VENTILATION IN HOSPITAL BUILDINGS IN NIGERIA

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ABSTRACT

Ventilation in buildings generally is a major pre-requisite for general well-being of the users of that building or space. If the ventilation is good, it becomes a user-friendly space, but if it is poor, we have a space or building in which there is poor thermal comfort, stuffiness i.e. poor exchange of inside air with outside air, which encourages the spread of diseases and disease-causing organisms especially within the hospital environment, increased number of deaths due to easy spread of diseases and ultimately an unsuccessful project.

All these anomalies can be avoided through the application of some proactive measures in ensuring that good ventilation (artificial and natural), is embedded into the fabric of the design of the hospital building.
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CHAPTER ONE

1.0. Introduction

Hospitals are institutions or place or buildings where people go to so as to get diagnosed and treated for different kinds of ailments. It suffices to say that a lot of contagious diseases are airborne. If adequate measures are not taken to restrict air movement in some areas of the hospital, while indoor and outdoor airflow is enhanced in some areas, the patient who comes to the hospital could end up being infected with a new ailment or disease right there in the hospital. Therefore adequate attention should be paid to ventilation issues in hospital buildings so as to prevent such an ironical scenario.

Case studies were carried out in different private and public hospitals around the country combined with a lot of literature review on the internet and it was observed that the level of attention given to the issue of proper ventilation in hospital buildings in the country was on the low side. Architects, engineers and builders are culpable in this regard. Very important building elements such as windows are just designed and placed on building facades at random to provide natural ventilation and this is combined with artificial ventilation (HVAC) systems in a haphazard format without recourse to some basic principles and precautionary measures that take into consideration the special function of hospital buildings, which is to restore health and not damage health.
CHAPTER TWO


People can suffer and even die as they are exposed to diseases they did not have when they come to the hospital. Often there are things, we as hospital planners and engineers could have done to prevent those germs from being there in the first place. These disease causing organisms enter the building on air supply, feed on moisture produce, breed in reservoirs installed, and move about on vehicles we maintain. Air contaminants, which include fungus, mold, bacteria, inorganic, and organic matter, cause many problems from nuisance colds to fatal pneumonia. Legionnaire's disease, got its name from the 1976 incident in Philadelphia where 34 members of the American Legion attending a convention, died of that previously unnamed pneumonia. After much investigation, it was determined that the bacteria was distributed by the air-conditioning system. In this era of antibiotics, prevention of hospital acquired infections is too often seen as unimportant. It is commonly accepted that patients will sometimes suffer infections while in the hospital. A lot of these infections are fatal and many people die every year as a direct result of nosocomial infections. Patients equaling five percent (5%) of the total admissions to Nigerian hospitals suffer some sort of hospital acquired infection. At an admission rate of 30-40 million people per year that means 1.5-2 million people are being infected in our hospitals every year. The engineering, architectural or medical communities have put very little emphasis on designing facilities for maximum infection control. Often those who built the facility did so on criteria that were more concerned with cost and aesthetics rather than reliability, serviceability, or asepsis. It is no longer enough for hospital engineers and planners to blindly accept what they design as the best for patients care.

2.1 Causes of Poor Ventilation in Nigerian Hospitals

Going through random sampling of private and general hospitals, some factors were identified as being responsible for poor ventilation in hospital buildings in Nigeria. They are enumerated as follows:
i. Low level of awareness of the enormous health implications of poorly ventilated buildings.

ii. Non-participation by trained hospital infection officers in construction.

iii. Poor site orientation of hospital buildings.

iv. Poor spatial arrangement of hospital spaces.

v. The widespread use of non-purpose-built buildings as hospitals especially by the private sector.

vi. The consideration of financial constraints, which hinders the purchase and installation of HVAC systems and accessories.

vii. The use of low quality and outdated HVAC systems and accessories.

vii. The lack of sufficient healthcare facilities in Nigeria, which in turn causes high population density per hospital in Nigeria.

The factors listed above are explained in more detail viz;

- **Low level of awareness of the enormous health implications of poorly ventilated buildings:** the primary function of ventilation is the exchange of used indoor air with fresh outside air. When a building is poorly ventilated, the indoor air quality is compromised, the space becomes stuffy very easily and infections and microbial growth is encouraged. Architects, builders and engineers should be more in tune with the specific ventilation needs of each and every single space in a hospital project.

- **Non-participation by trained hospital infection officers in construction:**

  The lack of involvement of infection control officers in the construction process from the inception heightens the risk of infection in hospitalized patients. This prevents identifying potential infection control issues early and an opportunity to design solutions prospectively. Infection control professionals also play an important role in educating architects, engineers, and construction workers about potential infection control risks and appropriate methods for reducing them. Because infection control professionals are often the only personnel with a clinical background working on the
construction project, they need to visit the construction site frequently and completely understand the extent of the project. Because of the profound implications of inadequate oversight by infection control professionals, these expectations should be included in the hospital building contract. In addition, if the policies and procedures set forth by the infection control team are consistently ignored, the institution should fine the contractors. As part of the planning process for constructing a new facility, an infection control risk assessment should be conducted to determine the potential risk for transmission of microorganisms within the hospital. The association between construction and the development of aspergillosis in immunocompromised patients and other ailments has been known for decades.

- **Poor site orientation of hospital buildings:**
  Site planning plays a crucial role in the quality of ventilation that a hospital building gets. Depending on the climatic zone where the building is located, certain rules have to be followed when positioning the building relative to the site. For example, in the forest zone of Nigeria, the building should be placed in an east-west direction. Spaces like wards and offices should be at the north and south directions because these are positions of minimal heat build-up. However, it was observed that none of these principles were observed in the construction of many hospital buildings.

- **Poor spatial arrangement of hospital spaces:** our hospitals especially the private ones, lack good and efficient spatial arrangement. Some rooms even have one window, which hinders cross-ventilation, which is much needed in this climes. The most efficient hospital would contain private rooms, a private toilets and lavatory in each room; a central kitchen and serving station; central linen supply instead of linen rooms on each floor; elimination of long corridors; dumbwaiters direct from central supply rooms; and pneumatic tubes to carry written requisitions. No room should have more than four beds, and 41% of the rooms should be private or had only one bed. In addition, 10 private rooms surrounding central nurses' station to be designed for "intensive nursing care." This should include an ISPIN (isolation, pre- and postoperative care including intensive nursing) unit with all private rooms placed
between the operating room and the wards. This allows for "clean" surgeries to be separated from those with the potential of infection that is airborne.

- The widespread use of non-purpose-built buildings as hospitals especially by the private sector:

Government-built hospitals have been found to be the only ones which were purpose built in Nigeria, with the exception of a few private-owned hospitals. Every other hospital building seems to be a make-shift or temporary structure run by medical professionals in the private sector. There is absolutely no decorum when it comes to the choice of buildings to be used as hospitals. Spaces former used as hotels, residential living spaces, etc are rented or bought out rightly and used indiscriminately as hospitals. Some of these buildings are located in places where there is little or no spacing between adjacent buildings. Apparently, since the spaces were not planned initially to be used as wards or offices, the spaces become easily stuffy, uncomfortable, ventilation is hampered and the general indoor air quality is poor.

- The consideration of financial constraints, which hinders the purchase and installation of HVAC systems and accessories: artificial cooling and heating devices and systems are an essential part of hospital ventilation in the 21st century. The perfect functioning of some spaces like the laboratory are hampered without these devices. Such rooms should be sealable and airtight and conditioned so that it can function properly. Paucity of funds makes many hospitals forgo such provision even though it is not a luxury but a necessity.

- The use of low quality and outdated HVAC systems and accessories: even when these facilities are provided, care should be taken to maintain and upgrade them to the present day standards as some of them have varying degrees of side effects and can cause and spread infections on their own and have been replaced with newer models. Some of these provisions are ozone generators, which oxidizes pollutants, Air filters, which prevent the flow of air containing infectious particulates, air filtration is provided in Air Handling Units which filters particles, pathogens and
water droplets carried into the air, either from the coils and humidifiers or through leaks in the low-pressure side of the unit.

**Exhausts** which should be located at a minimum of 3 m above ground level and away from doors, occupied areas and operable windows. Preferred location for exhaust outlets is at roof level projecting upward or horizontally away from outdoor intakes.

**Intakes**, which must be located to draw in the best quality air. They must be away from vehicle exhaust, plumbing stacks, and any other contaminant source.

- The lack of sufficient healthcare facilities in Nigeria, which in turn causes high population density per hospital in Nigeria; it is a known fact today in Nigeria that healthcare facilities are in short supply. Even when these facilities are provided in the rural areas, they are often times ill-equipped. A lot of people in the rural and suburban areas have to travel very long distances to get fairly good medical attention. As a direct result of this, hospitals in the city are usually overcrowded and the number of people/occupants whether temporary or more permanent in the building per time puts a lot of stress on the ventilation facility. The functionality of the facility is defeated and air-borne diseases are easily spread in such a situation.
CHAPTER THREE

3.0 Problems Arising From Poor Ventilation

Some of the problems that could crop up as a result of the problems discussed above are:

i. Increased infection rate in hospitals.

ii. Increased mortality rate.

iii. Poor indoor air quality.

iv. Poor thermal comfort.

The factors listed above are explained thus;

- **Increased infection rate in hospitals:**

  Poor location of air intakes accommodates birds, are a major source of Aspergillus, one of the most common cause of infection in immunocompromised patients. Also, often AHU plenums are insulated from inside using fiberglass for noise reduction; several studies have shown that fiberglass is unsuited for use in the air stream. It absorbs moisture, has irregular surface that traps dirt, is impossible to clean, and releases inorganic respirable fibers. As a result, bacteria and mold thrive in the fiberglass and may even be transported to the patient on a fiberglass fiber. Also, coils in heating and cooling systems trap debris and moisture, which build up and mold and fungus will grow until no air will be able to pass through the coils. This buildup will serve as a reservoir that will release germs into the airstream.

- **Increased mortality rate:** due to the high level of germs present in a poorly ventilated hospital, such hospitals record slower recovery rate and lower survival rate of patients in their custody.

- **Poor indoor air quality:** Chemical pollutants, aerosols and odors are major health hazards in indoor environment. This causes allergies and sickness of respiratory tracts. High incidence of sickness due to allergies, asthma, fatigue, headache, cold and respiratory disorders are results of poor ventilation.
• **Poor thermal comfort:** As was earlier mentioned, when a hospital space is overcrowded. The functionality of the devices put in place to enhance ventilation, whether structural or mechanical, becomes hampered and their efficiency is reduced, causing stuffiness, sweating unpleasant odours and general discomfort.
CHAPTER FOUR

4.0 Conclusion

It can therefore be inferred from this paper that if both the private and public sectors join hands to apply the highlighted principles in this paper to provide good quality ventilation in hospital buildings in Nigeria, the joint effort can only culminate into an enhanced healthcare delivery system for Nigerian citizens which is at par with acceptable standards in the world and ultimately, higher life expectancy for all.
CHAPTER FIVE

5.0 Recommendations for Solving Ventilation Problems in Nigerian Hospitals

After digging into the causes and effects of poor ventilation in hospital buildings in Nigeria, it suffices to proffer solutions to correct the anomalies highlighted above. They are presented as follows:

a. More hospitals should be built to take the pressure off the limited healthcare facilities in the cities.

b. Good spatial organisation should be emphasised in the design and planning of hospital buildings in this country.

c. Good site planning and building orientation must also not be left out of the scheme of things in hospital design and construction.

d. Controlled spaces should be present in hospital design for particular specialist functions within the overall design to enhance quality of service to patients. For example laboratories should be and theatres should be fully air-conditioned and air exchange should be high in these spaces.

e. Infection health workers should be involved in the construction planning of hospitals from the inception, and they should be involved in giving advice to architects, engineers and builders during the design and construction stages of hospital projects.

f. Proper use and maintenance of HVAC systems should be encouraged in hospitals and among hospital staff so as to ensure good air quality within these buildings. This also includes the suggestion that up-to-date facilities that can cope with the challenges of the present day demands of Medicare are purchased and installed in the hospitals.
REFERENCES


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