

# Assessment of Illumination Levels in Healthcare Facilities in Makurdi Metropolis

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## ABSTRACT

In this study, the illumination levels in some selected health care facilities in Makurdi Metropolis were assessed. The illumination levels at laboratories, nursing stations, postnatal recovery area, medication stations, patients' rooms, pharmacies and the surgical suite (operating rooms) of Bishop Murray Medical Centre (BMMC), Family Support Hospital (FSH), General Hospital North Bank (GHNB), Multi-Care Hospital (MCH) and Benue State University Teaching Hospital (BSUTH) were measured with luxmeter (LX101) in conformity to The British Standard specifications, BS 667:2005. Results reveal that for medication stations, examination and treatment rooms, surgical suites (operating room) and postnatal ward all the health care facilities failed as their illumination levels were below the IESNA standards of 807 Lx, 1615 Lx, 1615 Lx and 807 Lx respectively. However, only BSUTH conformed with the illumination requirement for laboratories, nursing stations and patients' rooms. In general the illumination levels in the health care facilities are very poor. Monitoring of illumination or lighting in health care facilities before and after licensure, establishment regulatory bodies like IES to ensure implementation of illumination standards in health care centers by the Federal Ministry of Health, use of low energy bulbs for luminaries instead of the usual tungsten-filament bulbs in hospitals and studies on the effect of health facility architecture on the illumination level are recommended.

**Keywords :** Illumination, Assessment, Hospital, Luxmeter, Workplace

## I. INTRODUCTION

Vision is a powerful human sense which provides information about the world around us. For the visual process to be effective, there need to be good lighting or illumination to enable people to carry out tasks which can range from the relatively simple to the highly complex. Vision informs us about the environment around us, not just in an objective way by determining or identifying features such as room's shape, size and coloring, also creating a psychological sensation which can include feelings of comfort,

security, stimulation and much more [1]. The relevance of proper illumination of Health care environments cannot be over-emphasized. Good illumination plays an important role in safeguarding health at work by enabling employees to perform their task comfortably and efficiently. Accordingly, adequate level of lighting is required in the health care facilities working environment [2].

Benefits of good lighting in health care facilities are improved psychological and physiological states for both patients and staff. Studies show that good

illumination can reduce mental and physical strain of patients, nurses and doctors[3]. Moreover, adequate illumination has been associated with improved mood, enhanced morale, lower fatigue and reduced eye strain. One of the important psychological aspects of good lighting is meeting the need for contact with the outside living environment[4]. The natural recovery rate of patients of some disease condition improves with exposure to adequate illumination. Alzheimer is one of such diseases conditions. Alzheimer's patients who are exposed to bright light during the day have improved circadian rhythms and are less prone to depression. The improved circadian rhythms reduces the stay of patients in Alzheimer[5].

Intensive Care Unit(ICU) in hospitals is stressful for patients and health-care-givers. Some patients can develop post operative delirium in a stressful environment which affects the intellectual ability of patients. Good illumination helps reduce the stress associated with this environment[6].

Health care environments are inherently challenging in terms of the critical task being performed. The patient, the nurse, the physician (including surgeons, anesthesiologists, dentists, therapists, dietician, X-ray laboratory technicians, house-keeping personnel, administrative personnel and visitors) require different illumination levels to accommodate their various functions and services[7]. Unfortunately very little considerations are given in determining lighting requirements in various health care facilities spread across Africa. And this venture is highly consequential. It has been observed that insufficient general illumination for routine nursing care or for cleaning the room, insufficient illumination for examinations, giving intravenous injections, changing dressings and other seeing tasks pertinent to patient's care in health care today harms too frequently and routinely fails to deliver its potential benefits [8]. Medical errors in hospitals as a consequence of a relatively poor physical environment (including insufficient lighting) are amongst the leading causes

of death in United States each killing persons more than AIDS, breast cancer, or automobile accidents[8]. These mentioned above are the consequences when Illumination Standards which are provided as minimum requirement for construction and licensure are over looked.

Lighting assessment is the examination of lighting condition in the workplace or environment. This assessment is done in order to: identify the potential hazards arising from the work activity under the lighting condition in the work environment such as insufficient illumination, excessive contrast, glare or flare; decide who may be harmed, evaluate the risk and decide whether improvement measures may be required to protect employees and provision of good of lighting[9]. Use of checklist and lighting measurements are the two approaches to lighting assessment. A checklist is a simple guide to health risk assessment, office environment series and lighting in offices produced to assess lighting condition in the work environment. With the checklist, lighting problems such as dim work environment, defective lamps, strong glare and reflections and possible solution to lighting problems are provided[2]. Lighting assessment by measurement involves measuring the illumination level (illuminance) in the work environment for the purpose of ascertaining the adequacy of lighting level for the task or activities involved. Illumination measurement has the advantage of providing objective, accurate and comprehensive information about the lighting condition in the work environment. This information will be useful to draw evidenced based conclusions and then formulate improvement measures.

It is observed that Illumination assessment records (information )like checklist are not found in major hospitals in Makurdi, Benue State and Nigeria at large do not exist. It is against this background that this study seeks to carry out a survey or assessment of illumination levels in some selected hospitals in Makurdi Metropolis .

To achieve this aim, five different most popular hospitals in Makurdi Metropolis were sampled for the study. Illumination levels in Medical laboratories, Nursing stations, Medication stations, Postnatal wards, patients' rooms, pharmacies and surgical suites of the selected health care facilities were measured with a Luxmeter (LX101) and then compared with the illumination standards of Illumination Engineering Society of North America (IESNA).

Among other significance, this study gives the actual illumination levels in the hospitals under review. This information gives the management of the hospitals a direction or yardstick in improving lighting in the various sections of the hospitals. This baseline information on the other hand is relevant to the Benue State Hospital Management Board(BSHMB) in the formulation of the regulations on lighting in health care facilities in the State.

## II. MATERIALS AND METHOD

Selected hospitals for the study were: Bishop Murray Medical Centre(BMMC), High level Makurdi. Bishop Murray Medical Center is a private owned Hospital/Clinic in Makurdi Local Government Area of Benue State, Nigeria; Family Support Hospital (FSH), Atiku Abubakar Road, Makurdi, Benue State. This is Benue State Government owned hospital;

Multi-Care Hospital Makurdi (MCH), is a private owned Hospital/Clinic in Makurdi Local Government

Area of Benue State, at Ogbaji Jonah Street, Behind Local Government Commission Makurdi; General Hospital, North Bank (GHNB), Makurdi, Benue State. It is a secondary health care facility which offers medical care services and Benue State University Teaching Hospital(BSUTH), Km 3 Makurdi-Gboko Road, Makurdi, Benue State. BSUTH was established in April 2005. It is a tertiary health care and teaching hospital which offers medical care services and training of medical students.

The illumination level was measured with Luxmeter, model LX101. This is a handy instrument with a sensor, the measured illuminance is directly displayed in lux (lx). The specifications of the Luxmeter conformed with British Standard, BS 667:2005.

In measuring illumination levels in the selected areas, four representative points on the work plane(0.8m-1.0m above the ground) were selected and the illuminance measured by placing the white- circular sensor area at the point of measurement facing upward and the illumination level displayed in lux (lx). The average of these measurements was taken as the average illuminance at the work place or position.

## III. RESULTS

The result of the survey of the level of the illumination are as shown in the table and bar charts shown below

**Table 1.** Illumination Levels at various sections of Hospitals in Makurdi.

Area/Activity	BMMC lux	FSH lux	GHNB lux	MCH lux	BSUTH lux	IESNA Standard(lux)
Laboratories	56.67	147.50	223.33	175.00	932.00	538
Nursing stations	330.00	85.00	100.00	40.00	482.00	323
Medication station	100.00	85.00	500.0	90.00	534.60	807
Postnatal ward	46.67	73.33	102.00	130.00	336.00	807
Patients' rooms	46.67	73.33	102.00	327.50	534.60	215
Pharmacy	108.00	26.67	173.33	23.33	587.00	807
Operation Room	86.67	73.00	192.50	75.00	341.75	1615
Corridors	11.67	440.00	65.00	14.00	462.00	215

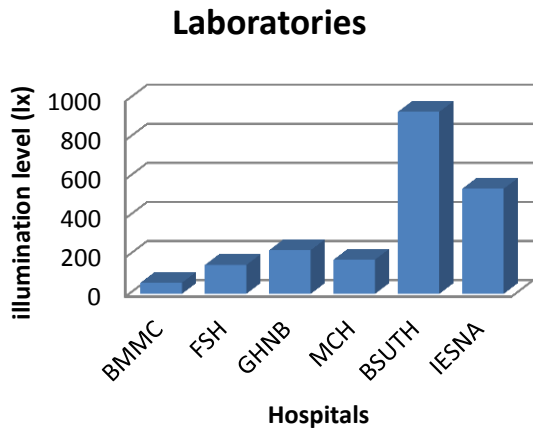


Figure 1. Illumination levels at Laboratories of selected Hospitals

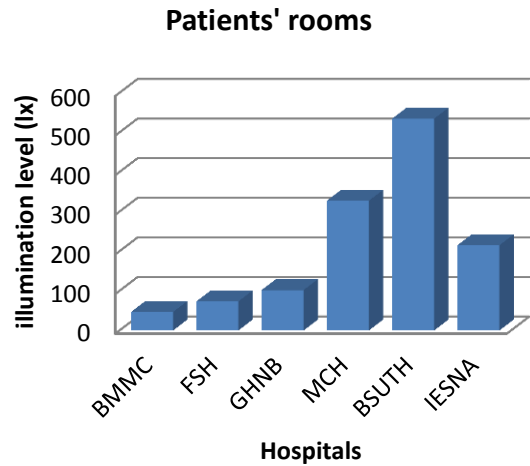


Figure 4. Illumination levels at Patients rooms of selected Hospital

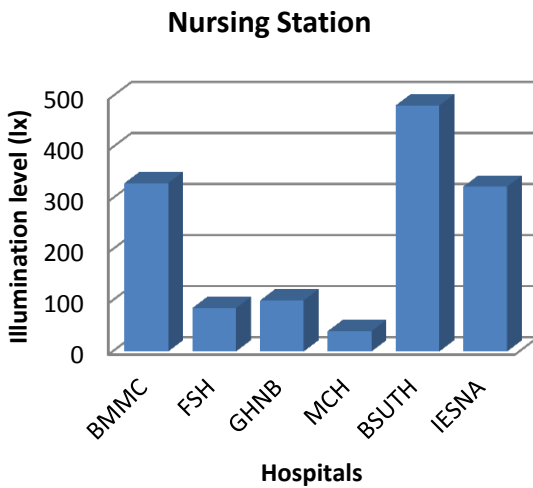


Figure 2. Illumination levels at Nursing Stations of selected Hospitals

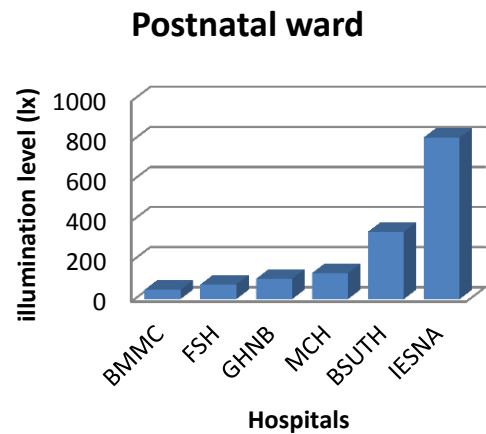


Figure 5. Illumination levels at Post natal Ward of selected Hospitals

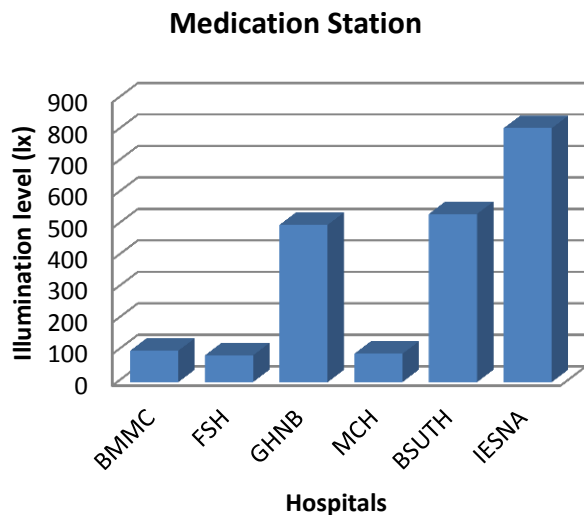


Figure 3. Illumination levels at Medication Stations of selected Hospitals

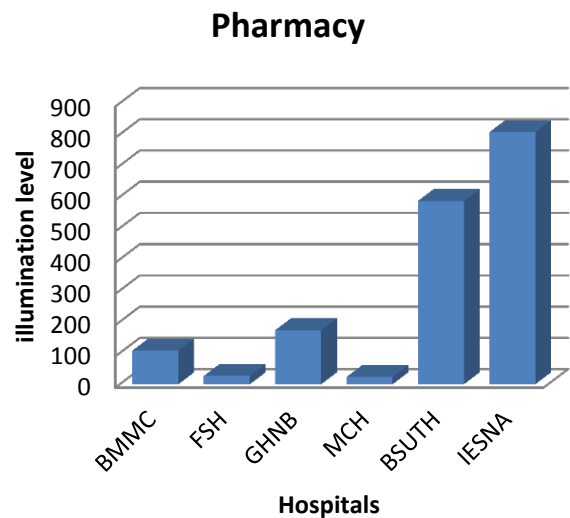
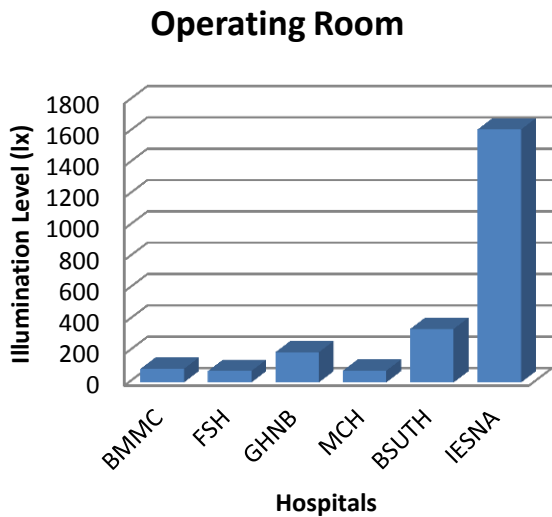
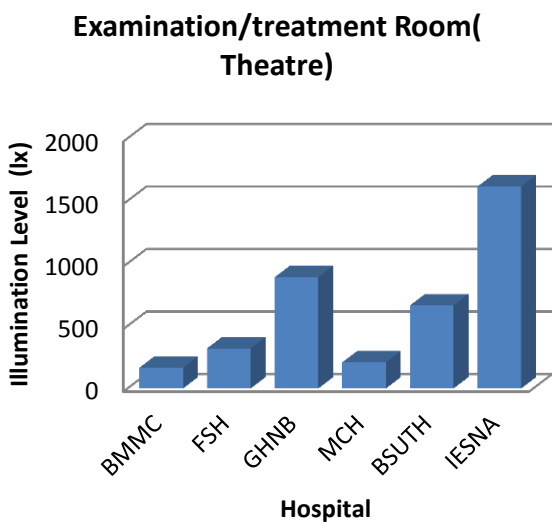


Figure 6. Illumination levels at Pharmacy of selected Hospitals



**Figure 7.** Illumination levels at Operating Room of selected Hospitals



**Figure 8.** Illumination levels at Examination and treatment Room of selected Hospitals

#### IV. DISCUSSION

The illumination levels at laboratories, nursing stations, postnatal recovery area, medication stations, patients' rooms, pharmacies and the surgical suite (operating rooms) of Bishop Murray Medical Centre (BMMC), Family Support Hospital (FSH), General Hospital North Bank (GHNB), Multi-Care Hospital (MCH) and Benue State University Teaching Hospital (BSUTH) were measured with luxmeter (LX101) and results compared the standards of

Illumination Engineering Society of North America (IESNA).

From table 1 and figures 1-8, it is observed that in the laboratories BSUTH met the IESNA standards for illumination. Whereas, the illumination levels in BMMC, FSH, GHNB and MCH fell below recommended standards. This indicates that only 20% of the sampled healthcare facilities met the illumination requirements. For nursing stations, BSUTH and BMMC met the recommended standards of illumination. This represents 40% of the sampled hospitals. Also, for the patients' rooms and BSUTH and MCH met the IESNA standards while only BSUTH met the illumination standards in the pharmacy. This represents 40% and 20% respectively for patients' rooms and Pharmacy's. For medication stations, examination and treatment rooms, surgical suites (operating room) and postnatal ward all the health care facilities failed as their illumination levels were below the IESNA standards of 807 Lx, 1615 Lx, 1615 Lx and 807 Lx respectively.

#### V. CONCLUSION

We can say conclusively that on a general note, the illumination level in all the health care facilities under review are poor as majority of the hospitals scored below the standard values of Illumination Engineering Society of North America (IESNA). BSUTH met a good number of illumination standards. This is a call for concern as the lighting in the hospitals is not adequate enough to ensure optimum care for patients. The healthcare givers on the other are pruned to mental stress and eye strain.

It is however suggested that, attention should be directed at the health care facilities and their operations monitored such that before and after licensure, health care facilities are well illuminated to meet the optimal level of illumination for efficient service in the hospital and to forestall any occurrence of accidents due to poor illumination. The Federal

Ministry of Health should enact special-intervention regulatory bodies for the implementation of policies related to illumination standards ensuring light illumination standards are met in all health care facilities in Nigeria for a step up in health care delivery. Luminaries employing the use of low energy bulbs should replace the commonly used tungsten - filament bulbs in all sections of health care facilities to obtain more brightness at a lower cost. The architecture of health care should be investigated into, studied and if possible improved to allow for better lighting in health care facilities. And finally, since light illumination is quite a sensitive subject, an illumination engineering society should be established in Nigeria to monitor and ensure that in public places like schools, lecture theatres, restaurants etc illumination standards are met by all means.

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