of the units as well as 40 percent of local lightening of bookshelves in this study was lower than the standard minimum. As well as measurements show that the UV measured value is less than standard and in good condition. Majidiet al, in a study, examined the intensity of lightening in the libraries with irregular geometric shapes in the city of Zanjan. The results are indicative of the fact that the overall, natural and artificial lightening were less than 300 LUX, 51 percent, 80 percent and 99 percent, respectively. It is therefore essential that by correcting its deficiencies again, at least be met in these libraries (5). A study which was conducted in the United States to measure lighting in homes, showed that its value is less than standard (8). Another study was carried out at a university in Costa Rica by Espinoza et al in 2010 and reported that 50 percent of measurement stations in relation with workshop had inadequate lighting. Disproportion between studied sites with its users, the lack of attention to proper lighting system design has led in some cases, the lightening is less than the standard, and it was determined that all 61 measuring points in the Library has had bad lighting (9). In another study which was done by Abramason et al at the University in Brazil on every seat available in classrooms, it was found that, in most of the seats, the lighting is appropriate and above the standard level (10). A study carried out by Ghotbi Ravandiet al to evaluate the lightening and UV radiation in the public libraries of Kerman universities in 2010 showed that the difference between the ultraviolet intensity measured in both the general and natural, in some cases, was significant, and in others, although the difference was not significant, but significant differences indicate that the values of the radiation emitted from the lamps is high. However, the values measured for the radiation in the desired places are less than the effective ultraviolet radiation received according to Iranian standard (6). Finally, according to the results obtained, we can say that, poor lighting in the libraries is mainly due to the change

in user. According to the measurements, the lightening intensity is higher than standard at some stations, but their average shows unfavorable condition of lightening which was due to improper alignment of the lamps. However, quantitative parameters such as average lighting intensity, is a necessary condition for judging the adequacy about lightening systems does not indicate the adequacy of a system to provide comfort and safety and sufficient condition is establishing desirable characteristics in terms of quantity and quality for lighting systems in places (such as high brightness, creating desired color, observing the general principles of design, etc). The library was studied as a case study, and lack of proper design, improper selection of lighting sources and the lack of timely maintenance reduce the lightening intensity. On the other hand, there is need to redesign the lightening system, because some of buildings are old, there are changes in user. In addition, the maximum use of natural lighting can greatly be used to provide appropriate lightening and reduce energy consumption.

Conclusion

According to the results, it can be said that, poor lighting in the mentioned libraries is primarily due to the change in user. In addition, measurements indicate that, at some stations, the intensity is recommended higher than standard, but their average shows improper situation of lightening, so that improper alignment of the lamps causes this unfavorable situation. Library has been studied as case study and lack of proper design, improper selection of lighting sources, as well as the lack of timely maintenance lead to reduce lightening intensity and given the high importance of this issue, follow-up and regular proceedings of the relevant authorities could ultimately lead to create a desirable space in these places.

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Corresponding Author:

Reza Rostami²

Email: Rezarostami745@gmail.com