NATIONAL EYE CENTRE
(Ophthalmic 300-bed Teaching Hospital)

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.....To the National Institute of
Ophthalmology in particular and
the people of Nigeria in general.

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THANKS BE TO ALLAH - THE LORD OF THE WORLDS!

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PREFACE

No known non-professional writer and busy architect finds the writing of a thesis dissertation of this nature simple. This book tries to look into the problems of eye morbidity in this country with a view to alleviating or completely eradicating some of them.

It is a well known fact that the average Nigerian lacks basic personal hygiene and this has led to the spread of many contagious eye diseases within the population. Cases of eye trauma resulting from the high rate of accidents on our lethal roads also contributes to loss of sight or problems relating to that. It is in view of the increasing cases of these problems and the lack of adequate provision of medical facilities to cope up, that the federal government decided to set up a national Institute of Ophthalmology containing in its nucleus a fully equiped ophthalmic teaching hospital for the training of consultants in the field.

What characterises the teaching hospital is its use as a workshop where the student physician learns the actual practice of his art, where he works under highly qualified clinicians observing and studying and under their instructions and supervision takes part in patient care. In order to achieve these through functional and architectural relationship, the author has employed the 'theory of contiguity' - a principle which is now popularly gaining world recognition in hospital architecture.

This principle allows all related functions to be contigous to each other in a horizontal plane thus improving the efficiency of the professional staff and

cutting travel distance of patients. The author has also at the back of his mind, the climatic consideration of the site. A system of internal courtyyards is employed so as to achieve natural light and ventilation. Adequate planting in these courtyards enables:

1. Control of glare
2. Cooling effect on the building
3. Softening the scale of the building
4. Adequate condscaping and proper treatment of open spaces.

INTRODUCTION

The object of this thesis proposal is to make an investigation of the adequacy of the existing medical and health facilities as it relates to cases of eye morbidity in Nigeria.

It is obvious from research study of existing health care services, that the eye, though small in comparism to the total body is one of the most important and complex organ of the body whose malfunctioning can cause unbearable distress or even lead to loss of sight, thus rendering a person permanently disabled. This can greatly reduce ones production ability. It is in the light of this great function of the eye and its complex nature that it had been separated from the Eye, Ear, Nose and Throat (EENT) branch of medicine and treated as a speciality known as ophthalmology.

It is ironical to note that in a country where cases of eye morbidity is high, this special branch of medicine has not received adequate attention by the government resulting to an estimated figure of 2 million blind population and growth rate of 10%.

In Nigeria, like most countries of Africa, over 80% of the population live in rural areas and rely on agriculture as a means of living - thus their welfare is of major economic importance to the nation but in general its this population that remain underprevileged, illiterate and poor. Health facilities in rural areas are so poor that there are few doctors who work there or who understand the relationship between the people,

their crops and their health. It is this neglect by government towards provision of adequate health services especially that related to the eye that there is an undesirable rise in the population of disabled blind. This has greatly paralysed the output of these rural farmers and resulted into production not keeping in pace with the rate of growth of population. The discovery of oil in the country which is now the main source of economy saved us from a catastrophy of femine and malnutrition.

Communicable eye diseases caused by far the most serious health harzards in the country. Acute infections diseases such as measles in infants is one of major causes of blindness. A number of factors are thought to contribute to the prevelence of communicable eye diseases in Nigeria. These factors include the tropical climate, poor hygiene and over-crowding in cramped living conditions enhancing a quick spread of epidemics in both the rural and urban areas.

The Teaching hospital will definitely play a vital role in improving eye health care services in the country as it will form a nucleus where clinical research and consultations, training of consultant ophthalmologists and other paramedical staff in ophthalmology will be carried out. A survey conducted by the author of some eye hospitals in the country show that complicated cases of the eye diseases require special technical facilities for operation and radio-therapy. These cases are usually referred overseas for special treatment. When this teaching hospital

is in operation, it will contain highly advanced and specialised equipment facilities for teaching and training programs so as to cope up with any form of complications of the eye which, in a teaching hospital of this nature, are referred as "clinical teaching material". Parenthetically, in any consideration of hospital planning, it should be manufest that the doctor is the pivotal factor in health services, that therefore, provision for the doctor's education is an essential part of the planning of medical care - and that, consequently, the planning of medical teaching facility is an essential part of medical facility planning.

In order to integrate the various components of hospital care system - arranging them to compliment and support each other so that they work in unison, the author derived his ideas and information from secondary sources - consulting books written by hospital consultants, and primary sources through case studies of existing similar structures, needs and requirements of the clients and other similar sources.

The first part of this report gives the reader an insight of a brief history of hospital planning from the past to the present design trends. General information concerning the various categories of hospitals - from the rural health centres and district hospitals forming the "Primary health program" to the "tertiary" or teaching hospitals usually affiliated to a university for the training of medical doctors and research work on medicine. The following chapters

treated the methods in hospital planning with a detailed study on the requirements of various departments and their inter-relationships with each other. Case studies of existing eye hospitals was conducted and conclusions drawn which enabled the determination of sizes and number of some departments. The last part of the report mainly explains the methodology and design criteria, condition of the site and its physical features and the role of the national eye centre in the medical advancement of the country.

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CHAPTER 1

HOSPITAL PLANNING - A brief history

It is an elementary instruction during primary school years that mans three essential basic needs are food, shelter and clothing. A closer study of man from his beginnings will however show that alongside these basic needs, is the fundamental instinct for health care.

In early times, medicine and healing were linked with the gods, hence the traditional medicine man (the witch doctor) who claimed to have the powers of healing was considered to form a link between man and the 'displeased gods'. Hospitals appeared in the middle ages resembling temples merely as places where the 'poor' are housed and cared for when sick or injured. The concepts of rational planning and logical arrangement of sequences based on function were not studied. This pattern of planning continued up to the Renaissance period.

The real beginnings of hospital planning based on scientific and functional relationship came up in the laft 18th and early 19th century with the introduction of the 'PAVILION' type plan where patients are segragated into smaller groups to ensure natural light and ventilation. There was orderlines and simplicity of the plan with clear, simple streettype pattern of circulation and functional grouping of elements.

This philosophy of natural light and ventilation dominated the 19th century until the introduction of the theory of 'MIASMA' in 1860's resulting from the

spread of cross infection attributed to gases or 'miasmas' generated by organic filth hence attention was paid towards reviewing the ventilation problem and distances between buildings.

> "The idea of having two floors with the patients wards on top of the Pavilion system was introduced and a device of mechanical system (hypocaust) for ventilating the wards from the ground floor was adopted."

Flourence Nightingale in 1859 published her studies in 'Notes on Hospitals' based on her experience as a nurse questioning the miasma theory - suggesting that defects of the then existing hospitals lay mainly in their inadequate lighting, ventilation and over - crowding of the sick. She suggested precise areas and dimensions of some rooms and positions of the toilets leading to what was generally accepted for nearly eighty years as the 'Nightingale ward'. This is characterised by a long corridor with beds by the sides of the walls and a nursing station centrally located for clear vision and the toilet at one end. The treatment room, doctors consultating room, clean and dirty utility rooms on the other end of the hall.

Scientific discoveries of the late 19th century in the field of medicine had great significant in the treatment and nursing of the patient.

The physician and the nurse reduce to be mobile treating and nursing gradually separate, each requiring specific locations and functional relationship and the

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"Hospital Architecture and Beyond"
Page 25, Year of Publication - 1969
Isodore Rosenfield.

philosophy of low horizontal 'Pavilion' type gave way to the present 20th century model of the vertical monoblock. In the meantime discoveries in the medical field by scientists greatly changed what hospitals used to be viewed - as charitable institutions for the common man in the street, while the well-to-do man stays at home when sick and the private physician visits him with his black bag. Development of sophisticated equipments in the diagnosis and therapeutic services, the use of X-rays and also the discovery of aneasthesia enhancing surgery without pain makes the operation of the hospital so complex and specialised that a thorough scientific and functional analysis of its operations needs to be conducted to enable the organisation of the departments in an architectural relationships.

In the vertical monoblock type, the out-patients department and other facilities for diagnosis like the X-ray and the pathology departments are placed on the ground floor while the first floor will house the surgical suite and special therapeutic facilities. The nursing units are on the upper floors while hospital ancillary services - kitchen, laundry, Central Sterile Supply Department (C.S.S.D) etc are on the ground floor. The advantages of the vertical monoblock is that horizontal distances are reduced to a minimum and vertical supply of materials from ancillary to the nursing stations to the upper floors by life service become more efficient.

> "However the 'monoblock' require mechanical means of ventilations and vertical transport. Also there is the problem of so many lift services for clean utility, dirty, medical staff e.t.c. resulting in prolonged waiting and also risk of mechanical failure or fire out-break."

This is only suitable in developed countries where there is no fear of power failure and land is limited. In developing countries such as Nigeria where land is abundant its always safer to spread horizontally as far as the site can permit and to rely on natural light and ventilation.

More recently there has been a marked return to the horizontal concept in the developed countries like the United States because of its striking advantages over the vertical monoblock. The concept is to spread horizontally as far as the site can accomodate.

Health Care Services in Nigeria

Its the intention of every nation, rich or poor to be able to provide health care services to the totality of its population both in the urban and rural areas. Whatever is the stage of development of the society, adequate health facilities are now viewed as the right of every citizen as this plays a vital role in stimulating economic growth and the development of

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a nation. This is because people will look foward to their future with optimism and confidence hence offer their best to the development of the nation.

Its in view of this significant role of the hospital as social institution for nation building that the federal government of Nigeria embarked opon a scheme of tertiary health care programme. In this scheme, teaching hospitals with affiliation to a medical school in the major universities of the federation form the nucleus where clinical consultations, clinical research work and clinical training of young Nigerian doctors in the field of general medicine and surgery is carried out. There is also at the national level a scheme for the establishment of national research institutes where research work on certain branches of medicine or disease is conducted. An example of this is the National Institute of Tripanesomiasis Research at Kaduna conducting research work on Onchorcerciasis (River blindness) and sleeping sickness.

The state governments are however responsible for the provision of health services in the rural and urban areas. In the rural areas, mobile clinics, rural health centres and district hospitals are scattered to cover the needs of the population. Since in Nigeria the majority of its population about 80% live in the rural areas, its most commendable to provide a system of low cost health care facilities to reach every corner of these areas. Usually such health centres

are cheaper to construct and manage as no provision for special diagnostic and teatment facilities such as Radiology and Pathology departments are made. Cases that require special diagnosis and treatment are referred to state district hospitals from where it can be handled or further referred to a teaching hospital or specialist hospital.

Majority of the eye diseases that lead to blindness in Nigeria are curable if proper health facilities and medical personnel in ophthalmology were made available to the country's demand. This statement is justified by the Report prepared by Dr. Boddins in 1952[1]. The result of this inadequacy both in scope and effectiveness of health care facilities in the country is evident in the two million blind population and a growth rate of about 10 - 12 percent.

Infections eye diseases mostly cause by bacterial or viral infections are the common causes of blindness in the Northern part of the country. The fact that such eye diseases are contagious makes it easy to spread within the population. Areas around the rivers Niger and Benue i.e. the middle belt lie within heavy Onchocerciasis (River blindness) zone. An insect which breeds around riverine areas carries the germs and spread the disease within the population. This disease is responsible for about 62% of the blind population around the middle belt. A similar survey on the Western and Eastern regions of the country showed

[1]Dr. Boddins conducted a research on causes of blindness in Nigeria. His work covered rural areas in the Eye Hospitals in the Western and Eastern Regions - See Table 4.

that 60% of the blind population resulted from conjuctivitis and eye trauma.

Most of the eye clinics existing in the General Hospitals are illequiped and not manned by Specialist Ophthalmologists. Only the old established teaching hospitals contain departments of ophthalmology with required medical personnel and reasonably equiped with the necessary diagnostic and therapeutic services. However a lot of cases that cannot be handled by these teaching hospitals mostly due to lack of special diagnostic or therapeutic facilities are referred to overseas for special attention.

Lack of basic personnel hygiene is responsible for a lot of eye diseases in Nigeria. This enhances the spread of a lot of contagious eye diseases. Also the case of onchocerciasis or River blindness can be completely eradicated by controlling the breeding places of the insect that spreads it. There is also the increased cases of eye trauma resulting mostly from the high rate of accidents on our lethan roads due to over speeding and careless driving. A lot of Nigerians loose their sight as a result of accidents on our roads. The problem is further compounded by acadamicians who consume a high proportion of reading glasses whose main eye problems are defects of refraction such as myopia (short sight) and presbyopia (long sight).

It is in view of those factors enumerated above that the federal government deemed it necessary to set up one natinal Eye Specialist teaching hospital. This will enable local training of post-graduate medical

consultants in ophthalmology for the country's yarning needs. The centre will contain facilities for both curative and preventive medicine so as to alleviate the sufferings of the people and check the rate of growth of the country's blind population.

The Eye and Psychology of Seeing

We are so familiar with seeing, that it takes a leap of imagination to realise that there are problems to be solved. But consider it. We are given tiny distorted upside down images in the eyes, and we see separate solid objects in surrounding space. From the patterns of stimulation on the retinas we perceive the world of objects and this is nothing short of a miracle.

The eye is often described as like a camera, but it has quite unlike. camera features of perception which are most interesting. How are information from the eyes coded into neural terms, into the language of brain and reconstituted into experience of surrounding object. The task of eye and brain is quite different from either a photographic or a television camera converting objects merely into images. There is a temptation, which must be avoided to say that the eyes produce pictures into the brain for a picture in the brain suggest another eye to see it. This is absurd. What the eye really does is to feed the brain with information - coded neural activity - chains of electrical inpulses - which by their code and patterns of brain activity represent objects.

Each part of the eye is an extremely specialised structure. The perfection of the eye as an optical

instrument is a token of the importance of vision in the struggle for survival. Not only are the parts of the eye beautifully contrived, but even the tissues are specialised. The cornea is special in having no blood supply, blood vessels are avoided by obtaiining nutriment from the aqueous humour. This is fortunate for it makes possible transplant of the cornea.

CHAPTER 2

THE SITE

Location - Kaduna

Questions may be asked as to why such a National Eye Centre is not sited in the new Federal Capital - Abuja, but Kaduna. It is an established fact derived from statistical analysis that the site - Kaduna is centrally located in the region of highest incidences of eye diseases i.e. areas north of rivers Niger and Benue. Therefore, the greatest need for ophthalmic services and for clinical research is in these areas of which Kaduna happened to be a geographical centre. It is at the same time near the new Federal Capital - Abuja.

Absence of major physical limitations and the availability of basic physical and social infrastructure in terms of provision of good road network, telephone and power lines, water supply and human resources depict Kaduna as the most suitable site for the project.

Furthermore, the present Kaduna domestic Airport is one of the busiest in the country, as such referred emergency cases of eye diseases from any part of the country can be quickly and efficiently conveyed to the centre which is also sited very close to the domestic Airport. The new International Airport currently under construction is also close to the site of the centre.


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a's Basic Fra ework

Kaduna's framewo f regional roads resembles a pitch-fork. The shoulder of the fork forms the Capital's central line, (Zaria Road and Ahmadu Bello Way) destined, as soon as the new bridges are built on th ger and Benue Rivers, to become the main route from the far north to the deep South and East of geria. Meanwhile the main road to Lagos (the handle of the fork) merely brushes the outskirts Kaduna but does not penetrate its heart. The two eastern prongs, twenty miles apart, lead to Jo d Kachia. Between them flows the Kaduna river, the source of water for the flourishing textile

Referred cases from neighbouring countries can also access the site by the International Airport.

Kaduna, capital of the then Northern Region and now Capital of Kaduna State lies geographically on latitude 10° - 36'N and longitude 7° 36 'E. It is located fairly in the centre of the Northern States of Nigeria. Its basic climatic data indicates a long wet season starting from the month of May to October. The months of November to February is the period of Harmattan with temperatures falling to 45°F in the month of January. Visibility is very poor due to the strong, dry, dusty harmattan wind originating from the Saharan desert. Highest temperature of the year is recorded (95 - 105°F) in the month of April during the dry season.

The Site

The piece of land of about 400 hectares is situated between the rivers Gora and Mashi, to the Northwest of Kaduna town, on a commanding hill top with a panoramic view of the city. The land was acquired by the Federal Government for the National Institute of Ophthalmology. The site is relatively a flat hill top with a maximum slop gradient of about 2.0%. The ground slopes gently towards the river Mashi Valley.

To the North of the site, about 5km away is the Kaduna Domestic Airport, to the East is the spread of the Nigerian Defence Academy. A high - voltage NEPA transmission line cuts the site diagonally from South-West side.

Site Micro-climate

The site is a virgin land with no human structures for a radius of about 2km. The ground cover is generally low shrubs with few scattered trees. Site located on a commanding hill top surrounded by the rivers Mashi and Gora. Invading, strong, dusty Harmattan wind prevailing in the months of December to February sweeps across the barren site. Proper planting in the North-East side to protect the site by blocking the wind. Excessive glare from the direct sun-rays and severe heat gain due to excessive reflection from the hill top. Cool, favourable South-West wind prevailing from the months of May to November suitable for human comfort.

CHAPTER 3

ROLE OF THE NATIONAL EYE CENTRE

The Teaching Hospital

As the technical and scientific demands of medical care grow more complex, and medicine grows more diverse and comprehensively responsible to human and social needs, the specialist hospital and the teaching hospital with affiliations to a University form the nucleus where research and training of medical personnel is carried out.

"What characterises the teaching hospital is its use as the workshop where the student physician learns the actual practice of his art, where he works under highly qualified clinicians, observing and studying, and under their instructions and supervisior, takes part in the care of patients."

In the past, when science of medicine was less advanced and treatment less complex, the architectural requirements were less demanding and planning the hospital to serve as a teaching tool as an integral part of the hospital process was not considered. As a result of the growing complexity of modern medicine both in technological and scientific advancement, the teaching hospital is now viewed as a compromise between the needs of the patients and those of the taught.

The centre when fully commissioned will contain as its nucleus a 300-bed ophthalmic teaching hospital for the training and research of post-graduate ophthalmologists, diagnosis and treatment of eye diseases and the supply of optical appliances, a post-graduate medical school for the training of interns and residents, training facilities for orthoptists, ophthalmic technicians and health personnel in preventive ophthalmology. The centre will also play the role of administering other eye hospitals in the country. The centre will also contain the staff housing estate, recreation facilities, shopping centre and religious buildings.

Briefly, the Eye Centre seeks to provide:-

(a) Post-graduate teaching hospital in ophthalmology for clinical consultation and supply/production of optical appliances.

(b) Post-graduate ophthalmic medical school for the training of consultants and research work.

(c) Training facilities for:

- Ophthalmologists
- Orthoptists
- Ophthalmic technicians
- Ophthalmic nurses
- Dispensing opticians
- Health personnel in preventive ophthalmology.

(d) Research facilities in all aspects of ophthalmology, visual, clinical and experimental using animal house.

(e) Conferences and seminars

(f) Establishment and administering other eye hospitals throughout the federation.

THE NURSING UNITS

The patient care unit being the building where the hospitalised patient is accomodated from admission to discharge is considered as one of the most important units in the hospital design followed by the doctors' workshop - diagnosis and therapeutic departments.

The major task facing todays hospital planners and consultants is how to create facilities, in the face of modern trends in medical technology and automation, that will preserve the personal contact between the patient, the doctor and the nurse, as well as to watch and properly maintain critical cases in the nursing units.

The problems of ward design were first given critical look by a British nurse Flourence Nightingale when she published her studies and recommendations in 'Notes on hospitals' in 1859. In her recommendations, she gave a limit of 32 patient-beds per ward and a space allowance of 1,500 cu.ft. The beds are arranged perpendicular to the wall with a nursing unit centrally located for proper observation and the toilets positioned at the extreme end of one side of the ward. She also observed that due to bedside treatment of patients by the nurses, chances of cross infection

amongst patients was greatly increased as such, a treatment room, dirty and clean utility rooms were recommended.

> "There cannot surely be a greater contradiction in the nature of things that a disease produced by a hospital."

It was also observed that due to inadequate ventilation in the hospital, it has encouraged chances of cross-infection, therefore a thorough cross ventilation, not overcrowding the ward and the provision of isolation rooms should be introduced so as to check chances of cross-infection.

These recommendations were accepted by hospital planners and enjoyed world-wide recognition and the Nightingale ward resulted for the subsequent seventy years that followed. Cost of living, as a result of the growing world economy due to industrial revolution, and the need for privacy in ward planning becomes an essential factor. Partitioning of the ward into units containing smaller number of beds was introduced. This has created some form of privacy in the ward.

The present day concept of ward design incorporating the "Nurserver" and other innovations by the famous hospital consultant - Gordon A. Friesen

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"Studies in the Functions and Design of Hospitals"
page 57
The report of an investigation sponsored by the Nuffield Provincial Hospitals Trust and the University of Bristol.

has enabled complete elimination of the nursing station. The great advantage of this is that the efficiency of the nurse is increased as all non-nursing activities are eliminated and the nurse has all her time with the patient.

> "It is considered almost axiomatic that the only proper nursing care is that in which the nursing staff does virtually nothing but minister to the patient."

The quotation above suggests and the author agrees that the only way to achieve this is by freeing the nurse from all non-nursing activities, put in her hands all the instruments and keep her in close contact with the patient.

The author tries to incorporate the modern trends of ward design by integrating the 'nurserver' introduced by Gordon Freisen in the reviewed Nightingale ward, thus ariving at a compromise between function and philosophy of natural light and ventilation. 'Nurserver was incorporated in the design of the intensive care units, but generally the phylosophy of natural light and ventilation dictated by the nature of the climate condition of the site was adopted in the design. The 'T' concept of ward design is selected as most

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suitable to conform with the overall concept of the hospital and accomodate both nursing teaching and training functions.

The various nursing units in the eye teaching hospital are categorised as follows:-

- Medical ward
- Surgical ward
- Pediatric ward

The wards are further categorised into male and female ward and within each ward there are isolation rooms for patients requiring special treatment.

Planning Methods

Size

The size of nursing unit is determined by the nurses' ability of care and observation. Planning specialist puts a figure of 30 - 40 patients per nursing unit as adequate.

> "Some nursing authorities reason that the smaller the unit, the more intimate the nursing service, others argue that the size of the nursing unit has nothing to do with quality of nursing...."

For an effective nursing service and organisation, 25 patients per each nursing unit is

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Quotation from the "Freisen plan at work"

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considered most adequate by the author so as to reduce overcrowding in the ward.

The structure of nursing unit in the eye hospital should be determined by the following considerations:-

- climate
- cost of construction and maintenance
- relations with other departments.

The Partient's Bedroom

There is no multi-purpose space in the hospital requiring planning attention than the patients bedroom as it serves the various functions of dinning, receiving visitors and even treatment area. In the case of the eye hospital great attention has to be paid at control of glare effect and dust. Proper handling of the sunsheilding device to check and control the effect of glare.

Ward Ancillery

Clean and dirty utility rooms enhanced the separation of the two works so as to reduce chances of contamination of sterilised materials. Doctors room and treatment room plus a seminar room for teaching purposes are all incorporated in the ward planning programme. Provision of visitors waiting spaces and day spaces for ambulent patients such that they are not confined to their bed for 24 hours a day are all elements of the good planning of the ward.

ANCILLERY SERVICES

C. S. S. D

This department supplies all necessary sterile products required by these service departments:-

- Surgical suite
- Pathology
- Nursing units
- Out-patient department.

Its location therefore should be such that effective and quick collection and distribution of soiled and sterilised equipments is enhanced. The different processes involved in this department include

- Receiving and sorting
- Washing and drying
- Packing
- Sterilizing
- Storing
- Distribution.

In planning this departments, the following factors need to be considered.

- Efficient and proper work flow
- Economy of labour
- Separation of soiled and sterilised materials
- The entire operation of the unit should be supervised by the officer in charge located at a stretegic station.

LAUNDRY

All soiled and dirty linen mostly from the nursing units and operation suites are brought and handled in the laundry where they are washed, mended, marked and redistributed. Linens that require sterilisation like the ones used in the surgical suite are taken to the central sterile supply department for that effect and from there redistributed to the affected departments.

The laundry can be categorised into two work area by way of their functions.

- Dirty work area where soiled and dirty materials are treated. Sorting compartment to handle the various types of soiled materials which are then fed to washing machines.
- Clean work area where all the treated products are assembled dried ironed, mended, stored and redistributed to various departments.

In order to cater for the functions mentioned above, the following facilities needs to be provided:-

- Collection and sorting
- Main washing area
- Mending room
- Dry work area for pressing

- Clean linen store
- Distribution area.

The house keeping section of this department deals mainly in general cleaning of the hospital. It plays as such a very significant role as high standard of cleanliness has to be maintained in a hospital. The unit handles all sanitary supplies and general cleaning of the hospital surroundings.

The unit should have:-

- general store for cleaners
- work room
- storage for materials office for house keeper.

Hospital Central Stores

The central stores functions as storage areas for goods purchased in bulk and used in small quantities. The hospital purchasing unit is also located here.

Facilities to be provided for include:-

- Pharmacy main stores
- Food store
- Furniture
- Hospital equipment

The following offices also needs to be included.

- Officers for clerks/supervisors
- reception room.

KITCHEN

The hospital kitchen caters for both the employees and the inpatients and relies on the central stores for its supply of raw materials.

Considerations as regards is location should be given to the nursing units and the staff cateteria for short travel distances to offer services.

Adjuct Diagnostic/Therapeutic Facilities

A considerable proportion of the patient care is given by the adjunct diagnostic and treatment services which provide aid or supplement the physician in carrying out his work. This division of the hospital is also termed as the 'doctor's workshop' containing highly specialised technical equipments and medical personnel offering special diagnostic and therapeutic services to the patient.

All services offered in these departments are secondary, only upon the prescription of the physician for further investigation to aid in diagnosis of offer special therapy to the patient.

The departments include:-

- Surgical suite
- Radiology
- Clinical laboratories
- Electro diagnostic
- Orthoptics
- Flouroscein Angiography
- Refraction/contact lens

DIAGNOSTIC AND THERAPEUTIC DEPARTMENTS

The diagnostic and therapeutic departments in a teaching hospital can be referred as the workshop or laboratory where the student physician learns the actual practice of his art, under close supervision of highly trained and qualified clinicians. Adjunct specialised facilities such as the clinical laboratories, aid the physician in diagnosis since in a teaching hospital majority of the referred cases require extensive laboratory study of special therapeutic facilities. Each department in this section is treated in detail and design requirements with functional relationships with other departments studied.

Radiology Department

This department ranks with the clinical laboratories as a prime diagnostic aid, serving patients only prescription by the attending physician. The department serves both bed and ambulant patients, therefore should be readily accessible to the nursing units and out-patient department. The department is mainly divided into two:-

- Diagnostic X-ray
- Radiation therapy

Diagnostic X-ray

The essential function of this section is to take shadow pictures of the vital parts of the body for

diagnostic purposes. At the entrance to the department, a reception and records area should have waiting space for embulant patients to sit and trolley waiting area for in-patients in the recods area, clerical work takes place, record keeping and film storage. Radio - diagnostic rooms accomodate the X-ray machines and fluoroscopic machines. Workrooms, film viewing rooms and offices for radiologists should be provided.

In determining the number of radiographic rooms adequate for the eye teaching hospital, it is important to consider the following points:-

- The estimated number of determinations for hospital bed patients
- Some for ambulant patients
- The percentage of special eye problems requiring X-ray

It is important to note that only trauma injuries of the eye require diagnostic X-ray.

Radiation therapy

This is a technique whereby radiation used reduce or eliminate carcinogenic cells. The radiation is generated either by natural source such as radioactive cobalt or by man-made as in linear accelerator. This method of therapy is used in the treatment of certain cancer of the eye. Heavy sheilding is required to prevent leakage of dangerous radiation.

Procedure room with shielding mazes should be large enough to accomodate equipment plus access for patient on stretcher/trolley. Spaces for reception waiting, examination, treatment planning, mould making for shielding the patient during treatment and office for physicist should be provided.

Patients are taken into equipment room and so positioned that the source of radiation converge to the part of the diseased eye. The attendant then retires to the control room from which patient can be observed through heavy lead glass porthole. The procedure can be very frightening for a patient.

Clinical (Pathology) Laboratory

This department is the busiest and often the largest of the adjunct facilities where numerous diagnostic, teaching and research tests are carried out. The general planning and equipment criteria are not very different from those of other kinds of laboratories. The clinical laboratories are generally classified into:-

- Ocular Pathology
- Ocular Biochemistry
- Hematology
- Microbiology
- Histology

Ocular Pathology

This is the study of gross specimen of diseased elements. As a general term pathology here means the science or study of the nature of disease of the eye (ocular).

Ocular Biochemistry

Is the study of the chemistry of living tissues and fluids of the eye. Much of the routine testing is done on mechanised equipment and the patient has to be brought here to examine the eye as the specimen.

Hemetology is concerned with the study of the functions and disorders of blood. Part of this section deals with testing of blood for transfusion received from donors and equiped with blood-bank.

Microbiology includes parasitoloty. It is the study of the nature, life and actions of micro-organisms. Most of infectious disease relating to the eye are caused by bacteria or virus. Histology is the microscopic examination of cellular pattern of diseased specimens, usually done with smears on glass slides or paper thin sections cut from specimen.

Electrodiagnostic Department

This department contain highly sophisticated equipments specialised in the detection and recording the electrical activity of the eye. It is mainly

divided into two parts:

Electro-Oculography (EOG): This is a method of recording eye position and movements by using electrodes placed on the skin adjacent to the lateral canthi to detect a standing potential difference between the front and back of the eyeball.

Electro-Retinography (ERG) is the recording and study of retinal action currents.

Orthoptics, Refraction and Contact Lens:- These are related units mainly concerned with defects in binocular vision, in the action of ocular muscles or of faulty visual habits. The orthoptic department is equiped with ultra-sound scanner that provides cross-sectional pictures of the eye and the structures around and behind the eye by beaming pulses of sound into the eye area. An electronic machine converts the sound echoes into signals which appear on a television screen.

Open eye examination lanes and refraction eye lanes for testing of correct medical glasses in the optical department where manufacturing examining and fitting of contact lens and other medical visual appliances is carried out.

Flouroscein Angiography

This department is mainly concerned with radiography of vessels or lymphatics. Flouroscein solution, infected

through the vein appears as a coloured pigment in the blood capilleries of the eye. Photographs are then taken which when printed gives the descriptions which aid in diagnosis. Ocular tension recording is also made.

Surgical Suite

The nineteenth century development of the anti-septic and later the aseptic techniques led to spectacular achievements in the field of surgery. Modern aseptic techniques and equipments are now in routine use all over the world and have dramatically reduced the risk of sepsis in operating theatres.

General Planning Considerations.

The planning and design considerations of hospitals most technically complex department cannot be exhaustive. An operating department is a unit consisting of a number of operating theatres with ancillary accomodation, providing the most effective therapeutic services in the hospital.

Flow patterns for people, services and air with a view to avoiding causes of infection reaching clean areas are crucial. Mechanical system of ventilating critical areas such as the theatres are pressurised to minimise entry of air-borne contamination. It is

microbiologically acceptable to provide a single corridor serving for circulation of both people and materials. Windows attached to the theatres should be avoided, however external view has some psychological benefit to the surgeons minimising the inevitable clinical and highly technical environment of the department. This can be achieved by allowing barrowed light across a corridow or by achieving pleasant view to external green areas from the staff's rest room.

The department should be intimately tied to the surgical nursing units and should be located off the main hospital corridor (street).

> "It was recommended that to ensure quite and minimise air-borne infection, the whole suite should be planned as a culde-sac off the hospital main corridor...."

The surgery department in a teaching hospital usually includes an observatory operating theatre equiped with closed circuit television facilities for recording the procedure of the operation, discussions and comments of consultant surgeons during and after operations. All these information can be watched by the interns and residents for training and teaching purposes. Though improvements of modern trends in medical technology and automation enhance and facilitate teaching methods, nevertheless, the need for personal contact between the consultant physician,

the patient and student resident is the most effective means of training. So the demonstration operating theatre, where complicated operations of clinical teaching interest are handled, should be made bigger to accomodate a number of student residents who observe and assist the surgeons and in the process learn their art.

Number and size of operating rooms is determined by the total number of surgical beds in the nursing units and the nature of operations to be carried out. A simple formular for determining the number of operations per year is as follows:-

$$\text{No. of operations} = \frac{\text{Total No. of Surgical beds} \times \text{percentage of bed occupancy} \times 365 \text{ days}}{\text{Average length of stay.}}$$

The Out-patient Care Division

Hospital out-patient services are being increasingly utilised by the population as an essential element in the contribution of hospitals to the total health picture of the community. Hospital beds are expensive and cannot be supplied to all those that need diagnosis and treatment in a hospital. Beds are costly to build and maintain and it will be an economic waste to utilise in-patient care when out-patient services would suffice. The hospital out-patient department is defined as:-

> "That section of the hospital with allotted physical facilities, regularly scheduled hours, and personnel in sufficient numbers assigned for established hours, to provide for care of patients who are not registered as in-patients receiving physician, dentist or allied services."

The above definition clearly shows how the out-patient care division opposes the in-patient care services from an organisational structure point of view. It is wrong to view the out-patient care as "ambulatory care". This is because not all out-patients are ambulatory and some in-patients(in the case of an eye hospital, majority of the in-patients are fully ambulant) are ambulatory.

"Facts and Trends on Hospital Outpatient Services"
Year of publication - 1964.

U.S. Department of Health, Education, And Welfare
Public Health Service.

The different units that form the out-patient care division include:-

- Outpatient units (clinics)
- Emergency services unit
- Medical records
- Preventive Health Care Unit.

Out-patients department provide consultation, investigation, diagnosis and treatment for those patients requiring little or nc recovery services afterwards and are not admitted to acute ward. Most patients attend session at specific clinic by appointment.

An out-patient is a person given general or emergency diagnostic, therapeutic or preventive health services provided by hospital facilities or health programme, and who at a time is not registered as an in-patient. There are basically three categories of out-patients:

1. General outpatient
2. Refereed outpatient
3. Emergency outpatient

General outpatient is a person given diagnostic or therapeutic services, on an outpatient basis, for other than emergency condition, and who has not been directly referred for such services by his attending physician.

Referred outpatient is a person directly referred by his attending medical practitioner for specific diagnostic or treatment procedures, for other than emergency condition.

Emergency outpatient is a person given outpatient emergency or traumatic care, for conditions determined clinically as requiring immediate physician attention.

There are two types of out-patient visits:

1. New outpatient visit
2. Repeat outpatient visit

New outpatient visit - a visit by a person who appears for the first time or within a specified period of time which is concurrent with reporting periods for inpatient admissions.

Repeat outpatient visit - a visit by a person who appears within specified period of time (appointment) subsequent to a new outpatient visit.

The outpatient clinics

Those various units responsible for general and specialty management of designated diagnostic and treatment procedures. General design requirement include receptionist counter and a large main waiting area for male and female patients. A records counter should be placed close to the entrace hall and general waiting area for issue of cards and fixing of appointments.

The design of Doctor's Consulting/ [nation Room in the case of eye hospital require s minimum of 6.0m viewing lanes. Another itive is to have •or arrangement, such that bl disti ice *of* viewing lane is required. It is however preferrable to have bigger consulting rooms, since this is a teaching hospital, spaces should be made bigger to accomodate students and allow clinical teaching and demonstration to be carried out,

A large hall is also required in the outpatient department where lectures and demonstrations *on* preventive, restorative and personal hygiene is conducted. Physical medicine is also a unit of the O.P.D.

Emergency Services Unit

The relationships of the Accident and Emergency Department (AED) can be compared with that of Intens Care Unit to the inpatients. The A.E.D. should be a sensitive and vital part of the O.P.D. functionally and organisationally.

The two types of patients are those seriously sick or injured in an accident brought in by an ambulance, and the walking *or* 'casual' sick. In the cases of the former, a short direct route to a fully equipped resuscitation room is essential.. The patient y then need an X-ray or surgery. The X-ray should be

contigous to the A.E.D. for emergency services. The surgical suite is usually placed on first floor contigous to the surgical nursing units. The A.E.D. should also be close to the surgical theatre but generally placed on the ground floor. A common compromise is to provide an emergency operation theatre contained in the A.E.D. However some hospital consultants oppose to this idea because of duplication of sophisticated surgical equipments and professional staff. However in the case of the ophthalmic teaching hospital, such duplication of facilities does not occur because the A.E.D. provide facilities for only traumatic therapy. The operation theatre is thus equipped with facilities for traumatic surgery only avoiding unnecessary duplication of both staff and equipments.

A "day ward" is recommendable in the Accident and Emergency Unit to avoid unexpected work load in the nursing units.

> "It is crucial that the A.E.D is always open, always staffed with doctors and nurses, and with consultants on cell. Compact planning should enable the staff to carry out all their duties with a minimum of walking and ensure that patients in the observation unit are not over looked."

"Facts and Trends on Hospital Outpatient Services"
Year of publication - 1964

U.S. Department of Health, Education and Welfare Public Health Service.

A drive - in reception is preferrable to ensure speedy transfer of patient out of the ambulance to resuscitation or examination room.

Medical Records Department

This department forms the most important link between the out-patient care and the administration. The staff deal with registration appointments and transport at the O.P. reception point. Records of both inpatients and outpatients are analysed and kept for a statutory minimum of six years. A statistical analysis of the records is now a growing need in hospital as valuable information can be derived from it.

Planning requirements include a large room where clerks issue cards and fixing of appointments at the reception hall, large store where records are kept, offices for medical records officers, statistical analysis room. The department should form a link between outpatient waiting hall and the administrative block.

Teaching and Research Facilities

Hospitals which are affiliated to a medical school or university and are thus involved in undergraduate or postgraduate training form a special problem not often encountered. The teaching hospital is considered as a workshop or a laboratory where the student physician learns the actual practice of his art.

> [1]"The teaching hospital is a compromise between the needs of the patients and those of the tought."

In a teaching hospital, added to the complex problem of the hospital itself, there is that of the student physicians, thus requiring increased spaces for the circulation and teaching facilities of the students.

> [2]"In quantitative terms, the difference between a teaching hospital and a community hospital of the same number of beds can be expressed by the PHS planning rough estimate that the teaching hospital requires 35 to 40 percent more space."

All departments in the teaching hospital should have teaching and training facilities in form of equipments and spaces. The informal aspect of training

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[1]"Hospital and Medical School Design" International Symposium, Dundee, 1961.

[2]"Hospital Architecture And Beyond" Page 126 Isadore Rosenfield.

must be stressed as valuable teaching may take place while teachers and students are on bed-rounds in the nursing units as such corridors should be made wider with provision of hodes where students are likely to gather for short discussions of cases of interest.

Formal teaching inside the hospitals takes place in seminar rooms, workshops, demonstration rooms etc. distributed in virtually all the departments.

Interns and Residents

The intern and resident doctor staff, popularly known as the house officer forms the core of any teaching programme in the ophthalmic teaching hospital. In the patient care division the house staff should be provided with charting spaces and conference rooms where they can form for discussions.

Most postgraduate education is intimately tied to a research block. Postgraduate students or fellows provide much of the research staff and are a primary source of consultants and research scientists. The hospital library play a vital role to both students and professional staff for studies and research work.

Research block

In the research block, there are two divisions which should be horizontally contigous to each other and should be linked to the animal house.

The two divisions are:-

- Clinical Research Unit
- Animal Quarters

Clinical Research Unit

This division deals with clinical aspect of the research work. Research on certain types of complicated eye diseases like cancer of the eye, cornea transplant, onchocerciasis e.t.c. Planning requirements include experimental laboratories, examination/treatment rooms and consultation rooms. Only specialists on certain eye diseases man this unit. In England and the United States some eye hospitals treat only certain aspect of the eye e.g. Retina hospital where only abnormalities of the retina are treated by retina specialists.

Animal Quarters

In the animal quarters, samples of eye from animals are experimented opon and the results are observed. Animals common by used are rabbits, monkeys etc. Specimen of virus or bacteria injected to the animal and the type of infectious eye disease that resulted observed and studied. Such tests require experimental laboratories and animal cages.

CHAPTER 4

CASE STUDIES

GUINNESS EYE CLINIC - KADUNA

Case studies of some existing eye hospitals in parts of the country conducted by the author furnished the necessary data required to analyse and make comparisms and deductions as to the work loads of the professional medical staff, nature and degree of occurrance of some eye diseases, required number of beds per head of population effectively served and other relevant information. Also a survey of referred cases of eye diseases to overseas for special treatment was conducted.

GUINNES EYE CLINIC - KADUNA

No. of doctors in the O.P.D = 15 Residents
5 Consultants

No. of operation theatres = 2

Workload of a consultant perday = 50 patients

No. of hospital beds = 55 beds

Average length of stay = 12 days

Cases that are referred overseas for special diagnosic and treatment.

Surgical cases:-

- Retinal detatchment
- cancer

non surgical:-

- Radiotherapy
- Electrodiagnostic Investigation.

YEAR	ATTENDANCE O.P.D.	ADMISSIONS	DISCHARGE	AVERAGE LENGTH OF STAY	TURN OVER INTERVAL	% OF OCCUPANCY	DEATHS
1978	58549	1775	1763	10	1	92	1
1979	58524	1568	1576	11	2	84	-
1980	61294	1441	1411	9	0.8	94	4
1981	58098	1557	1619	11	1.3	89	4

Staff Organisation

A. Professional staff

5 consultant ophthalmologists

15 resident doctors

6 surgical technicians

2 aneasthesiologists

B Nurses and Technicians

6 Senior Nursing Staff

11 Staff Nurse

Para-medical staff

4 Optical Technicians

5 Aneasthetic Technicians

Non-professional staff

12 non-professional staff.

This eye clinic is a unit of the department of ophthalmology, Ahmadu Bello University Teaching Hospital, Kaduna. Some of the diagnostic equipments also serve for teaching aid for the training of young medical students in general medicine and surgery. Referred cases from State General Hospitals and Ibadan Teaching Hospitals are brought to this clinic for diagnostic and treatment.

ECWA EYE HOSPITAL

This is a private eye hospital with a total of 175 bed, the biggest of its kind in the northern states.

Most patients who cannot wait for the services of the Guinness Eye Clinic which is the only well equiped and experienced eye hospital around and free services, they all go to this private hospital where they pay for good treatment. This hospital is being managed by a christian organisation.

CASE STUDY

No. of doctors in the O.P.D. = 10 Residents
6 Consultants

No. of operation theatres = 2

No. of hospital beds = 175 beds

No. of wards = 5 wards

Categories of wards

a. Male Surgical
b. Female Surgical
c. Male Medical
d. Female Medical
e. Amenity Ward.

Work load of a consultant per day 20 patients

Cases that are referred overseas for special diagnosis and treatment.

Surgical cases:-

- Retinal detatchment
- Cancer
- Glaucoma

YEAR	ATTENDANCE O.P.D.	ADMISSIONS	DISCHARGES	AVERAGE LENGTH OF STAY	TURN OVER INTERVAL	% OF BED OCCUPANY	DEATHS
1978	46,559	5251	4766	9	2	89.7	8
1979	48,822	4177	3397	6.5	1	69.8	5
1980	56.065	3513	3360	10.6	1.2	84.3	2
1981	40,860	4899	4518	10.3	2	85.0	1

Non-Surgical

- Radiotherapy
- Electrodiagnostic Investigation
- Ocular Sonography

Heiracny of staff

Professional Medical Staff

6 Consultant Ophthalmologists

10 Resident doctors

4 Surgical Technicians

1 Aneasthesiologist

Nursing Staff

12 Senior nursing officers

7 staff nurses

40 nursing sisters

Para-medical staff

17 Optical technicians

6 Laboratory technicians

4 Aneasthetic technicians

Non-professional staff

24 Non-professionals - Cleaners, porters, Cooks, etc.

CONCLUSIONS

From the statistical data drawn for the past four years of operation of these two hospitals the following important conclusions are made:-

(a) Due to lack of sufficient equipments and special facilities the average length of stay of 12 days is longer than necessary

(b) Due to insufficient qualified medical personnel, the average work load of 40 patients per consultant per day is too high to cope with resulting to quick and improper thorough investigations.

(c) Inadequate number of hospital beds in the wards to cope with the rate of patients requiring admissions resulted into short turn over intervals of less than a day.

(d) Lack of special diagnostic and therapeutic facilities in these hospitals led to simple treatments requiring no special skill like Radiotherapy has to be referred overseas for attention which is more expensive.

SPACE DETERMINANTS

Number of Out-Patient Clinics

Assume 20 patients referred per day from each of the 19 states of the federation.

If a consultant takes an average of 15 mins. per patient, then per day he would see a total of 32 (for 8 working hours/day). To man the O.P.D. clinics we need about

$$20 \times {}^{19}/_{30}$$

$$= \quad 18 \text{ doctors}$$

Since this is a teaching hospital, student residents will man 10 ordinary clinics where screening of patients with the supervision of consultants is carried out. The rest of the 8 clinics will be manned by the specialist consultants under close watch of the students residents. Thus we have:-

10 ordinary clinics

8 special clinics

Number of operation theatres

The number of hospital beds has already been considered to be 300. Then in a 300-bed hospital assume 150 beds for surgical

150 beds for medical.

∴ No. of operating theatres to serve 150 beds:

No. of operations/year =

$$150 \times 85\% \text{ occupancy} \times {}^{365}/_{11} \text{ days average stay.}$$

$$= 4584 \text{ ops/year.}$$

No. of operating rooms =

$$\frac{4584}{286 \text{ day} \times 4 \text{ ops/room/day}}$$

= 4 operating theatres

In addition to that, considering the role of the hospital as a training place for consultants the need for a demonstration operation theatre is highly recommendable as such the author decided to include a special observatory operating theatre with modern viewing galleries and facilities for closed circuit television system to record the activities during operation for teaching purposes.

Total No. of ops. theatres = 5

DISEASE	RURAL AREAS IN NORTHERN STATES	MEDDLE BELT	SOUTHERN STATES
ONCHOCERCIA-SIS	50 %	62 %	4 %
CATARACT	13 "	7 "	6 "
TRACHOMA	3/4 "	10 "	18 "
GLAUCOMA	10 "	7 "	5 "
OTHERS	1/4 "	9 "	50 "

DR. BODDINGS REPORT ON SURVEY OF CAUSES OF BLINDNESS IN NIGERIA - 1962

GEOGRAPHICAL SPREAD



From the report of Dr. Boddins on Causes of Blindness in Nigeria it can be concluded that River blindness occurs most around the region of the middle belt. This is so because the insect that spread this disease breeds along the river sides. This insect is responsible for the fast spread of other diseases such as sleeping sickness and cattle trypanosomiasis. Intensive work on the eradication of river blindness on the federal capital territory area has been carried out by the Federal Ministry of Health and according to their report, the area is now free of onchocerciasis. Presently, the National Institute of Trypanosomiasis Research based in Kaduna is conducting research work on major rivers in the northern states where this

insect breeds and carrying out an intensive eradication programme to wipe out this insect.

Most of the eye problems from the southern part of the country are congenital cases. Conjunctivitis of the eye is a common disease found in this region. Few cases of infectious eye problems are recorded. In the northern part of the country, most of the cases are related to infectious eye diseases such as trachoma, cataract etc. Viral and bacterial infections of the eye spread by the dusty harmattan wind resulted into greater percentage of the blind population.

CHAPTER 5

Design Methodology

Research study in hospital design shows two concepts in the trends of hospital architecture:

(a) the pavillion hospital

(b) the vertical mono-block

The pavillion hospital is characterised by long corridors known as 'hospital streets' where all other departments are attached at right angles to it. In this concept of design, it allows natural light and ventilation thus suitable for tropical climate conditions. The only disadvantage of this concept is the long noisy'hospital streets'.

The 'vertical mono-block' minimises the long travel distances within hospital departments. The other advantage is the optimum utilisation of the site. However mechanical means of ventilation has to be employed. Expansion becomes more difficult requiring special technical ability.

Design Criteria: The criteria of the design occur from the site constraints which include microclimatic considerations, topography and shape of the site, expansion possibilities and also the complex operation of the teaching hospital. Compact planning using a system of courtyards is introduced to provide avenues

planting of trees and green areas. Adequate planting serve for:

(i) muffling of noise

(ii) soffening the scale of the building

(iii) effecting desired coolness of surroundings.

(iv) blocking dusty harmattan winds

(v) sun-shielding device

(vi) interesting views of open green spaces.

Structure: The normal structural system for hospitals i.e post and beam with grid deck as roofing is used. In the out-patient care division, a module of 4 metres was used for convenience in the sizes of consultation rooms and seminar rooms. A module of 3.5 metres was used in the nursing units.

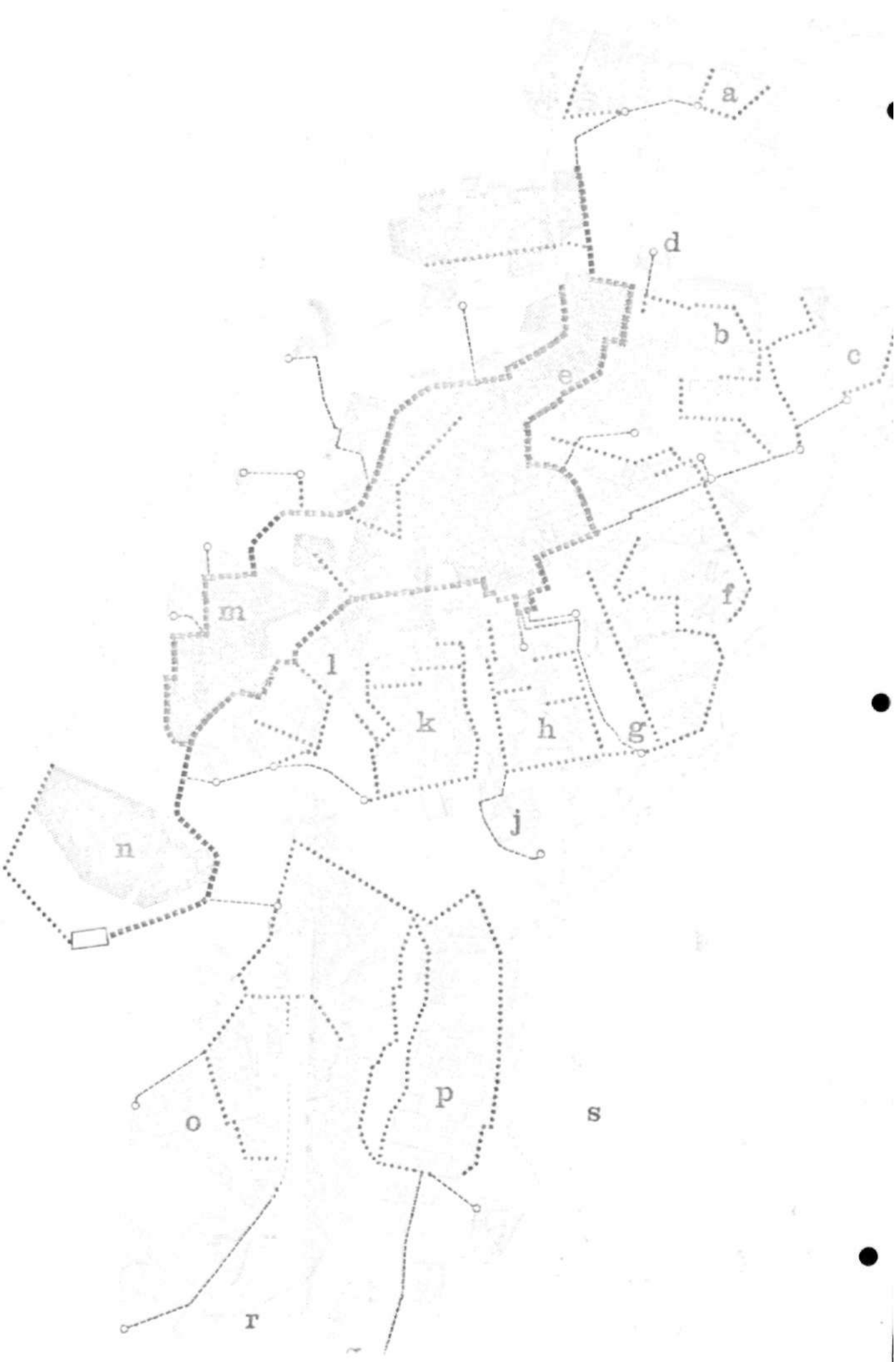
Mechanical services: The special treatment of ventilation system using central air conditioning in the surgical suite and electrodiagnostic department was introduced. Hospital lifts are introduced wherever essential. Special bed lifts are introduced in the nursing and O.P.D.

Expansion: The hospital is not envisaged to require more than 50% expansion. In the triangular core of the out-patient care division, the expansion is restricted to vertical direction. The ward blocks are capable of carrying two more floors and can

expand in linear direction.

Handrails: All corridors, walkways and staircases contain hand rails to guide patients who may be partially blind.

Sewage: Sewage is by gravity drainage system from the property lines of the centre. Drain connections are carried to nearest pumping station situated near River Mashi. From there central pumping mains will carry sewage to the Gravity Trunk Sewers.


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The Contiguity Principle

Research study conducted by the author on functions and inter-relationships in hospital architecture yields "the contiguity theory" which is now ganing worldwide recognition. In this theory, all closely related functions of the various hospital departments should be tied together in a horizontal contigous plane. In this manner, long travel distances between related departments is reduced and vertical movements using staircases, elavators e.t.c is completely eliminated.

Contiguity Principle Applied

(a) The National Eye Centre

The whole project, embarked upon by the Federal Ministry of Health in its tertiary health care programme, consist of the following:

(a) Post-graduate medical school

(b) Research unit in ophthalmology

(c) 300-Bed ophthalmic teaching hospital.

The relationship in this centre is such that all related functions are tied together in a contigous horizontal system of cerculation using corridors. This rationalises and simplified movement of patients, professional staff, students and supplies. In this manner, a doctor can do much of his day-to-day activities - patient rounds, clinical and pre-clinical teaching, work in the diagnostic and therapeutic departments e.t.c in the same horizontal plane. The rythm is not broken with stair case or elavator trips. The research block ties the post-graduate school to the ophthalmic teaching hospital. An auditorium is located on the gound floor of the research block with the central medical library on the first floor.

(b) Out-patient care division

The out-patient care division is the busiest quarter of the hospital comprising of a number of departments which include:

(i) Out-patient department

(ii) medical records department

(iii) hospital administration block

(iv) X-ray department

(v) clinical laboratories

(vi) pharmacy department.

To achieve horizontal contiguity in the above listed related departments of the out-patient care division, a triangular concept is introduced to tie them together at the same time reducing long travel distances. On the first floor of the out-patient care division lie the clinical research quarters comprising of a number of specialised diagnostic/therapeutic and research units.

Screening takes place in the out-patient clinics mainly performed by the 'residents' and 'interns' under close supervision and instructions of consultant ophthalmologists. Complicated cases of diseases of clinical training interest referred to as 'clinical teaching materials' are screened and taken to special consultation/seminar rooms where students will learn.

Diagnostic & therapeutic departments.

All other diagnostic and therapeutic departments are located on the ground floor of the nursing units to cut travel distances. The surgical suite is located on the first floor of the pharmacy department.

In-patient Care Division

The Nursing Units:

All nursing units are on first and second floors of the diagnostic departments in three separate blocks for acoustic control. They are all inter-connected by a system of corridors. There is a gentle sloping ramp in the central block for evacuation of non-ambulant patients in cases of emergencies such as fire out-break.

The 'T' concept of nursing unit design was adopted by the author for convenience lecture rooms in the short stem.

Ancillery Services

Ancillery service departments comprise mainly of the following:-

(i) central kitchen

(ii) maintenance workshop

(iii) central medical stores

(iv) laundry

(v) Incinerator, Boiler/Generator house.

A close study of these departments shows that there is either a high fire-risk or high noise generation or both in all of them. In order to minimise noise in the quite areas of the hospital i.e the nursing units and the diagnostic and therapeutic departments, and reduced the risk of fire outbreak, the ancillery departments are located as separate blocks away from the hospital connected by a system of corridors. A appropriate planting to muffle the noise generated by these departments is relevant.

CHAPTER 6

ACOUSTICS AND SOUND CONTROL IN HOSPITALS

Noise in hospitals present a serious problem to both patients and the medical staff. Hospitals have been becoming steadily noisier as a result of its growing complexity and lack of concern to control unwanted noise in hospitals. There is more nursing and medical activity because more patients are in acute condition and sources of noise have increased. In the case of a teaching hospital there is an added generation of noise from students on the move or as they form to argue and discuss a point of interest.

> "There is more walking, more transport especially by trolley - more mechanical equipment and there are more sanitary fittings."

The Chief sources of noise in hospitals identified during a sound measurement survey conducted jointly by the investigation and Building Research Station include:-

(a) - the corridors

(b) - door openings

(c) - sanitary fittings

Studies in The Functions And Design of Hospitals. Page 115.
Nuffield Provincial Hospitals Trust.

(d) -noisy departments (ancillary services)

- central kitchen
- laundry
- incinerator, boiler, generator house
- maintainence workshop
- C.S.S.D.

Large multi-storey hospitals (the vertical mono-block) present a more serious problem as a result of compact planning bringing all sources of noise closer to the patient.

Sound generally is controlled by minimizing noise at its source, by isolating or muffling structure-borne reverberations caused by impact, by providing sound reducing walls and floors between the sources of noise and the patients, and by applying absorbents to surfaces in areas where noise is likely to occur. Many of these noises result from and are emphasised by the hard hygienic surfaces which are generally required in hospitals. This is so because most of common sound-absorbing surface treatments are not popular with the medical profession as a result of their germ-harbouring possibilities. Special treatments, however, such as thin non-porous films over soft absorbent material - overcome this problem and are now commonly used in the United States of America. The use of these absorbent materials can

be most helpful and they should certainly be used in corridors and circulation spaces. They should, however, not be used in wards because they can increase the intelligibility to an embarrassing degree.

Every item used in the finishings and fittings should be considered to see if some resilient material could be used to replace a hard one. To check noise in corridors and other circulation spaces, the floor finishings should be sound a absorbent material such as cork tile which has pleasant - looking surface. A carpet in the 'day space' where convalescent patients stay, further absorbs the noise there. The use of ceilings of various absorbent materials are commonly used in hospitals. All dors should be fitted with silent closers. Swing doors are preferable in very busy rooms such as the treatment rooms, though they only provide spatial sound-barrier. All other doors should be provided with an automatic closing device. The door is free until it reaches apoint with a few inches of the door frame where an overhead mechanism takes charge and shuts it gently against a cushioned jamb.

The insulation of walls between rooms in general, except where neither require protection from noise, should be at least 40 dB. If a room of high noise level such as the ward kitchen, occurs next to a room

requiring very quite conditions such as the intensive care rooms, the insulation should be at least 45 dB. Floors between wards should preferably have an overall insulation of 50 dB. Noisy service corridors in the nursing units are separated from that of the medical staff. All nursing units are on first and second floors to avoid the noisy and congested ground floor corridors. The same treatment is applied to the surgical suite which is on first floor of the pharmacy department.

All noisy ancillary service units such as the laundry, incinerator, boiler, generator house and the animal quarters in the research section are sited in remote areas to prevent noise disturbance.

Also, proper landscaping and planting of green areas play an important role in muffling noise.

Fire Protection in Hospitals

The predominant fire risk in hospitals is to human life. Unlike occupants of many other buildings, in hospitals many patients are not ambulant and must be helped to safety. This problem is further emphasised in an eye hospital where patients cannot see properly.

Therefore particular emphasis should be on preventing fire outbreaks in hospitals.

> "....this is ensured chiefly by safe storage and handling of combustibles and the proper installation and maintenance of equipment. It is equally important to ensure that any outbreak can be quickly detected and attacked at once....."

There is, however, the risk that a small fire outbreak may grow into a serious one. The design must be such that fire is prevented from spreading within buildings by providing separate compartments with fire check materials between them. The provision and proper planning and construction of adequate means of escape from all parts of the building are alse required.

Hospitals should be so designed as to reduce fire outbreaks or spread from one part to the other by

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division into compartments of all departments having high life - risk i.e the nursing units, and those with high fire-risk like the main central medical stores, kitchens, laboratories, boiler house laundries, maintenance shops etc. Most of these ancillary service units should be preferable treated as separate buildings to reduce chances of fire spreading to buildings attached.

SCHEDULE OF ACCOMODATION

	Department	Area $(M)^2$	Total Area/Dept
A	OUTPATIENT (O.P.D)		3,890.0
	- Waiting Areas	1800.0	
	- Entrance Lobby	60.0	
	- Public Lecture Hall	150.0	
	- Consulation/Treatment	150.0	
	- Doctors Common Room (2 No)	100.0	
	- Snacks/Coffee	100.0	
B	PHARMACY		
	- Day Store		
	- Cold Store		
	- Prepacked Storage		450.0
	- Compounding		
	- Mixing		
	- Dispensing		
	- Issue/Waiting/Toilets		
	- Chief Pharmacist		
C	RADIOLOGY		
	- Diagnostic Radiologist		
	- X-ray Rooms	150.0	800.0
	- Dark room/X-ray Therapy	180.0	
	- Seminar		
	- Examination Room		
	- Records		
D	CLINICAL LABORATORIES		
	- Ocular Pathology		
	- Ocular Biochemistry		1400.0
	- Microbiology		
	- Hematology		
	- Histopathology		
	- Blood Bank		
	- General Laboratory		
	- Toilets/Waiting Areas		

E	ACCIDENT & EMERGENCY		
	- Waiting/Reception		
	- Resuscitation		
	- Exam/Consultation		844.0
	- Treatment Rooms		
	- Theatre		
	- Day Ward		
	- Toilets		
F	ELECTRO DIAGNOSTIC		
	- Electro Retinography		
	- Electro Oculography		750.0
	- Visually Evoked Potential		
	- Ultra Sound		
	- Future Holography		
	- Laser Room		
	- Exam/Treatmenr Room		
	- Seminar Room		
	- Waiting/Toilets		
G	FLOURESCEIN		
	- Dark Rooms		
	- Camera Rooms		
	- Film Archieves		550.0
	- Exam Rooms		
	- Seminar Room		
	- Toilet/Waiting		
H	REFRACTION		
	- Refraction Eye lanes (10 No)		620.0
	- Consultation		
	- Seminar		
	- Workshop		
	- Repairs		
	- Toilets/Waiting		

I CONTACT LANES		
- Examination/ Fitting		
- Records		650.0
- Offices		
- Laboratories		
- Workshop		
- Seminar/Lecture Room		
- Toilet/Waiting		
J SURGICAL SUITE		
- Operation Theatres (5 No.)		
- Recovery Space		
- Anesthesia		
- Seminar		1500.0
- Scrub Up		
- Autoclave		
- Staff Changing		
- Staff Rest Room		
K CLINICAL RESEARCH		
- Cancer Unit	625.0	
- Cornea Unit	520.0	2800.0
- Retina Unit	650.0	
- Glaucoma Unit	400.0	
- Experimental Laboratories		
- Examination Consultation		
- Treatment Rooms		

L ADMINISTRATION		
- Director - Conference Room - Board Room - 8 Big Offices - 4 Small Offices - Medical Records		950.0
CAFETERIA		1,440.0
- Dinning - Kitchen	840.0 600.0	
LAUNDRY		500.0
MORTUARY		250.0
BOILER HOUSE		700.0
VEHICLE & MAINTENANCE		750.0
INCINERATOR/FUEL		250.0
GENERATOR		120.0
MEDICAL STORES		440.0
CENTRAL STERILE SUPPLY DEPARTMENT. (C.S.S.D)		313.0
RESEARCH BLOCK - Animal Quarters - Study Spaces - Library		
POST GRADUATE SCHOOL - Administration - Lecture Rooms - Auditorium		

CASES OF COMMON EYE DISEASES IN NIGERIA
FROM 1978 - 1981

APPENDIX 1

DISEASES ..	1978	1979	1980	1981	1978 - '81 TOTAL
ONCHOCERCIASIS	8343	10287	10922	9342	38,894
GLAUCOMA	9484	6770	7287	7995	31,536
TRACHOMA	3713	3110	5232	4972	17,027
CATARACT	11277	11923	8827	8773	40,800

HOSPITAL MORBIDITY OF NOTIFIBLE EYE DISEASES
IN NIGERIA FOR YEAR 1980

APPENDIX 2.

	OUT-PATIENTS			IN-PATIENTS		
	M	F	TOTAL	M	F	TOTAL
EYE TRAUMA	72,568	52,881	125,451	1975	793	2,768
CONGENITAL	5342	3342	78,627	620	485	1,105
CANCERS	151	113	264	20	37	57

Sources (Tables 1 & 2) and Tables 5 & 6)
Federal Ministry of Health - Lagos.

REFERRED CASES OF EYE MORBIDITY FOR SPECIAL TREATMENT OVERSEAS - 1981

APPENDIX 3

HOSPITAL	RADIOTHERAPY	CANCER	OTHERS
ECWA-KANO	11	5	3
GUINNESS-KADUNA	23	17	9
Q-QUARIA-LAGOS	48	31	12

DR. BODDINS REPORT ON SURVEY OF CAUSES OF BLINDNESS IN NIGERIA - 1962

APPENDIX 4

DISEASE	NORTHERN REGION	MIDDLE BELT	SOUTHERN REGION
ONCHOCERCIASIS	50	62	4
CATARACT	13	7	6
TRACHOMA	34	10	18
GLAUCOMA	10	7	5
OTHERS	14	9	50

Sources (Table 3)

Records Division of the mentioned hospitals
(Table 4) Kaduna State Rehabilitation Board.

REPORTED CASES AND MORTALITY OF EYE DISEASES
BY STATES - YEAR 1980

APPENDIX 5

STATE	ONCHOCERCIASIS		CATARACT		TRACHOMA	
	CASES	DEATHS	CASES	DEATHS	CASES	DEATHS
ANAMBRA	165		5		11	
BAUCHI	257		107		73	
BENDEL	82		2		32	
BENUE	4367		52		120	
BORNO	2454		353		58	
CROSS RIVER	52		51		5	
GONGOLA	1230		228		684	
IMO	422		123		47	
KADUNA	257	1	566		558	2
KANO	83		1108		1268	3
KWARA	598		134		109	
LAGOS	23		6		2	
NIGER	166		138		39	
OGUN	19		7		-	
ONDO	7		15		17	
OYO	-		37		3	
PLATEAU	1772		266		15	
RIVERS	2		25		7	
SOKOTO	724		599		253	
TOTAL	12,674	1	3822	-	3300	5

REPORTED CASES AND MORTALITY OF EYE DISEASES BY STATE YEAR 1981

APPENDIX 6

STATE	ONCHOCERCIASIS		CATARACT		OP.NEMATORUM	
ANAMBRA	187		4		84	
BAUCHI	-		2127		2	
BENDEL	46		26		286	
BENUE	3535		93		797	
BORNO	2710		965		257	
CROSS-RIVER	241		6		580	
GONGOLA	1015		720		134	
IMO	511		55		2257	
KADUNA	71		1597		261	
KANO	58		1077		641	
KWARA	497		137		213	
LAGOS	315		-		66	
NIGER	2198		2125		14	
OGUN	-		-		37	
ONDO	16		25		13	
OYO	1		15		235	
PLATEAU	1538		9		160	
RIVERS	4		5		-	
SOKOTO	1716		2331		-	
TOTAL	14659		11317		5396	

Common Eye Diseases in Nigeria

Majority of the common eye diseases that lead to blindness in Nigeria are curable if proper health facilities and trained medical personnel in ophthalomology are made available to the country's demand.

Dr. Bjorn Thylefors, manager of World Health Organisation (WHO) programme for the prevention of blindness said that there were at least 20 million blind people in the world, ⅔ of which were from the developing countries. In his article titled "Avoidable blindness", he attributed "the causes of blindness in the developing countries to poor living conditions, environmental harzards and lack of health services." Dr. Thylefors said that the number of blind people in the world would probably double by the next century unless rapid action was taken.

Some common curable eye diseases that lead to blindness include:-

1. Trachoma: About 600 million people affected in the world and is the world's major cause of blindness.

2. Cataract: Opaque spots that form on the cornea and spread throughout the lens area blocking light rays from passing through it.

Word Definitions

Opthalmology:- The scientific study of the structure, functions and infections of the eye.

Electro Oculography (EOC):- A method of recording eye position and movements by using electrodes placed on the skin adjacent to the lateral canthi to detect a standing potential difference between the front and back of the eye ball.

Electro Retinography (ERG):- The recording and study of the electrical activity of the retine.

Flouresceín Angiography:- Radiography of vessels after the injection of a radiopaque material, description of the blood vessels or lymphatics.

Orthoptics:- The study and therapy of detective binocular vision; of defects in the action of the ocular muscles, or of faulty visual habits.

Therapy:- Branch of medicine dealing with remedial treatment of diseases.

Ultra - Sound:- Instrument that provides cross-sectional pictures of the eye and the structures around and behind the eye itself by beaming pulses of sound into the eye area at the rate of millions/sec. An electronic machine converts the sound echoes into light signals, and this gives black and white picture on television screen.

Symptons: blurring vision

Treatment: Surgery

3. Onchocerciacis: (River blindness): 20 million people are affected in the world and about 10% of the cases are blinded. Caused by insect vector (black fly) that breeds in riverine areas.

4. Glaucoma:- An increased pressure within the eye ball because drainage of fluid is impeded and pressure builds up, thus inhibiting the blood supply.