PROPOSED KADUNA PAEDIATRIC HOSPITAL, KADUNA:

USE OF HOSPITAL OUTDOOR SPACES TO PROMOTE HEALING

BY

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APRIL, 2012

DECLARATION

I, Isa, Ramatu Makarfi hereby declare that this thesis has been a personal academic undertaking by me and that all quotations and sources of information have been duly acknowledged by means of references.

……. .....

Isa Ramatu Makarfi Date

CERTIFICATION

This is to certify that this thesis entitled **"Proposed Kaduna Paediatric Hospital,Kaduna:Use of Hospital Outdoor Spaces to Promote Healing"** by Isa,Ramatu Makarfi meets the regulations governing the award of Master of Science degree in Architecture of Ahmadu Bello University, Zaria , Nigeria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This thesis is dedicated to the memory of my late father,Arc. Isa I. Makarfi,my mother,Hajia Hauwa I. Makarfi,my husband,Kabiru Ayuba and my children,Isa,Khadija and Ayyub.

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ABSTRACT

The planning and design of hospital outdoor spaces to assist in the healing process of children is new in Nigeria but full of prospect in the health care sector. It is of particular importance to health care providers and designers as it could result in better patient management and care. However, its potentials have not been fully exploited. The study explores and examines the relationship between various landscape elements and healing. Case studies were conducted and data was collected through visual surveys and interviews. Findings show that the outdoor environment is not generally used as a means of therapy in hospitals. With proper design and implementation, hospital outdoor spaces can be made into therapeutic platforms for children to play, rest and socialize while recovering from their illness; and also provide a conducive environment for their caregivers and other hospital staff.

TABLE OF CONTENTS

TITLE PAGE……i

DECLARATION……ii

CERTIFICATION……iii

DEDICATION……...iv

ACKNOWLEDGEMENT……..v

ABSTRACT……...vi

TABLE OF CONTENTS……vii

LIST OF FIGURES……xiv

LIST OF TABLES……..xv

LIST OF PLATES……xvi

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background of study 1

1.2 Problem statement 2

1.3 Aims and objectives 3

1.4 Motivation 4

1.5 Justification of work 4

1.6 Scope of work 4

1.7 Research Methodology 4

2.0 CHAPTER TWO: LITERATURE REVIEW

2.1 Nature as Healer 6

2.1.1 Theories about why Nature is Restorative 7

2.1.2 History of Gardens in Healthcare Settings 8

2.1.3 Design and Healing Gardens for Children 9

2.2 Evolution of Hospitals 11

2.2.1 Roman Empire 11

2.2.2 Medieval Islamic World 12

2.2.3 Medieval Europe 13

2.2.4 Colonial America 14

2.2.5 Modern Era 14

2.3 Evolution of Hospitals in Nigeria 16

2.3 Classification/Categories of Hospitals 17

2.5 Paediatric Hospital 19

2.5.1 Freestanding Independent Children's Hospitals 20

2.5.2 Paediatric Acute Care Facilities within Larger Medical Centres 20

2.6 The Health Pyramid (Primary,Secondary and Tertiary) 20

2.7 Hospital as a system 23

2.7.1 In-Patient Unit 23

2.7.2 Out-Patient Unit 24

2.7.3 Diagnostic/Treatment unit 24

2.7.4 Ancillary services 24

2.7.5 Administration Unit 24

3.0 CHAPTER THREE: MATERIALS AND METHODS

3.1 Use of Outdoor Spaces to Promote Healing 25

3.2 How Children Interact with their Environment 26

3.3 Play Theory 26

3.3.1 Play and Development 27

3.3.2 Play as a Means of Therapy 29

3.4 Therapeutic Gardens 30

3.5 How the Outdoor Environment affects Therapy 31

4.0 CHAPTER FOUR: CASE STUDIES

4.1 Case Study One (ABUTH, Shika) 35

4.1.1 History 35

4.1.2 Planning 35

4.1.3 Building Form 35

4.1.4 Building Materials 35

4.1.5 Integrated child care Facilities 36

4.1.6 Merits 37

4.1.7 Demerits 37

4.2 Case Study Two (National Hospital, Abuja) 37

4.2.1 History 37

4.2.2 Planning 37

4.2.3 Building Form 39

4..2.4 Building material 39

4.2. 5 Landscape 39

4.2.6 Integrated childcare facilities 39

4.2.7 Merits 39

4.2.8 Demerits 40

4.3 Case Study Three (Children's Hospital, Colorado, USA) 40

4.3.1 History 40

4.3.2 Building Form 41

4.3.3 Landscape 42

4.3.4 Scale 43

4.3.5 Merits 43

4.3.6 Demerits 43

4.4 Case Study Four (Miami Children's Hospital,Miami,Florida,USA) 44

4.4.1 History 44

4.4.2 Planning 44

4.4.3 Building Form 44

4.4.4 Building materials 45

4.4. 5 Landscape 45

4.4.6 Colours 46

4.4.7 Scales 47

4.4.8 Integrated childcare facilities 47

4.4.9 Merits 47

4.4.10 Demerits 47

4.5 Case Studies Findings 47

5.0 CHAPTER FIVE : SITE CONDITIONS

5.1 Site Documentation 50

5.2 Site location 50

5.3 Site selection Criteria 52

5.4 Climatic data of New Kaduna city 56

5.4.1 Temperature and Relative Humidity 57

5.4.2 Rainfall 58

5.4.3 Wind 59

5.4.4 Sunshine hours and cloud cover 60

5.5 Climatic implication on design 62

6.0 CHAPTER SIX : DESIGN REPORT

6.1 Design brief 64

6.2 Design synthesis 64

6.3 Design concept 65

6.3.1 Functional Concept 65

6.3.2 Aesthetic concept 66

6.3.3 Sustainability concept 67

6.4 Functional analysis 67

6.5 Departments/Units 69

6.5.1 General Out-Patient Department (GOPD) 69

6.5.2 Accident and Emergency Department (A & E) 70

6.5.3 Laboratories 70

6.5.4 Radiology Department 70

6.5.5 Surgery Department 70

6.5.6 Intensive Care Unit 70

6.5.7 Wards 70

6.5.8 Other Auxiliary Units 71

6.6 Design methodology 72

6.7 Special Design considerations 73

6.7.1 User-focused design 73

6.7.2 Future expansion 73

6.7.3 Drainage system 73

6.7.4 Construction methods 74

6.7.5 Services of the Complex 75

6.7.6 Materials and Finishes 76

6.8 Schedule of Accommodation 77

7.0 CHAPTER SEVEN: SUMMARY, CONCLUSION AND RECOMMENDATION

7.1 Summary 84

7.2 Conclusion 86

7.3 Recommendations 87

7.4 Contribution to Knowledge 87

REFERENCES 88

APPENDICES : Design drawings of the Hospital complex 92

1 Ground floor plan of G.O.P.D 92
2 Plan of Administrative unit 92
3 Ground floor plan of wards 93
4 First floor plan of wards 93
5 Ground floor plan of A& E 94
6 First floor plan of A& E 95
7 Plan of Operating Theatre 96
8 Plan of Laundary 97
9 Plan of CSSD 97
10 Plan of Cafetaria 98
11 Plan of Mortuary 98

LIST OF FIGURES

Fig. 2.1	Colonial hospital (Hospico Canas),Mexico	13
Fig .2.2	A Teaching Hospital in Canada	16
Fig. 2.3	Chart showing persons per hospital bed	17
Fig. 2.4	The Health Pyramid	21
Fig. 2.5	Synchronization of Hospital Departments	23
Fig. 3.1	A Healing Garden at a Children's Hospital,San Diego	30
Fig. 3.2	Therapeutic Garden at an Institute for Child Development	31
Fig. 4.1	Location of National Hospital,Abuja	38
Fig 4.2	Floor Plan of National Hospital,Abuja	38
Fig 4.3	Site Plan of Colorado Children's Hospital	41
Fig 4.4	Location of Miami Children's Hospital	44
Fig 4.5	Site Layout of Miami Children's Hospital	45
Fig.4.6	Landscape Garden of Miami Children's Hospital	46
Fig. 5.1	Map of Nigeria, Showing the location of Kaduna State	50
Fig. 5.2	Land Use Map of Kaduna	51
Fig. 5.3	Old and New Kaduna cities	52
Fig. 5.4	Air temperature data of Kaduna metropolis	58
Fig 5.5	Rainfall and Temperature Patterns in Kaduna metropolis	59
Fig 5.6	Wind Rose in Kaduna	60
Fig. 5.7	Kaduna, Nigeria- Solar energy and surface meteorology	61
Fig. 5.8	Kaduna, Nigeria – Sunrise, sunset, dawn and dusk times graph	62
Fig.6.1	Major clinical relationship	68
Fig 6.2	Site Layout of Kaduna Paediatric Hospital,Kaduna	71
Fig. 6.3	Site elevation of Kaduna paediatric hospital	72
Fig.6.4	Foundation details	74
Fig.6.5	Service trunk detail	76

LIST OF TABLES

Table 6.1 Ward schedule of accommodation 77

Table 6.2 Pathology department 79

Table 6.3 Emergency unit 80

Table 6.4 Radiology department 80

Table 6.5 Intensive care unit 81

Table 6.6 Kitchen/Dining 82

Table 6.7 Laundry/House-keeping 82

Table 6.8 Central sterilizing unit 83

LIST OF PLATES

Plate 4.1	Exterior View of ABUTH,Shika	36
Plate 4.2	Pediatric Ward,ABUTH,Shika	36
Plate 4.3	Exterior view of Colorado Children's Hospital	41
Plate 4.4	Nursing Unit of Colorado Children's Hospital	42
Plate 4.5	Play and Recreational Gardens	42
Plate 4.6	Aquarium waiting area at Miami Children's Hospital	46
Plate 5.1	Soil type at Site	53
Plate 5.2	Site drainage	54
Plate 5.3	Site Vegetation	54
Plate 5.4	Site Access Road	54
Plate 6.1	Perspective view of the hospital complex	66

CHAPTER ONE

1.1 BACKGROUND OF STUDY

The environment both built and natural affects all those who use it. Today, environmental psychologists study how environments affect people. And architects, who were once primarily concerned with how buildings looked, now have to consider how they will affect the people who use them. Principles of crowding, privacy, personal space and environment, privacy, personal space, and environmental perception, and factors such as noise, temperature, air circulation, and cost may all determine how a building is designed and how well it serves its function. This applies to the design of outdoor environments as well.

Even in ancient times there is evidence of the importance of the natural environment and its effect on man. Nature was thought to have restorative powers and "healing spaces were nearly always found in nature .. a healing spring, a sacred grove, a special rock or cave" (Marcus & Barnes, 1999). Some of our earlier hospitals were set in monasteries, and herbs and prayer were the focus of healing. For a while though, technology, with the latest gadgetry in surgical procedures and advances in medicine and drugs, became the focus of medicine. And the design of hospitals and healthcare facilities reflected this trends with high-rise buildings surrounded by streets and parking lots and little or no emphasis on nature (Marcus and Barnes, 1999).

A pediatric hospital is an accredited healthcare facility dedicated to the specialized care of infants, children, and adolescents. The main objective of a pediatric hospital is to manage and help kids recover from their injuries and illnesses .The level conformability, peace of mind and sense of security are some of the factors that put the patient at ease and therefore stimulate faster recovery. The quality of spaces in hospitals affects the outcome of medical

care for such patients and their families' as a calming environment helps the patients and care givers to deal with the issues of healing, illness and death not in morbid sense, but a place where one can feel at ease. Many of the qualities of space that are pleasing in hospitals are fundamental to good design in all types of buildings. In this regard, a well-designed hospital reflects the art and skill of architects in the practice of their craft. The emergence of these qualities in new hospitals thus represents a maturing of hospital design from its postwar focus on functional efficiency to a balance between function and aesthetics.

Understanding the spatial qualities that make a successful hospital is important to health care providers for two reasons. First, providers should be aware of the effects of spatial considerations on healing in order to manage patient care better. Second, informed providers can be advocates for good design in the planning and construction of health care facilities.

1.2 PROBLEM STATEMENT

In the past, Paediatric hospitals were designed with little or no considerations to outdoor spaces and their effect on health outcomes;and the way patients perceive the environment in which they were supposed to be treated and recover from their illness. To a sick child, hospitals can seem the scariest of places. The noisy hustle and bustle of the environment, the discomfort of cramped waiting spaces, and the general confusion upon entering a huge medical complex can add unnecessary stress for patients and families.A great deal of research has been conducted to confirm the positive benefits of hospital outdoor space.

To successfully design a user focused pediatric hospital, the client, in this case the patients, their families and staff of the hospital are to be involved in order to know what problems they do encounter as regards the hospital spaces and then try to proffer ways in which the problems can be eliminated or improved upon so as to focus on user safety and quality of care, efficient patient flow and effective use of skilled resources.

The challenge here is to look at how hospitals have been designed in the past and propose better ways these hospitals could be designed to improve patient and care-giver experience looking beyond elements that traditionally dominate pediatric design such as scale ,proportion and use of bright colors but instead consider other factors such as spatial, aesthetic and detail conscious means to meet the fundamental needs and interest of the child-patient, their families and care-givers. "A functional design can promote skill, economy, conveniences, and comforts; a non-functional design can impede activities of all types, detract from quality of care, and raise costs to intolerable levels (Hardy and Lammers,1986).

1.3 AIM AND OBJECTIVES

Aim - To explore and examine the relationship between various landscape elements and healing as well as the use of hospital outdoor spaces to promote healing.

Objectives

- To examine current trends in the design of pediatric hospitals.
- To analyze the problems with respect to the current trends in Pediatric Hospital design.
- To examine the problems of existing pediatric hospitals in the country
- To propose a Pediatric Hospital that will reflect the characteristics of good Architecture incorporating the use of outdoor spaces as a means to promote healing.

1.4 MOTIVATION

The motivating factor behind this work is my personal interest in pediatrics health care coupled with the need for a child friendly health care facility that will respond to the specific needs of pediatric age group and their care givers

1.5 JUSTIFICATION

Children are our future leaders, there is a need to ensure that they stay healthy to put in their best for societal development. Quality healthcare is the key factor in ensuring this, quality health care implies conforming with the basic factors that enhance treatment and recovery of patient through a focus on patient safety, quality of care, efficient patient flow as well as effective use of skilled resources as regards modern trends n pediatric architecture for optimal staff efficiency There exists at present a wide gap between what it is and what it ought to be.

1.6 SCOPE OF WORK

The study shall focus on modern trends in paediatric hospital design, with a focus on the design features of paediatric hospitals' outdoor spaces ,issues involving ideas for positive changes so as to design an inviting family functional and livable hospital for children and their families.The hospital is to be located in the new Kaduna Millenium City, case studies will be examined in the country and other parts of the world emphasis shall be on the design of hospital building with attention to its working spaces, administration, diagnostic and treatment, inpatient and outpatient, and location of these spaces as they relate to one another.

1.7 METHODOLOGY

An extensive literature review was first conducted to provide background information on both the effect of nature on health outcomes and the use of outdoor spaces like the *healing* and *restoration gardens* in enhancing the process of healing in patients recovering from illnesses.Also,an appraisal of some already existing facilities provided a great deal of information and lessons to be learnt from them. Case studies carried out reflected the scope

and intent of the research by delving into areas and facilities responsive to the needs of patients and caregivers responsible for creating a user-centered design that will employ the use of space to enhance and promote the healing process of patients (in this case children) in the Paediatric hospital.

CHAPTER TWO

LITERATURE REVIEW

2.1 NATURE AS A HEALER

Research does exist to support the idea of nature as healer. In his essay in *Healing Gardens*, Ulrich (1999) summarized some of the research and theory relevant to the effects of nature on health outcomes. He used the terms "healing garden" to refer to "features that foster restoration from stress and have other positive influences on patients and staff" (Marcus and Barnes, 1999, p. 30).Restoration from stress is an important goal in and of itself. But, it is also important because it directly affects many other health outcomes.

In his summary of the research, Ulrich first focused on non-patient groups. Restoration from stress was perceived as the most important benefit of users of parks. In these studies, there are indications that a major part of the restorative benefits is from simply viewing nature. In another study, a sampling of university students was asked what they regarded as places of emotional healing (Francis and Marcus, 1992). The students were asked to recall the type of place that they sought out and helped them to feel better when they were stressed or upset. Significantly, there was a preference for outdoor settings by seventy-one percent of the sample of one hundred and fifty-four students. Barnes (1994) asked a broader sampling of people (only one-fourth of the 65 participants chose a natural setting and approximately the same proportion chose a designed outdoor space as in the previous study).In one of his earlier studies, Ulrich focused on students who were experiencing mild stress because of a final exam (Ulrich,1997).A questionnaire was used to assess restorative influences of viewing slides of built settings lacking nature or slides dominated by green vegetation. Results suggested that the nature views fostered greater restoration.

Next, Ulrich focused on studies that include patient groups. Studies by Marcus and Barnes (1999) asked the simple question: "where do people choose to go when stressed?" In one study of the users of outdoor space in hospitals, ninety-five percent of the people interviewed reported a positive change in mood after spending time outside. Many of the feelings of anxiety and stress that accompany illness and hospitalization were temporarily relived and replaced with a more clam, balanced outlook. In one of his most often quoted studies "View Through a Window may influence Recovery from Surgery", Ulrich (1984) showed, with control for other variables, that patients with a view of nature had shorter hospital stays, lower analgesic use, and fewer complaints during surgery. But when a person views nature what occurs physically to foster restoration from stress? What bodily events occurs to make one feel calmer and more restored?

2.1.1 Theories about why Nature is Restorative

Several theories have evolved to address this question and are mentioned in both *Healing Gardens* (1999) and *Restorative Gardens* (1990). In learning theories, the subscribers suggest that man has learned to prefer nature. For example, people may have learned to associate restorative experience with nature because of vacations spent in beautiful settings or long childhood summers spent on the beach, or near a lake or stream. Urban settings, on the other hand, bring back images of traffic, congestion, work pressure, filth, or crime. Cultural theories propose that we are taught by society to have positive feelings towards certain types of environments. For example, Native American and Asian cultures have taught their peoples to respect nature.

Steve and Rachel Kaplan are proponents of the arousal and overload theory. They believe that the contemporary built environment taxes our senses by demanding us to remain in forced attention. In their book *The Experience of nature: a Psychological Perspective* (1989),

the authors suggest that a restorative experience is needed to recover from this overload of sensory input. The restorative experience of choice is nature. Recently, authors have proposed evolutionary theories. In his book, *The Experience of Landscape* (1975), Appleton suggests that we respond to landscapes the way we would have long ago. We chose habitats for their safety and their ability to provide food and water, and thus these "selected habitats" were favourable to our well-being and survival. If nature is so important to us then how did the absence of nature in medical environments come about?

2.1.2 History of Gardens in Health Care Settings

Warner, Jr.(in Gerlach-Spriggs et. al,1998) gives an excellent account of the history of gardens in medical facilities in *Restorative Gardens* (1998). And Marcus and Barnes give an historical summary in the introduction of *Healing Gardens* (1999). Restorative gardens first appeared in Europe during the middle Ages in hospitals and monasteries that cared for the sick and insane. The buildings usually surrounded a courtyard, and an arcade offered shelter from sun and rain for those who stayed there. During the fourteenth and fifteenth centuries there was a decline in monasticism and the care of the sick fell upon the civic authorities and churches and the focus shifted away from the garden. For example, the Catholic Church had hospital wards created so that every patient could see the priest celebrating mass from his/her bed (Marcus and Barnes, 1999). In some hospitals courtyards remained. And others were reported to have characteristics such as access to fresh air, views to the gardens through the windows and doors, and opportunities to walk in the garden.

In the seventeenth century, statistics and scientific medicine demonstrated the importance of hygiene, fresh air, and cross ventilation. Hospitals were built with long, twenty-four bed wards joined at their ends by a service corridor like the teeth of a comb. These new designs

were known as pavilion hospitals and incorporated outdoor space between the wards (Malkin, 1992). Florence Nightingale (1820 – 1910) recognized that this new hospital design provided benefits such as exposure to sunlight, window views, and to the bright colors of flowers, which seemed to have a positive effect upon the mind and to promote recovery. But it was in the eighteenth century with the pastoral movement that the "connection between the nursing and medicine within the hospitals and the gardens without" that nature and gardens once again became places of restoration (Gerlach-Spriggs et. al,1998).

In the nineteenth century, nurses were encouraged to wheel beds out onto sun porches and roofs for fresh air and sunlight to promote recovery. Positive changes began to take place in psychiatric hospitals as well and a more humanistic approach replaced physical punishment as treatment. This was evident in the design of new psychiatric facilities with large landscape vistas where farming and gardening were used as therapy. With the twentieth century, the focus shifted towards efficiency and "saving steps for physicians and nurses and away from patient-centered gardens" (Gerlach-Spriggs et.al.,1998; Marcus and Barnes, 1999). However, with the establishment of Occupational Therapy and later Horticultural Therapy, garden work was used for therapy in rehabilitation hospitals and facilities for veterans. But in spite of these new fields, gardens in hospital settings continued to disappear.

2.1.3 Design and Healing Gardens for Children

Gardens have a special place in healing environments for children because of the importance of play in the child's world. Play is the child's way of making sense of his/her physical and social world. Children in many different health situations may benefit from a healing garden, whether they are recovering from an operation, working through the turmoil of a traumatic experience, coming to grips with a terminal illness, or living with a permanent or profound mental or physical impairment. The term habilitation rather than rehabilitation is used to

refer to the treatment of those with disabilities. It is important to focus on the child's potential. This way the healing garden can become a place to practice and improve old skills while discovering new skills. Inclusion is an important goal for all children. The healing garden is an ideal place to promote inclusion and foster understanding and tolerance. When reviewing the literature, it became apparent that healing gardens for children are designed based on several assumptions. The following list has been adapted from Moore et. al. (1978) and Marcus and Barnes (1999).

1. Outdoor play is a critical factor in healthy child development.
2. The quality of the outdoor play environment can affect the child's perception of it and the range and depth of play.
3. Nature plays an important part in play in the development of the child.
4. Intervention of play leaders/therapists can extend the range of play.
5. Children of all abilities have an equal right to play opportunities.
6. Indoor/outdoor links are important in encouraging use of the outdoor environment.

Several types of therapies are used in treatment of children. Examples of these are Play Therapy, Horticultural Therapy, Animal Therapy, Nature as Therapy, and Sensory Integration. Any one or a combination of these may be incorporated into a healing garden designed for children. Often the professionals who care for the child form an interdisciplinary team.

2.2 EVOLUTION OF HOSPITALS

In ancient cultures, religion and medicine were linked. The earliest documented institutions aiming to provide cures were Egyptian temples. In ancient Greece, temples dedicated to the healer-god Asclepius, known as *Asclepieia* functioned as centers of medical advice, prognosis, and healing(Risse,1990). At these shrines, patients would enter a dream-like state of induced sleep known as "enkoimesisnot unlike anesthesia, in which they either received guidance from the deity in a dream or were cured by surgery(Askitoupoulou et al,2002) Asclepeia provided carefully controlled spaces conducive to healing and fulfilled several of the requirements of institutions created for healing.In the Asclepieion of Epidaurus, three large marble boards dated to 350 BC preserve the names, case histories, complaints, and cures of about 70 patients who came to the temple with a problem and shed it there. Some of the surgical cures listed, such as the opening of an abdominal abscess or the removal of traumatic foreign material, are realistic enough to have taken place, but with the patient in a state of enkoimesis induced with the help of soporific substances such as opium(Askitoupoulou et al,2002) worship of Asclepius was adopted by the Romans. Under his Roman name Æsculapius, he was provided with a temple (291 BC) on an island in the Tiber in Rome, where similar rites were performed.

2.2.1 Roman Empire

The Romans created *valetudinaria* for the care of sick slaves, gladiators, and soldiers around 100 B.C., and many were identified by later archeology. While their existence is considered proven, there is some doubt as to whether they were as widespread as was once thought, as many were identified only according to the layout of building remains, and not by means of surviving records or finds of medical tools(Baker,1998). The adoption of Christianity as the state religion of the Roman Empire drove an expansion of the provision of care. The First

Council of Nicaea in 325 A.D. urged the Church to provide for the poor, sick, widows, and strangers; it ordered the construction of a hospital in every cathedral town. Among the earliest were those built by the physician Saint Sampson in Constantinople and by Basil, bishop of Caesarea. The latter was attached to a monastery and provided lodgings for poor and travelers, as well as treating the sick and infirm. There was a separate section for lepers.

2.2.2 Medieval Islamic World

In the medieval Islamic world, the word "bimaristan" was used to indicate a hospital establishment where the ill were welcomed, cared for and treated by qualified staff. The public hospital in Baghdad was opened during the Abbasid Caliphate of Harun al-Rashid in the 8th century(Hussain,2003). The first hospital in Egypt was opened in 872 and thereafter public hospitals sprang up all over the empire from Islamic Spain and the Maghrib to Persia. As the system developed, physicians and surgeons were appointed who gave lectures to medical students and issued diplomas (*ijazah*) to those who were considered qualified to practice, an early parallel to modern medical schools The first psychiatric hospital was built in Baghdad in 705. Many other Islamic hospitals also often had their own wards dedicated to mental health(Peter,2004).Between the eighth and twelfth centuries CE Muslim hospitals developed a high standard of care. Hospitals in Baghdad in the ninth and tenth centuries employed up to twenty-five staff physicians and had separate wards for different conditions. The Al-Qairawan hospital and mosque, in Tunisia, were built under the Aghlabid rule in 830 and was simple, but adequately equipped with halls organized into waiting rooms, a mosque, and a special bath. The hospital employed female nurses, including nurses from Sudan, as well as female physicians. Hospitals in the Islamic world featured competency tests for doctors, drug purity regulations, nurses and interns, and advanced surgical procedures

Hospitals were also created with separate wards for specific illnesses, so that people with contagious diseases could be kept away from other patients.

2.2.3 Medieval Europe

Medieval hospitals in Europe followed a similar pattern to the Byzantine. They were religious communities, with care provided by monks and nuns. (An old French term for hospital is *hôtel-Dieu*, "hostel of God.") Some were attached to monasteries; others were independent and had their own endowments, usually of property, which provided income for their support. Some hospitals were multi-functional while others were founded for specific purposes such as leper hospitals, or as refuges for the poor, or for pilgrims: not all cared for the sick. The first Spanish hospital, founded by the Catholic Visigoth bishop Masona in 580AD at Mérida, was a *xenodochium* designed as an inn for travellers (mostly pilgrims to the shrine of Eulalia of Mérida) as well as a hospital for citizens and local farmers. The hospital's endowment consisted of farms to feed its patients and guests (Risse, 1999).



Fig.2.1 Hospicio Cabañas, the largest hospital in colonial America, Guadalajara, Mexico (source:www.architects.com)

2.2.4 Colonial America

The first hospital founded in the Americas was the Hospital San Nicolás de Bari [Calle Hostos] in Santo Domingo, Distrito Nacional Dominican Republic. Fray Nicolás de Ovando, Spanish governor and colonial administrator from 1502–1509, authorized its construction on December 29, 1503. This hospital apparently incorporated a church. The first phase of its construction was completed in 1519, and it was rebuilt in 1552(Alfredo,2005). Abandoned in the mid-eighteenth century, the hospital now lies in ruins near the Cathedral in Santo Domingo.

Conquistador Hernán Cortés founded the two earliest hospitals in North America: the Immaculate Conception Hospital and the Saint Lazarus Hospital. The oldest was the Immaculate Conception, now the Hospital de Jesús Nazareno in Mexico City, founded in 1524 to care for the poor(Alfredo,2005).

The first hospital north of Mexico was the Hôtel-Dieu de Québec. It was established in New France in 1639 by three Augustinians from l'Hôtel-Dieu de Dieppe in France. The project, begun by the niece of Cardinal de Richelieu was granted a royal charter by King Louis XIII and staffed by a colonial physician, Robert Giffard de Moncel.

2.2.5 Modern Era

In Europe the medieval concept of Christian care evolved during the sixteenth and seventeenth centuries into a secular one, but it was in the eighteenth century that the modern hospital began to appear, serving only medical needs and staffed with physicians and surgeons. The Charité (founded in Berlin in 1710) is an early example.

Guy's Hospital was founded in London in 1724 from a bequest by the wealthy merchant, Thomas Guy. Other hospitals sprang up in London and other British cities over the century, many paid for by private subscriptions. In the British American colonies the Pennsylvania General Hospital was chartered in Philadelphia in 1751, after £2,000 from private subscription was matched by funds from the Assembly(Roderick,1985).

When the Vienna General Hospital opened in 1784 (instantly becoming the world's largest hospital), physicians acquired a new facility that gradually developed into the most important research center. During the nineteenth century, the Second Viennese Medical School emerged with the contributions of physicians such as Carl Freiherr von Rokitansky, Josef Škoda, Ferdinand Ritter von Hebra, and Ignaz Philipp Semmelweis. Basic medical science expanded and specialization advanced. Furthermore, the first dermatology, eye, as well as ear, nose, and throat clinics in the world were founded in Vienna, being considered as the birth of specialized medicineBy the mid-nineteenth century most of Europe and the United States had established a variety of public and private hospital systems. In continental Europe the new hospitals generally were built and run from public funds. The National Health Service, the principle provider of health care in the United Kingdom, was founded in 1948.

In the United States the traditional hospital is a non-profit hospital, usually sponsored by a religious denomination. One of the earliest of these "almshouses" in what would become the United States was started by William Penn in Philadelphia in 1713. These hospitals are tax-exempt due to their charitable purpose, but provide only a minimum of charitable medical care. They are supplemented by large public hospitals in major cities and research hospitals often affiliated with a medical school. The largest public hospital system in America is the New York City Health and Hospitals Corporation, which includes Bellevue Hospital, the oldest U.S. hospital, affiliated with New York University Medical School. In the late

twentieth century, chains of for-profit hospitals arose in the United States. In the 2000s, modern private hospitals began to appear in developing countries such as India.



Fig.2.2 A teaching hospital in Canada (source:www.architects.com)

2.3 EVOLUTION OF HOSPITALS IN NIGERIA

The first attempt of a plan for development of health service, took place in 1946 as part of the exercise which produced the overall "ten year plan" for development and welfare which covers all aspects of government activities. The proponents of the plan were mainly expatriate officers being the ones with the now how of this modern practice. This plan served as a solid basis for the emergence of future healthcare planning (Yabani,2002).

Since independence in October 1960, various health policies have evolved in different forms. The second national development plan in 1970-75, identified and aimed at correcting the flaws of the previous blueprint. The third national development plan of 1975-80, deliberately attempted to draw up a comprehensive national health policy dealing with such issues like health man power management, the position of comprehensive healthcare services, disease control, and efficient utilization of health resources, medical research and health planning.

The current health policy is targeted at achieving "health for all Nigerians" in order to attain a level of health that will enable us to achieve socially and economically productive lives. Nigeria, like other countries where in the race for WHO's health for all by the year 2000 which resulted in massive capital projects in the healthcare sector in the last decade. The booming populace of Nigeria has not in any way helped the deteriorating system which is becoming ever more underfunded. With the recent national privatization drive, there will be way for health investors to come in and turn things around. The Nigerian health market really seems to be a great potential for foreign investors to make good business.

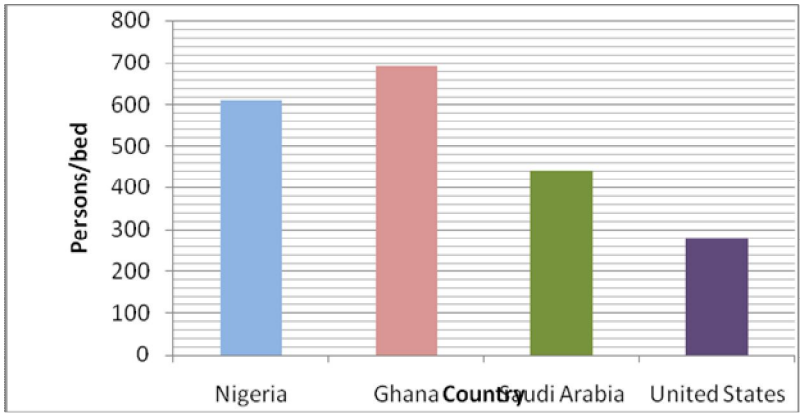


Fig. 2.3 Chart showing number of persons per hospital bed in four different countries. (Source: Maternal and Child Health in Nigeria)

2.4 CLASSIFICATION/CATEGORIES OF HOSPITALS

Hospitals are classified by the services they provide (general or specialized), the length of stay they offer patients (short stay or long-term care), and by their ownership (not-for-profit, proprietary, or government owned). Although most hospitals are classified as not-for-profit, any one hospital will fall into several of the above categories. For example, ECWA Eye Hospital, Kano, is a short-stay, not-for-profit, specialist hospital (Waziri,2010).

i Services Provided by Hospitals

General hospitals, regardless of their size, provide patients with a wide range of services, including emergency treatment, surgery, and medical and nursing care. Specialized hospitals, in contrast, may concentrate on a particular group of patients, such as children, or a disease, such as cancer. Some specialized hospitals combine treatment and research. For instance, Roswell Park Cancer Institute in Buffalo, New York, offers 37 specialized cancer treatment centers, including centers for acquired immunodeficiency syndrome (AIDS)-related can cers, brain tumors, and ovarian cancer, and provides state-of-the-art treatments for these cancers that are not generally available in other hospitals. The institute also conducts research on new cancer drugs and procedures, such as photodynamic therapy, which uses a laser to activate cancer-killing chemicals inside tumors

ii Length of Stay

The American Hospital Association (AHA), a national organization that promotes organizational and legislative issues of interest to hospitals, classifies hospitals by the length of stay they offer patients. AHA categorizes hospitals as short-stay or acute-care centers if their patients receive 30 days or less of inpatient treatment. In contrast, hospitals are classified as long-term care institutions if their patients require more than 30 days of treatment, as is available in rehabilitation facilities or nursing homes. A distinction is made between short-stay and long-term care facilities to reflect not only the difference in length of stay but also the scope and intensity of services provided by an institution. Short-stay hospitals are geared for quick intervention and constant monitoring of serious, often life-threatening illnesses. These hospitals provide immediate attention until a patient is stabilized enough to be treated at home or in a health care setting that can provide a longer stay. Long-term care institutions treat

physical diseases or injuries that are debilitating and require prolonged medical intervention or physical therapy and regular skilled nursing care. Some long-term care facilities are psychiatric institutions for the mentally ill who cannot be cared for at home.

iii Ownership of Hospitals

Not-for-profit, or voluntary, hospitals, are charitable institutions that exist to serve the best interests of their communities. Although not-for-profit hospitals do not receive funding from tax money, they are exempted from local, state, and federal taxation. Many not-for-profit hospitals were founded and continue to be run by religious groups. Proprietary, or for-profit, hospitals are owned by corporations and their shareholders. These hospitals are typically part of large investor-owned hospital chains. For instance, Hospital Corporation of America (HCA), the largest for-profit hospital chain in the United States, has more than 200 hospitals in its network. HCA is listed on the New York Stock Exchange, just as any other for-profit company; company executives seek to reward shareholders who invest in the company by applying standard corporate management techniques, likely to yield corporate profits, to hospital administration(Yabani,2002).

2.5 PAEDIATRIC HOSPITALS

A pediatric hospital is a specialist, most often short stay, non-profit tertiary healthcare facility that offers medical treatment to children from birth to the age of 18. There are two basic types of pediatric hospitals the free standing and pediatric acute care facilities within larger medical centers.

2.5.1 Freestanding Independent Children's Hospitals

These are more likely to have a community presence that attracts philanthropy and support, which is of increasing importance in a world of shrinking reimbursements. The trend in recent years has been a decrease in overall pediatric admissions in all hospitals, but an increase in children's hospital admissions. Concurrently, acute care hospitals are under pressure to free up beds for rising adult admissions with better reimbursement. As a result, fewer acute care hospitals are providing pediatric beds, and sicker children who require specialized services have migrated to children's hospitals.

2.5.2 Paediatric Acute Care Facilities within Larger Medical Centres

This last category provides care for a majority of the nation's hospitalized children. Without operating licenses or budgets of their own, these hospitals-within-hospitals integrate into their parent hospitals as service lines. While they can tap into the financial, programmatic and technology-rich resources of their parent hospitals, they suffer from less visibility, reduced identity and recognition, limited networks for partnering and constrained access to federally funded graduate medical education in comparison to their freestanding counterparts. Some are simply bed units on one or more floors of the host hospital on one or more floors of the host hospital, while others have developed separate entries, lobbies and elevators to create a more distinct experience(Ibrahim,2010).

2.6 THE HEALTH PYRAMID

The healthcare system is divided into three categories depending on the complexity, size of the facility and also the location which forms a pyramid that has facilities that correspond hierarchically. The healthcare pyramid consists of the primary healthcare, secondary healthcare and tertiary healthcare.

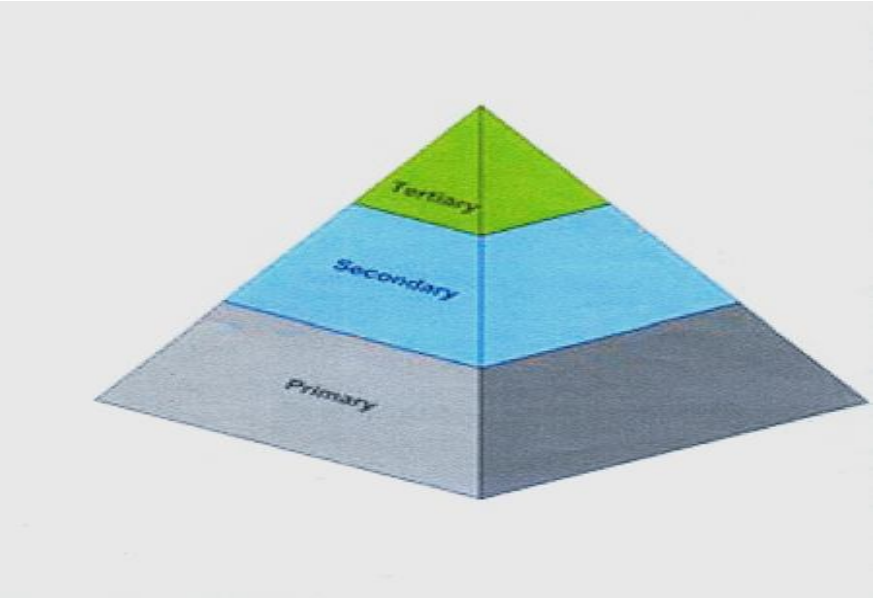


Fig. 2.4: The health Pyramid (Source: Hospital planning and design)

i **Primary Healthcare:** Many diseases are preventable through healthy living, and a primary public health goal is to educate the general public about how to prevent noninfectious diseases. Primary healthcare is concerned with aspects of preventive medicine with such programs as public health campaigns teach people about the value of avoiding smoking, getting treatment for high blood pressure, avoiding foods high in cholesterol and fat, and maintaining a healthy body weight, sanitation, hygiene, immunizations, dispensaries, health posts, etc. Other campaigns educate the public on ways to prevent birth defects, such as abstaining from alcohol during pregnancy to prevent fetal alcohol syndrome. A simple diagnosis takes place in numerous health centers as part of the primary health.

ii Secondary Healthcare: At the secondary level is the general hospital, to which patients from a wide surrounding area or district are referred when necessary by primary care units for more sophisticated diagnosis and treatment. These are facilities that encounter a wide range of diseases that require a immediate medical attention. The

emphasis unlike the primary healthcare is on curative medicine and also referrals are sometimes from the primary healthcare facilities. The diagnosis and therapeutic facilities in the out-patient care division is a major identifying feature. These general hospitals vary in size ranging from 100-500 beds.

iii Tertiary Healthcare: This consists of the specialists and teaching hospitals which are more advanced centers for complex cases. The specialists hospitals are devoted to one or a group of related diseases, the diagnosis, treatment and all other related aspects. They normally serve as referral hospitals from other hospitals. The teaching hospitals on the other hand, provide not only patient care services but also training of postgraduate and undergraduate medical students. These facilities provide care at any level with a degree of sophistication in every field. They sometimes develop into "Centers of Excellence" in some specific fields of medicine like transplants, cardio-vascular medicine, neuro-surgery etc.

These different healthcare categories form the healthcare pyramid which forms the basis of the referral system from one level to another(Waziri,2010).

2.7 HOSPITAL AS A SYSTEM

Hospitals are the most complex of building types. Each hospital is comprised of a wide range of services and functional units. These include diagnostic and treatment functions, such as clinical laboratories, imaging, emergency rooms, and surgery; hospitality functions, such as food service and housekeeping; and the fundamental inpatient care or bed-related function.

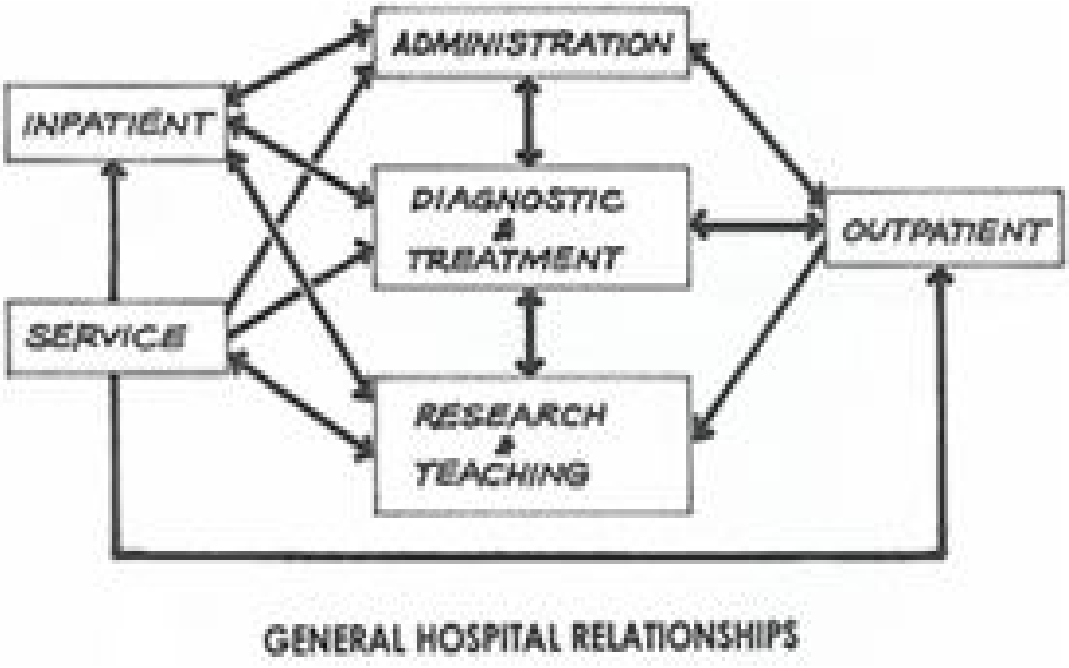


Figure 2.5 General Hospital Relationships
(Source: Whole Building Design Guide: National Institute of Building Sciences)

2.7.1 In-Patient Unit

The inpatient unit is designed to take care of the activities and functions pertaining management. This unit provides the day-to-day administrative activities, which leads to a better patient care. It provides comprehensive admission of patients and ward management: availability of beds, estimation, Agreement collection of advance, planned admission, emergency admission and so on. The in-patient unit deals with ward management: shifting from one ward to the other, bed available administration of drugs, nursing notes, charge slip and so on.

2.7.2 Out-Patient Unit

The outpatient unit serves as an entry point to schedule an appointment with the Doctor or consultant Doctor for medical consultations and diagnosis. This module support better and timely consultation decision by providing instant access to comprehensive patients. visits are divided into New, follow-up and review. This unit also handles report of laboratory tests and

other examinations. Some patients may avail only the hospital facilities like lab, radiology, nuclear, physiotherapy and so on.

2.7.3 Diagnostic/Treatment Unit

This unit deals with the diagnosis of ailments and issuing treatment to patients and this includes departments like the laboratories, Operating theatres Radiology, Scans, MRI, e.t.c

2.7.4 Auxillary Services

These unit is primarily to ensure good working conditions in the hospital, and these facilities include maintenance unit, power plant dining, laundry, central sterile unit e.t.c.

2.7.5 Administrative Unit

This unit coordinates the day-to-day running and regulation of the hospital system.These may include aspects like records,admissions,finance,maintenance,management,personnel,etc.

CHAPTER THREE

MATERIALS AND METHODS

3.1 USE OF OUTDOOR HOSPITAL SPACES TO PROMOTE HEALING

Interaction with nature is important in human health and well-being and more importantly children derive benefits physiologically and psychologically from engagement with nature and outdoor activities. Recently, studies have been conducted to confirm the positive benefits of hospital outdoor space. The attempts by experts in the field to introduce nature into healthcare settings have been variously described as contemplative gardens, restorative gardens, healing gardens, and therapeutic gardens. *Contemplative gardens* are usually intended to help mend the spirit. In *Restorative Gardens*, Nancy Gerlach-Spriggs, describes restorative gardens as places meant for the healthy as well as the sick. "for the healthy, such gardens encourage sociability among companions, promote relaxation and contemplation for the solitary visitor, or create a sense of community among residents who live in quarters around the garden. For the sick of body or troubled in spirit, the same garden relaxes and soothes and thereby encourages the body and the mind to restore themselves"(Gerlach-Spriggs et. al. 1998, p.7). According to Ulrich (1999) ,"a healing garden refers to a variety of garden features that have in common a consistent tendency to foster restoration from stress and have other positive influences on patients, visitors, and staff of caregivers" (Marcus and Barnes, 1999), p.27-36).The term "therapeutic", however, suggests more than comfort, according to Gerlach-Spriggs. It implies that the individual will be working toward a goal or outcome. For example, there may be ramps, small curbs, or varied surfaces designed into the environment for the patient (with the assistance of the occupational therapist) to master with a wheelchair, or there may be a small planting garden to improve fine motor skills.

3.2 HOW CHILDREN INTERACT WITH THEIR ENVIRONMENT

Children interact with their environment through play, while playing, they explore their surroundings, Healing gardens designed for children are based on several basic assumptions. The first of these is that play is important to the development of the child. Therefore, background on the nature of play will be discussed.

First of all, what constitutes play? There are certain characteristics that distinguish play behavior from non-play behavior (Garvey, 1977; Rubin et al., 1983; Smith and Vollstedt, 1985; Wolfberg, 1999). These characteristics can be observed in the play of typical children everywhere. The first characteristic of play is that play is fun! And a child at play usually displays a positive affect with humming, smiling, and/or laughter. Secondly, play requires involvement by the child. The motivation to play comes from the child and the child chooses freely. Therefore, play is voluntary. And the child is not interested in attaining some goal for it . There is an open-ended quality to play and the rules and goals are flexible and ever-changing. Finally, play has non-literal meaning in that children often imagine objects, actions, or events to be something that they are not.

3.3 PLAY THEORY

There are several theories about the nature of play. All children play no matter their race, time, or culture. Psychologists have studied play for years to determine its importance in the life of a child. In her book, *Play and Imagination in Children with Autism*, Wolfberg (1999) gives an excellent summary of the various theories of play that have emerged over the centuries. During the romantic period, Vygotsky (1999) regarded play as a natural childhood activity. He suggested building on the child's natural interests in play as a means to gradually develop his or her potential.

During the classical period, the surplus-energy theory of play emerged. Play was thought play as a way to practice and perfect skills considered necessary for adulthood. Hall (1906) proposed a recapitulation theory of play. According to his theory, children reenact developmental stages of the human race and get rid of primitive instincts before going on to adult life. This led to the idea that play has a cathartic function.

From Freud's (1961) psychoanalytic viewpoint, play is the projection of the child's inner self. Freud saw the role of play as being a therapeutic one. Erikson(1950) proposed that play serves as an ego function and progresses through stages that mirror children's psychosocial development. Play was considered centrally important in the child's intellectual development to Jean Piaget (1962). He believed that as the child transforms objects, roles, and situations in play, he or she is developing higher-level cognitive abilities. And finally Vygotsky (1966) stressed the importance of play in the social development of the child. He proposed that children construct meanings and gather skills, values, and knowledge important to their culture through play.

3.3.1 Play and Development

Play's relationship to the cognitive, emotional, social, and physical development of the child is evident. Wolfberg (1999) gives an excellent summary of some of the current literature. During play, the child explores and manipulates objects, which helps him to become aware of function and meaning. As the child learns the use for these objects and attributes meaning to them, he is able to determine relationships between them and assign them to various categories. Through play the child also becomes aware of cause-and-effect and spatial relationships too (Wolfberg, 1999). In pretend play, the child transforms objects into things that they are not. This helps the child to develop abstract thought, the ability to associate, and logical memory (Piaget, 1962 and Vygotsky, 1978 in Wolfberg, 1999). Because play is by

nature flexible and creative, the child feels at ease to put things together in novel ways. This promotes the formation of problem-solving skills. Play also provides opportunities for the child to learn subtle social skills such as how to enter into play with peers or how to extend an invitation. To establish and keep friendships the child must also learn how to share, and enter into mutually satisfying play activities. Through these play relationships the child has opportunities to express intimacy and affection. Social skills that arise out of conflict with peers such as negotiation, compromise, and trust are learned through play as well (Dunn, 1988; Garvey, 1977; Howes et al, 1992; Parker and Gottman, 1989; Wolfberg, 1999).

All of these social interchanges with peers require language and communication. Therefore, it follows that through play the child learns new vocabulary, complex language structures, and the rules of conversation (Ervin-Tripp, 1991; Garvey, 1977;Wolfberg, 1999).

Through play the child explores and develops his physical capabilities as he/she runs, jumps, climbs, and balances. Besides improving gross motor function, the child challenges fine motor skills by manipulating pebbles, sticks, four-leaf clovers, game pieces, and doll clothes. And finally because play helps the child deal with stress (Elkind, 1981) and work through confusing experiences of the past and present (Erikson, 1950; Freud, 1946), it serves an important role in the child's emotional development as well (Wolfberg, 1999). To summarize, play is important to the development of the child because it is the primary vehicle for learning and developing thinking skills, social skills, language, and self-concept, and for developing gross motor and fine motor skills. For this reason, play is an essential element in the design of healing gardens for children.

3.3.2 Play as a Means of Therapy

Although “play therapy” is rooted in the psychoanalytic tradition, there are different forms of play therapy. A natural setting is a location where, if given the opportunity, children would choose to play. What more natural a setting exists for children to play and interact than nature and the outdoors. Children love to play on playgrounds, in sandboxes, on swings, and bicycles. In addition, they also enjoy interacting with nature, Therefore, it makes sense to extend the therapeutic environment outdoors, especially for Play Therapy.

Also, contact with nature brings abstract concepts like the seasons to life. When thechild feels the chill in the air and jumps in the pile of leaves on the ground, the play leader can show the child in a concrete way what autumn means. Secondly, play therapy often requires the expertise of a play leader. A trained play leader and staff can extend the range, challenge, and creativity of the indoor and outdoor environment. They help to engage children with each other and with their environment to support growth and development of communication and social skills. Play therapy may be easily incorporated into a therapeutic garden. Play spaces should comfortably accommodate approximately five children. They should have clearly defined boundaries and an explicit organization. Play materials should be accessible, visible, clearly labeled, and logically arranged.

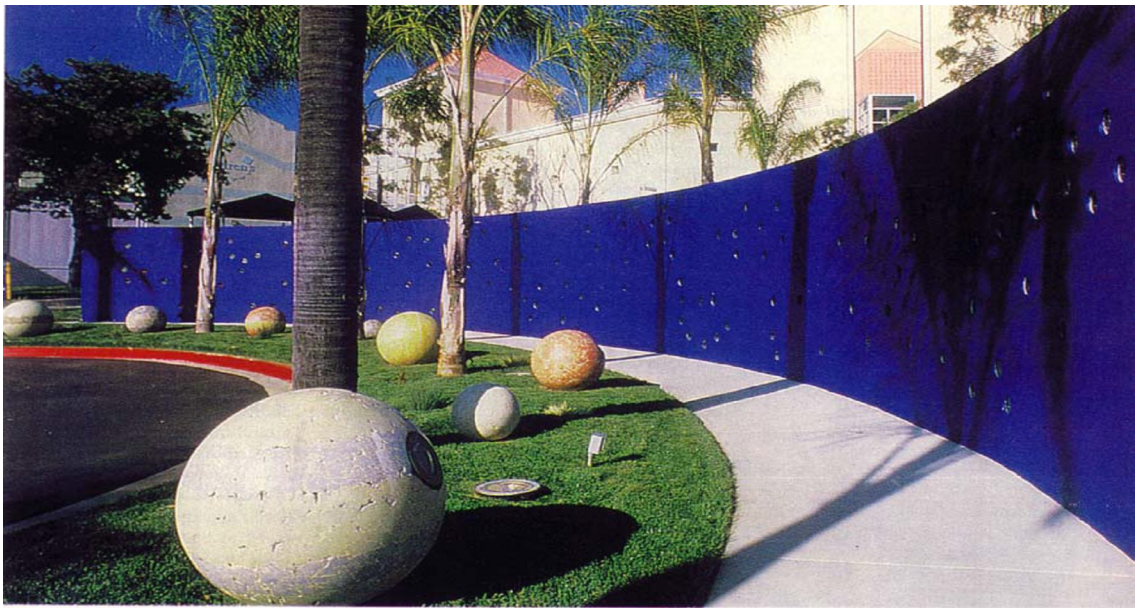


Fig.3.1: The Leichtag Family Healing Garden at the Children's Hospital in SanDiego, California.(Source: Taylor, G. and Cooper, G. A Healing Garden.*Landscape Architecture and Specifier News*, February, 2001: 64-72).

3.4 THERAPEUTIC GARDENS

Gardens are exploratory platform for children to explore, to search, to test, to discover and to learn from feedback on their own actions. It is an open-plan outdoor facility for the children to get the exposure to natural elements and climatic factors that stimulate all their senses and provide them with information. It is a place for freedom of choice packed with accessories that stimulate children's sensory levels including tactile, visual, audio and taste. Being in the garden, a child's body is engaged and his mind is fascinated by natural features including plants, animals, water and the climatic factors, namely, sunlight, winds and temperature, and the garden accessories such as play equipment and shelter. The garden offers variety of environmental cues that in their forms and movements provide solace and rejuvenation to the children (Olds, 1987).



Fig. 3.2 : Institute for Child and Adolescent Development in Wellesley, MA.
(Source: Dunwell, S. Winning Big. *Landscape Architecture*, 87, 11: 42-49).

3.5 HOW THE OUTDOOR ENVIRONMENT AFFECTS THERAPY

Studies by Fjortoft (2004) and Sa'id et al (2002) implicate that kindergarten or hospital ward should be integrated with the outdoor spaces especially gardenery place attachment for a child is when the show happiness and been in a place and sow regret or distress at leaving and they value it not only for satisfaction of physical needs but for its intrinsic qualities (Chawla1992).Thus the knowledge for childhood cognitive growth and development should be considered in design of hospitals. The belief that physical health care settings has an effect on health outcomes of patients is not new, over hundred years ago Florence Nightingale suggested that patients would recover more quickly if they were care for in an environment that had natural light, ventilation, cleanliness and basic sanitation (Pradhan,2007), The

physical health care environment also has an effect on wellbeing and job satisfaction and employee wellbeing are associated with work performance, productivity and ultimately with quality of healthcare (Lawson and Phiri,1999). A great children's hospital should be designed so that it does not look institutional" (Francis, 1988). In for example the Evalina children hospital, the exterior façade and the lobby, are key, providing direction and diversion, and allowing children and parents to forget that they are in a hospital. It is believed that a gigantic, imposing, unfriendly mega structure intimidates children (Fjortoft,2004) and that children are most comfortable in circular or curved environments (Scher,1992).

Physical working conditions contribute to nursing turn over and burnout, which further adds to current nursing shortage and which therefore puts patients' lives in danger. The term "healing environment" is used to describe the factors that positively affect both physically and physiologically the community served by the health care facility and includes physical setting as well as the organizational culture. The importance of humanizing and improving healthcare environments in order to increase users wellbeing has been stressed and is one aspect of "user centered" health care (Redshaw,2004) there is growing recognition that architecture is a tool in the healing process the term "Therapeutic environment" refers to one which incorporates certain architectural characteristics which aids in recovery (Marcus and Barnes, 1999). This has been supported through research into peoples experiences and emotional response to their health care (Barnes,1994) . With this in mind it is important to consider how the whole community might be affected not just the patients. There is much evidence to support an association between physical environment of healthcare facility and health outcomes for both patients and staff these include changes in wellbeing stress, length of hospital stay, the need for medication an physiological changes for patients recovery and wellbeing, a common feature in many of these positive outcomes is a heightened sense of control leading to more positive psychological health.

In their book, *Restorative Gardens*: *The Healing Landscape*, Gerlach-Spriggs, Kaufman, and Warner, Jr.(1998), gave the medical explanation of what happens in the body when one experiences stress. According to the authors, stress produces certain physiological changes such as elevation in blood pressure, increased heart rate, increased muscle tension, and changes in brain wave function and mental concentration. While these changes may help us to cope with stress they also take a toll.

We can use relaxation and imagery to "think" ourselves into reducing our stress. But viewing nature seems to be the preferred method of stress reduction. And we begin to feel better within minutes of viewing nature. Gerlach-Spriggs et al (1998) cited other studies to show how stress affects nearly every organ system in the body. Earlier, Selye (1936) in his book: *The Stress of life* showed that the endocrine system works overtime in times of stress. In more recent studies, the evidence showed that the central nervous system and immune system are also affected. Gerlach-Spriggs et al have also found studies in the field of psychoneuroimmunology that provide evidence that how we feel (stressed, relaxed) influences body function. And the most important finding is that both the central nervous system and endocrine systems communicate with and have an effect on the immune system.

Generally, children and adolescents seek to actively manage, negotiate and cope with their time in hospital. They value an interactive, engaging and aesthetically pleasing environment and a friendly, caring welcome from the hospital community ,Their feeling of wellbeing in hospital is dependent on their capacity to remain engaged, maintain a positive frame of mind and to feel comfortable in the hospital setting. Supporting children's experience of fit in a hospital setting means being mindful of the need to support children's choices, needs and purposes and their capacity for self-help.the importance of humanizing and improving healthcare environments in order to increase users well-being has been stressed, and is one

aspect of “user centered “ healthcare (Hebert,2003). There is growing recognition that architecture is a tool in the healing process.

CHAPTER FOUR

CASE STUDIES

4.1 CASE STUDY ONE

NAME: Ahmadu Bello University Teaching Hospital, Shika.

LOCATION: Shika Zaria, Nigeria.

4.1.1 History

The Ahmadu Bello University Teaching Hospital was established in 1970 as a tertiary institution that monitors the education of student doctors and also serves as an apex healthcare facility. Construction was slow and cumbersome but it was commissioned in February, 1999.

4.1.2 Planning

The whole hospital was planned in linear skewed grid system that lies side by side with adjacent blocks. The structure is designed as such and the pediatric unit occupies one block (which is not enough for number of admissions) Because of this beds are set up for patients in hallways causing overcrowding. The ground floor consists of the complex radiotherapy, planning/marking, operation theatre, recovery room, changing rooms, waiting area and reception. The upper floor consists of the administrative unit consisting of offices and staff facilities. There is a good attempt at separating pedestrian from vehicular traffic routes.

4.1.3 Building form

All the blocks in the hospital are recti-linear. The number of floors ranges from to one to four floors and the building looks like an office complex from the exterior.

4.1.4 Building materials

The structure is constructed of reinforced concrete frame, floors and sandcrete block infill.



Plate 4.1: Exterior view of ABUTH (Source: *Author's fieldwork, 20011*)

4.1.5 Integrated child care facilities

The pediatric clinic has beds; other patient care facilities that were integrated into the design include Shops and restaurants. Because the hospital is not just a children's hospital, there are limited facilities integrated to create a child friendly environment. Design consideration was not given to family members. There are no rest rooms, prayer rooms, laundry or kitchen services and as a result of this, family members are found sitting, praying on walkways and other circulation spaces. In the pediatric clinic, there isn't any room for parents staying with their children. The parents sleep on chairs by the children's bedside.



Plate 4.2: Pediatric ward at ABUTH (Source: *Author's fieldwork, 20011*)

4.1.6 Merits

i. Good controlled interior temperature and lighting.
ii. Controlled access and circulation.
iii. Good location of nurse station reduced transition time, and controlled observation of patients.

4.1.7 Demerits

i. Limited room for expansion due to the nature of the activity.
ii. Over dependence on artificial lighting and ventilation .
iii. Inadequate integration of patient care facilities.
iv. Overcrowding in the pediatric wards due limited space.
v. No considerations made for family members spatial needs

4.2 CASE STUDY TWO

NAME: National Hospital, Abuja.

LOCATION: Abuja, Nigeria.

4.2.1 History

In 1983, the federal government saw the need to address child and women health as an urgent problem. A committee headed by one Professor Bello Osagie was constituted to assess the situation and make recommendations. They recommended a hospital for women and children which would later be re-organized as an apex hospital for the whole nation. Initially called national hospital for women & children was later changed to national hospital, Abuja.

4.2.2 Planning

This hospital was planned as a spreading edifice with careful landscaping and proper segregation of different units. The out-patient is the first block in front of a first time visitor with the emergency entrance adjacent at the extreme left. The administration is located around the extreme right with ample parking and separate entrance. The diagnostic unit is centrally located between the clinics and the wards with the operation theatres close to the wards and the diagnostic unit.

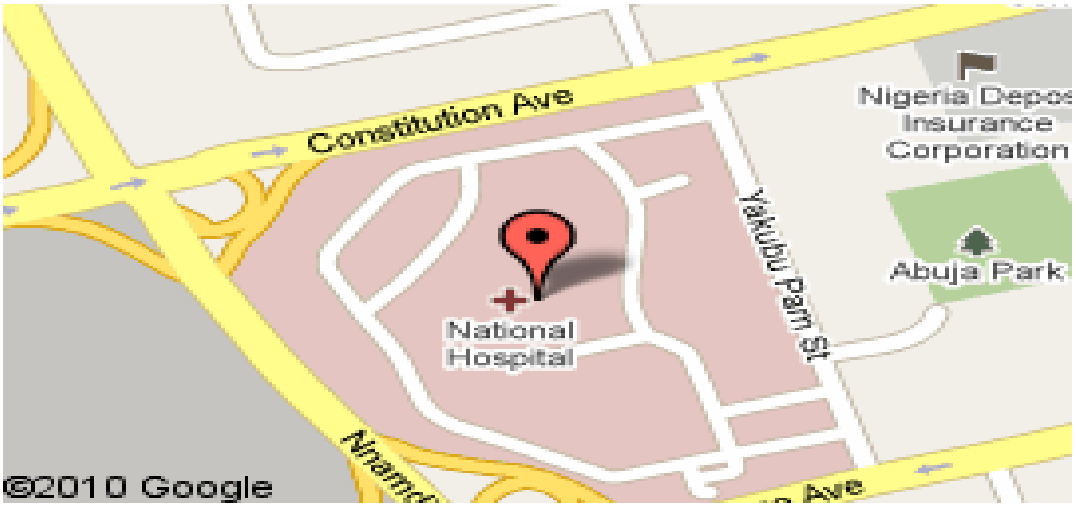


Fig. 4.1: Location of the National hospital (Source: *www.nationalhospitalabuja.net*)

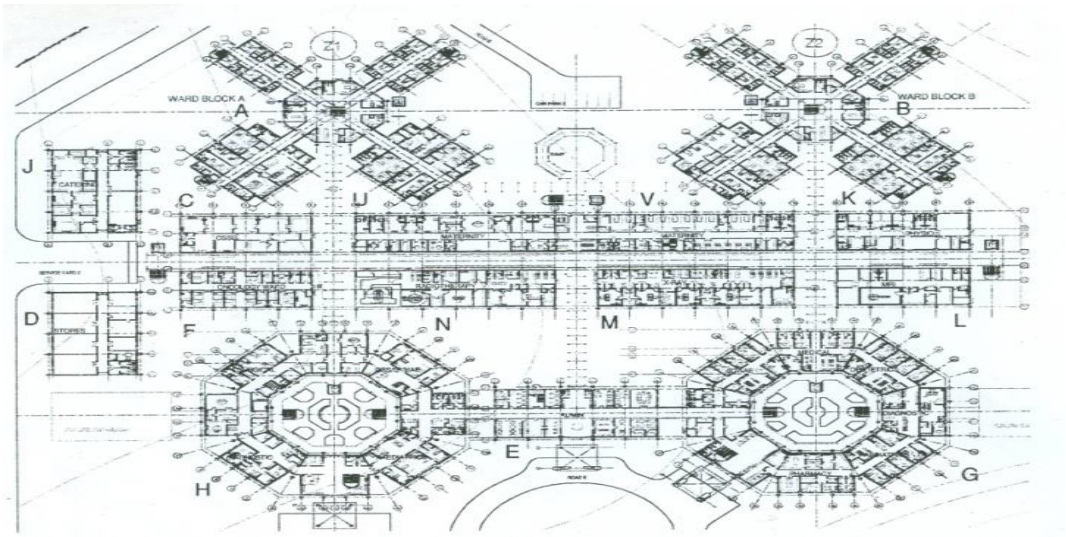


Fig. 4.2: Floor plan of the National hospital (Source: *www.nationalhospitalabuja.net*)

4.2.3 Building form

All the blocks in the hospital are recti-linear. The structure is designed as an open courtyard grid system that lies side by side with adjacent blocks raising only two floors up reducing

intimidation as one approaches. The pediatrics unit is located on Maryam Abacha block on the eastern part of the hospital. It occupies a unit of the seven units. No consideration was given in terms of building form as the users are children.

4.2.4 Building materials

It is constructed of reinforced concrete frame, floors and sandcrete block infill with glass fenestrations.

4.2.5 Landscape

The Hospital is designed with open courtyards in all the blocks. These courtyards are well designed with green look on and walk on lawns, hedges to demarcate different space use, flowers to beautify and scentify the environment concrete seats located strategically for patients to seat on.

4.2.6 Integrated child care facilities

The pediatric clinic has beds; other child care facilities that were integrated into the design include Shops, restaurants, a bank.

4.2.7 Merits

i. A decent effort towards making the pedi atric clinic child friendly.
ii. Serene landscaping may aid recovery.
iii. It stands as the best equipped nationwide.
iv. The existence of a homely atmosphere.
v. Information technology aids management.
vi. Short route because of the compact courtyard design reducing circulation stress.

4.2.8 Demerits

i. Ward window shading devices inhibit good views outside,which might increase depression in patients
ii. Patients limited exposure to the landscape.
iii. There is a problem of parking space

4.3 CASE STUDY THREE

NAME: Children's Hospital,Colorado.

LOCATION: Colorado,USA.

4.3.1 History

This hospital was founded on May 9, 1908. In 1909, The Children's Hospital converted a former residence at 2221 Downing Street into a well equipped institution with a capacity of 30 beds, admitting its first patients on Feb. 17, 1910. As the demand for child healthcare services increased throughout the region, the hospital quickly outgrew its original location and a new one with improved facility was built, which opened in 1917 at 19th Avenue and Downing Street in downtown Denver. The "beautiful, new, green and white" building opened with 100 beds. After numerous expansions over the years, the Children's Hospital opened on Sept. 29, 2007. It is ranked among the top ten pediatric hospitals in the United States. The Children's Hospital is affiliated with the University of Colorado Denver.

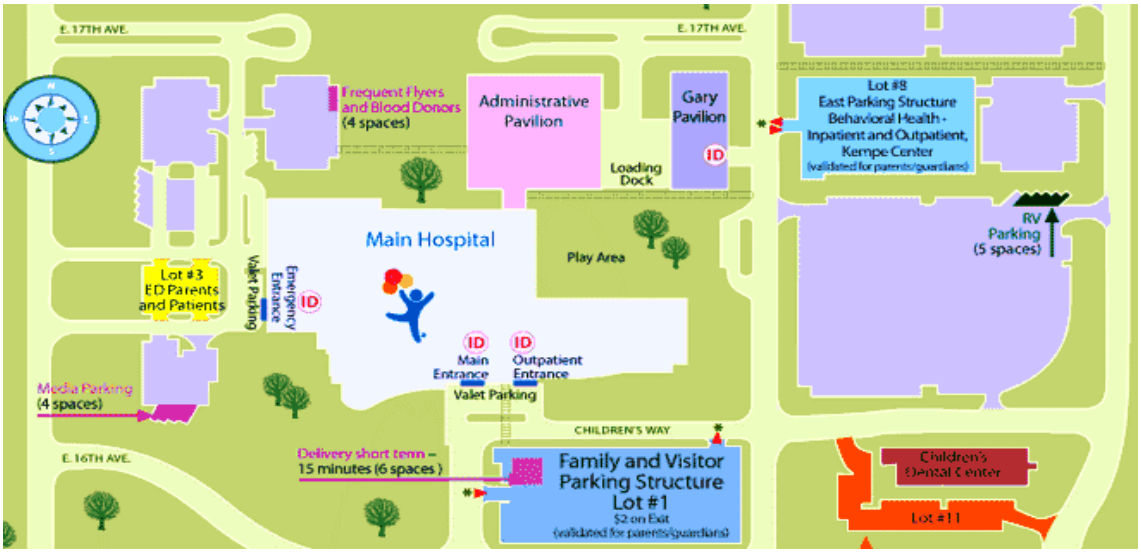


Fig. 4.3: Site plan of Colorado Children's hospital (Source: *www.thechildrenshospital.org*)

4.3.2 Building form

It is a ten storey high rise building that looks like an office complex. It comprises of three recti-linear parts massed together in harmony to serve as one. It is modular in plan and has alternate floor heights which give more room for natural lighting and generous views of the surrounding landscape.



Plate 4.3:Exterior view,Colorado Children's hospital (Source: *www.thechildrenshospital.org*)

Though the exterior form is recti-linear, the interior panels were curvi-linear especially in the patient care units.



Plate 4.4:Nursing unit,Colorado children's hospital (Source: *www.thechildrenshospital.org*)

4.3.3 Landscape

A 6.6-acre greenway on the southwest corner of The Children's Hospital property is designed to be a park with walkways, alcove gardens, lawn areas and play areas. The Garden of Hope located just outside the chapel features a playful labyrinth maze kids enjoy to play in. There is plenty of green space outside the Fresh Market Place for kids to run and play if they wish to. An outdoor family courtyard is also located on the third floor opposite the Heart Institute. These spaces provide patients and their parents an opportunity to take a breath and find some respite.



Plate. 4.5:Well designed play and recreational gardens in Colorado Children's hospital
(Source: *www.thechildrenshospital.org*)

4.3.4 Scale

Patient rooms had smaller heights than that of the normal adult rooms. Fittings and fixtures were designed to fit children's sizes, different colors were also used to create specific feelings

Other child care facilities include cinemas, reading nooks, playrooms, laundry and kitchen for the parents, respite rooms, lounges etc.

4.3.5 Merits

i. The building approach is inviting to kids because of the artworks used on the entrance porch.
ii. There is a good attempt on the use and blend of colors and themes in creating a friendly environment.
iii. The atrium as a meeting place provides a regional, comfortable and fun space to gather for activities and interaction. Making the patients to feel at ease in the hospital environment

iv. There was an attempt at bringing in natural light and the provision of good views especially in patient centered spaces and around the wards.
v. Spaces are sensitive to the patients with enough circulation room and decent patient centered care.
vi. Landscape elements were used at strategic locations to aid the healing process.
vii. A lot of non-clinical child care facilities were incorporated to help in making the environment comforting for the child- patient their families and caregivers

4.3.6 Demerit

The linear concept of the plan causes long distance walks and hence fatigue to patients their parents and caregivers resulting in reduced staff performance as a result of increased walking time.

4.4 CASE STUDY FOUR

NAME: Miami children's hospital

LOCATION: 3100 SW 62nd Avenue, Miami Florida, USA

4.4.1 History

This hospital was founded in 1965. It serves children from Florida, the United States, Central and South America, and the Caribbean. It is a 268-bed facility and the largest freestanding paediatric teaching hospital in the south-eastern United States. It has served the region for more than 55 years. It is affiliated to the university of Miami and is involved in three major activities; treatment, research and training.



Fig. 4.4: Location of the Miami children's hospital (Source: *www.mch.com*)

4.4.2 Planning

The structure is designed as a modular grid system that lies side by side with adjacent blocks. It has alternating floor heights ranging from three to six floors. It comprises of nine rectangular blocks connected by walkways, corridors, staircases and a series of courtyards.

4.4.3 Building form

All the blocks in the hospital are recti-linear. The number of floors ranges from three to six floors and the building looks like an office complex from the exterior except places close to the entrance which had curvi- linear forms to help reduce anxiety in the children as they approach.



Fig. 4.5 .:Site layout of the Miami children's hospital (Source: *www.mch.com*)

4.4.4 Building materials

The structure is constructed of reinforced concrete frame and floors with block infill and glass fenestrations.

4.4.5 Landscape

Miami Children's Hospital is incorporating green strategies. The Hospital's Master Facility Plan was unanimously approved by the Board of County Commissioners on July 26, 2007 and that made provision for the installation of a system to recycle run-off water for irrigation and the utilization of environmentally friendly materials in planning construction. It also made provisions to increase the landscaping in and around the hospital;calms traffic through roundabouts/circles and incorporate noise reduction strategies into new and existing parking garages through landscape elements. The hospital already was built in an open courtyard system. The courtyards offer green environments to the patients and their families. The surrounding areas are also covered with lush green grass making the hospital inviting as one approach.



Fig. 4.6:Landscape at the Miami children's hospital (Source: *www.mch.com*)

4.4.6 Colors

Various color palettes were used both in the exterior and interior to create a specific feeling or mood. There was a careful consideration on how spaces will be experienced. From every open space to every clinic and corridor, there was a careful consideration of how the colors used will affect the experiences of patients, families and staff. Different themes were used in various spaces but there was a prevalence of the aquarium theme as it was used in lounges, corridors and even the MRI room.



Plate 4.6: Aquarium themed waiting area and MRI room at the Miami children's hospital (Source: *www.mch.com*)

4.4.7 Scales

There was a breakdown of scale on exterior image. This reduces intimidation and the entry sequence should always be as convenient and inviting as possible. Inside, the ambience should promote a sense of order and orientation as well as wonder and engagement.

4.4.8 Integrated child care facilities

The hospital has two hundred and eighty nine inpatient beds, Other child care facilities that were integrated into the design include Shops, restaurants, cinema, a bank, play ground, spiritual care services, hospital school, laundry and kitchen services for parents etc.

4.4.9 Merits

i. The building approach is inviting to kids and there was an attempt to decrease intimidation by down scaling the building elements at the entrance.
ii. There is a good attempt on the use and blend of colors and themes both inside and outside the hospital to create a friendly environment.
iii. Spaces are sensitive to the patients with enough circulation room and decent patient centered care.
iv. Landscape elements were used at strategic locations to aid the healing process.

4.4.10 Demerits

i. Repetitions of the aquarium themes make some spaces boring.
ii. The linear concept of the plan causes long distance walks and hence fatigue to both patients and their parents.

4.5 CASE STUDIES FINDINGS

From the case studies conducted, it is apparent that children's hospitals face the same design issues--flexibility,proper use of space, operational efficiency, patient safety, new technologies etc --as other types of hospitals. Additionally, issues unique to children's facilities include the following:

i. There is generally the prevalence of rectilinear forms due to the highly technical and functional nature of hospitals. However, there is the use of curvilinear forms in wards, child care and play areas and waiting lounges.

ii. The buildings are mostly massive due to the number of activities and people involved but there is always an attempt at reducing scales in areas where children mostly stay. There is also a reduction in scale in terms of furniture, fittings, fixtures and ceiling heights in child care areas.

iii. Anxiety may be at its highest when the child approaches the children's hospital. Ideally, the building should communicate that it is a special place for children, different from its neighbors. An exterior image that breaks down scale and reduces intimidation is preferred and the entry sequence should always be as convenient and inviting as possible.

iv. In the foreign case studies which are all free standing hospitals designed specifically for kids, there was a great consideration in the design as regards colors and themes that are friendly to children. While in the local case studies the pediatric clinics are designed like all other units of the hospital.

v. The hospital interior ambience should promote a sense of order and orientation as well as wonder and engagement.

vi. Landscape and outdoor areas were provided in all the hospitals proofs that landscape and natural environments are integral part of the healing process.

vii. Concrete, still and glass were the predominant materials used though one of the foreign hospitals used terracotta panels which are a locally found material in the area.

viii. There is special consideration given to lighting the interiors not just for the medical processes but to reduce anxiety and fright in the children.

ix. Non clinical facilities such as play areas, lounges, reading rooms, cinemas etc if integrated into the design could help in creating a child friendly.

x. Children's facilities may also have a classroom that provides the opportunity for children with extended hospitalizations to continue their studies.

xi. Security in a children's hospital needs to be robust yet unobtrusive. The building's design should limit access to outsiders and help prevent children from wandering away or into potentially hazardous areas. Everything from lines of sight from patient care workstations to the location and height of sharps containers requires consideration.

xii. Increasingly, facilities are enhancing the "bench-to-bedside" relationship between basic research and patient care. Thus, design should balance the needs of principal investigators, clinical researchers and the patient and family.

xiii. Multidisciplinary collaborative workrooms in transitional areas between research labs and patient care areas encourage exchange between scientists and clinicians; and integrating clinical research exam areas with ambulatory care services allows researchers and providers to frequently interact, and offers families and children convenient access to participation in clinical trials.

CHAPTER FIVE

SITE CONDITIONS

5.1 SITE DOCUMENTATION

Kaduna was created on May 27 1967,It is state located in northern Nigeria and lies between latitudes 9°03'N and 11°32'N, it extends from the upper River Mariga on the foot slopes of the scarp of Jos Plateau. It is bordered by Zamfara, Katsina and Kano states to the north, Niger and the FCT to the east, Bauchi and Platue states to the west and Nassarawa state to the south.

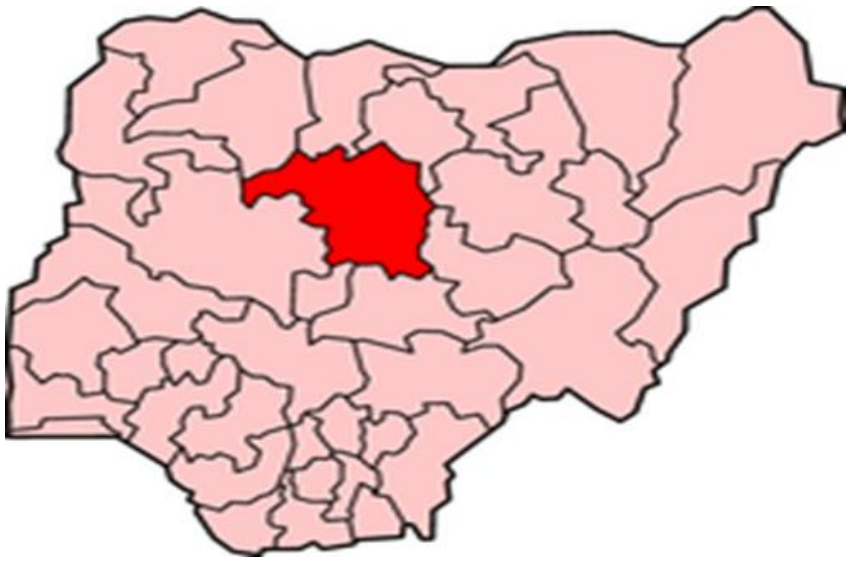


Fig. 5.1: Map of Nigeria showing Kaduna state. (Source: Final master plan report 2008)

5.2 SITE LOCATION

The site is located at the eastern part of kaduna metropolis,at the new millennium city,along the new kaduna eastern bypass.

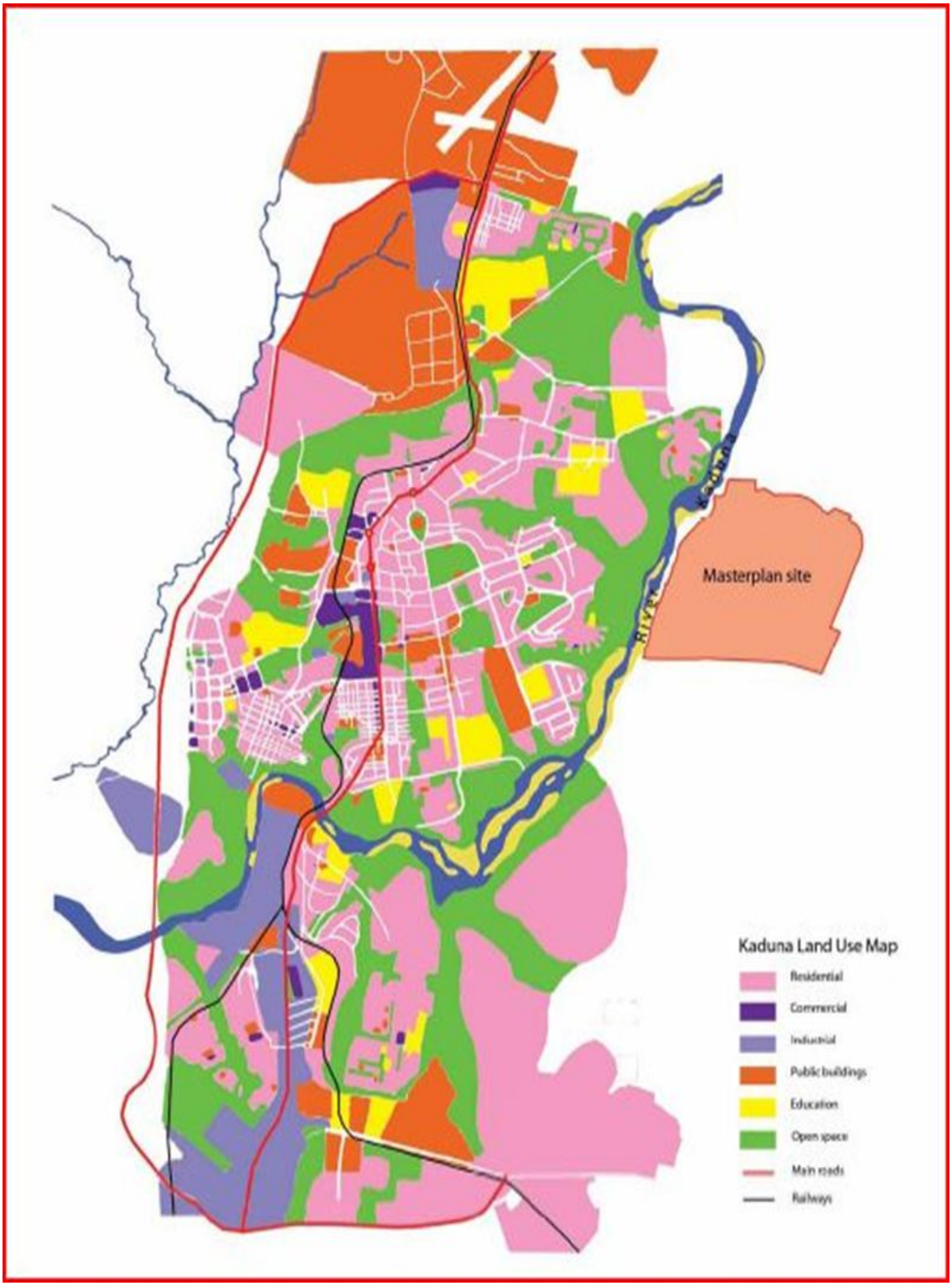


Fig 5.2: Kaduna Land use map in relation with new Kaduna city
(Source: Final master plan report 2008)



Fig. 5.3: Kaduna old and new city (Source: www.nigeriagalleria.com)

5.3 SITE SELECTION CRITERIA

The site adopted has been carefully analyzed, with some factors taken into consideration to determine its potentials and the purpose and magnitude of the project. The suitability of the site was analyzed using the following criteria.

Physical criteria:-

The physical criteria considered include the geology and soil, topography and drainage, vegetation and land availability.

Geology and Soil: - The types of activities and structure to be put on a site will determine the suitability of that soil for that purpose. The structural integrity of any complex is closely related to the soil/rock bedding, which should be able to bear the proposed land use. In this

case, the lateritic soil nature of the site renders it suitable for even the most advanced structural composition. The topsoil is permeable and will permit fast and easy water penetration/drain, thus preventing pools of water gathering around the site. The site is also blessed with vast open spaces around it which provides a suitable excitement and natural feeling to the patients the hospital.



Plate 5.1: Soil type of the Site (Source: Author, 2011)

Topography and Drainage: - The site is gently slopes towards the south western corner but flattens towards the middle with gentle slopes radials to the other corners. This makes an elevated hill like centre which will serve as a natural drainage system. The periphery is also well drained towards a tributary of an existing Kaduna river. .



Plate 5.2 (a & b): Site drainage (Source: Author, 2011)

Vegetation: - The vegetation of the whole surrounding can be characterized as lush green with a lot of trees and shrubs which are spread all over. The flatten area viewed from a far give it an ever green look. The vegetation is so very attractive and suitable for a hospital site in view of the therapeutic and healing effects of landscape on the patients.



Plate 5.3: Site Vegetation (Source: Author, 2011)

Land Availability: -The site chosen is a virgin land it is located a few kilometers away from the surrounding neighborhood and there is enough room for future expansion. There will not be any need to demolish any structure or to pay compensation for structured destroyed.

Environmental criteria:-

The nature of the overall environment is very crucial to the type of development within an area. In this case, the site is located in a strategic location within a medium density and high density residential areas and a mixed land use area, which is a plus to the location of hospital. It is also close to the tertiary institution which will provide easy access in case of emergencies. The site also happens to be bounding with vast open spaces which will support the private and sedentary atmosphere required by the patients.

Another plus to the selection of this site is its strategic location off the primary road and the ring road that surrounds the entire district coming from the old Kaduna city. All the sides of the site are bounded by roads which include a secondary road for easy access, an arterial road for convenient access off the highway.

Man-made features:-

The man-made features include factors that have been put in place through the activities of men, which affects the suitability, or non-suitability of the selected site. They include public utilities, services and accessibility.

Public utilities: -

The site chosen is located in a place where adequate public utilities that can encourage movement of people to the area are available; they include parks and gardens, tertiary institution, primary school, and good road network.



Plate 5.4: Site Access road (Source: Author's fieldwork, 2011)

Services:-

The site is bounded by very good services such as electric power line and a network of telephone communication, which makes access to them easily obtainable. There is also a good drainage system and very good method of solid waste disposal.

5.4 CLIMATIC DATA

The climate of a place is the average weather conditions over a long period of time, the weather of a place which brings changes in the condition of the atmosphere at a particular time in a particular place is described in terms of its temperature, relative humidity, rainfall, winds and sun shine hours. The climate thus plays an important role in the design of building in terms of orientation, materials or for building envelope, the roof type, the drainage pattern and effects of wind pressure.

Therefore, to successfully design a comfortable living environment,one has to maximize the aspects of environment which reduce heat and the effect of humidity, and protect from rain and dust. Planning with climate should take place at all scales. While

detailed climatic information is not yet available, extrapolations from existing airport meteorological stations have been used to develop the basic description of climatic parameters of the site.

5.5.1 TEMPERATURE AND RELATIVE HUMIDITY

In human terms, net radiation is felt as air temperature the response to which is

greatly influenced by humidity conditions in the air. In kaduna state,the temperature is at its highest in the dry season. During the rainy reason, the maximum temperature is lower due to the dense cloud cover. Temperature falls in the afternoon to a low 20%. This low relative humidity couple with the high afternoon temperatures account for the desiccating effect of the dry season. In the rainy season the relative humidity is much higher especially in the morning hours. However, in Kaduna state, the seasonality is pronounced with the cool to hot dry season being longer, than the rainy season.

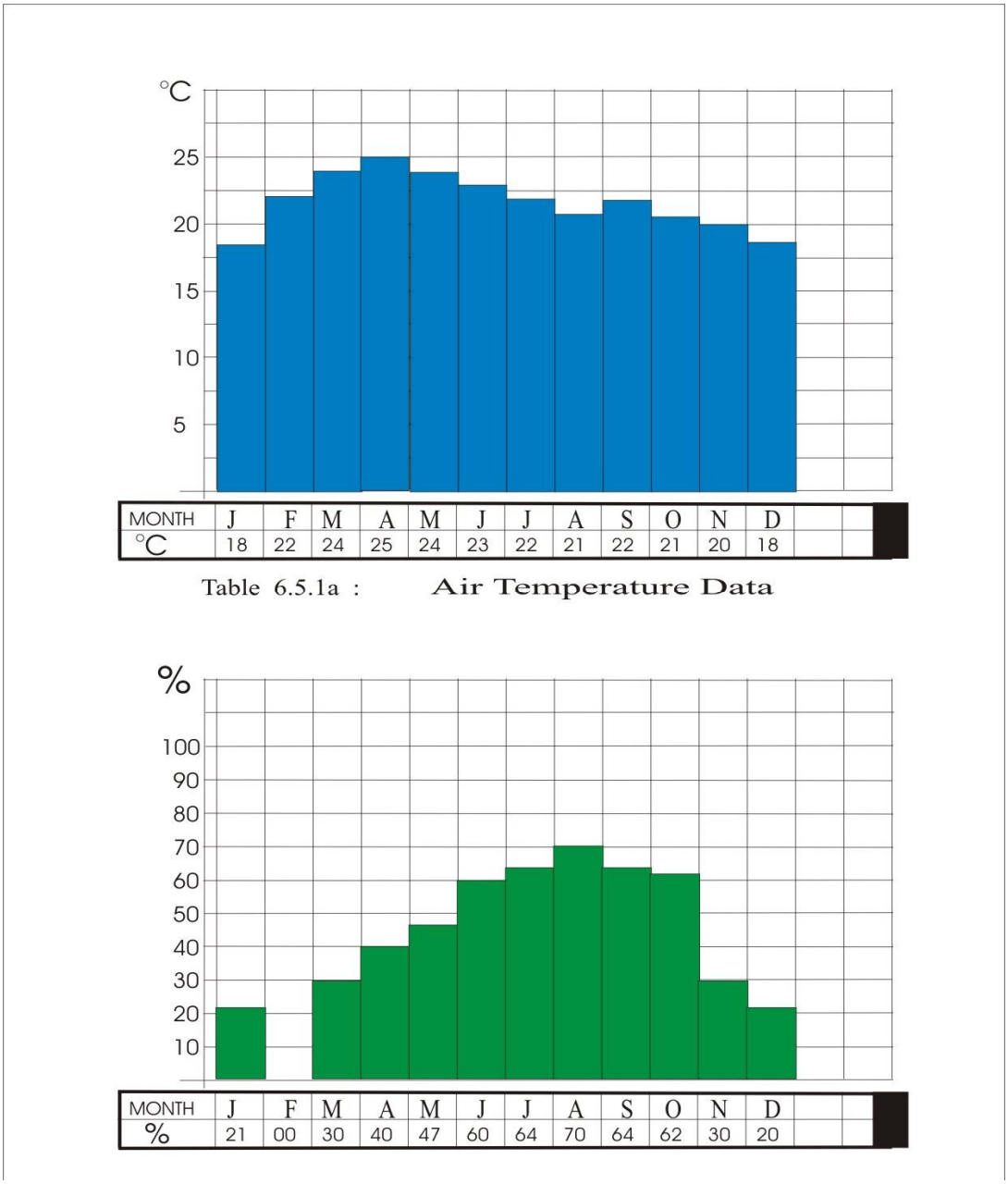


Fig 5.4 : Air temperature data of Kaduna metropolis (Source: Final master plan report 2008)

5.5.2 RAINFALL

The rainy season usually starts around the month of April this continues to around October. Thus, this implies that the rainy season is between 180 to 190 days. The five month rainfall supplies a mean monthly distribution that shows a tendency for concentration of rainfall

shows the need for a drainage system that can evacuate large volumes of water very quickly. The rainfall regime is the result of the convergence of the cool, moist, south-westerly air mass (monsoon) and the dry, hot north-easterly air mass (Harmattan).

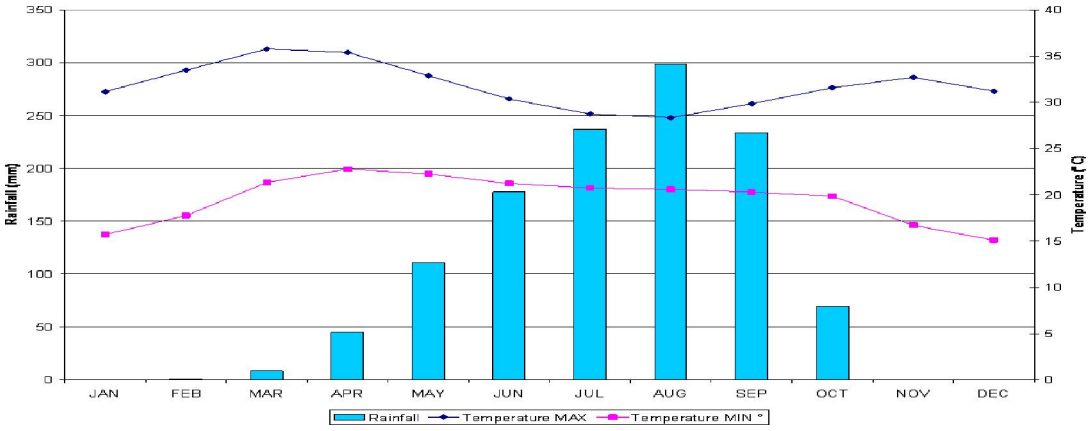


Fig.5.5: Rainfall and Temperature Patterns in Kaduna (1980-2006) (Source: Final master plan report 2008)

5.5.3 WIND

There are two major air masses that dominate the climate of northern Nigeria. They are tropical maritime air mass (monsoon) and the tropical continental air mass (Harmattan).

The monsoon: This is a moist, cool, air mass with the long history of sea tracking over the South Atlantic Ocean. It is south westerly in direction and has a small decrease in temperature with height. This is associated with the set season.

The Harmattan: - This is a dry and hot air mass with a large decrease of temperature with height. It is a long history of desert tracking uja as a north-easterly wind. The harmattan wind is developed over Sahara desert and is therefore warm, dry and blows in the opposite direction. North-East to South-West. This is associated with dry season in June the northerly

flow of air component has weakened and only the southerly flow predominates. Being moisture laden, it brings about a lot of rain. In September, the tropical continental begins to intensify over the territory and the north-east trade becomes the dominant wind from October to March bringing with it dry, cloudless but dust laden conditions.

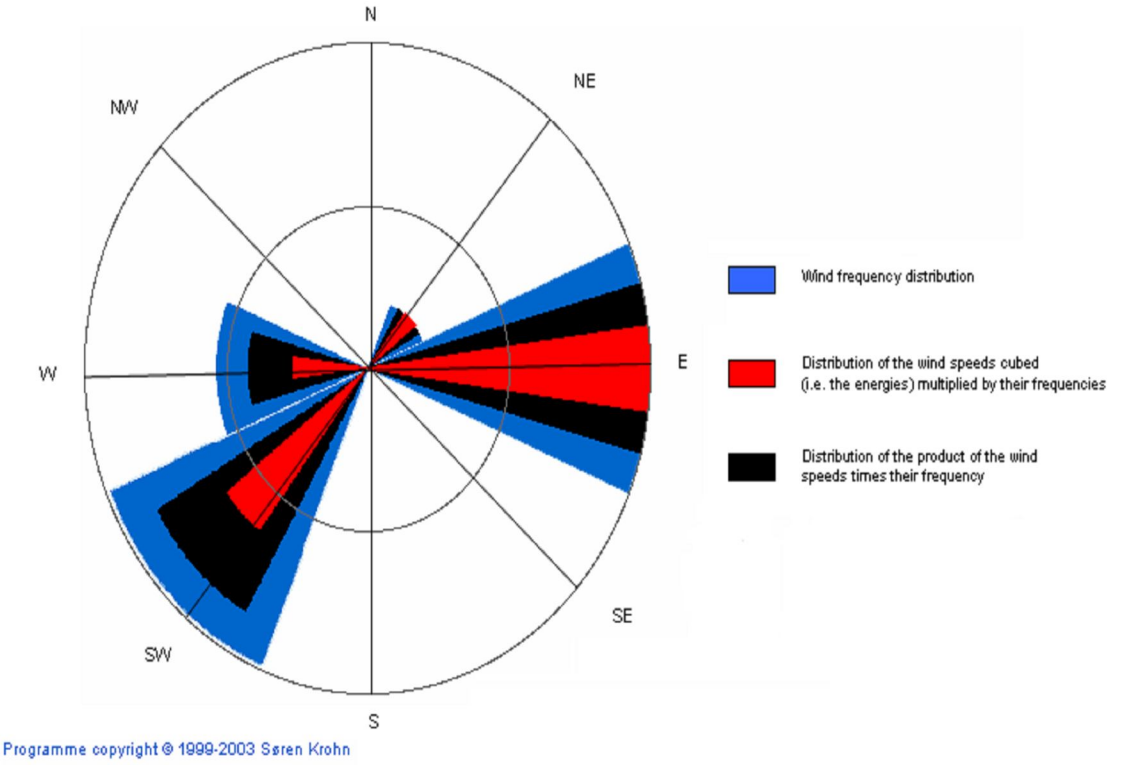


Fig 5.6: Wind Rose in Kaduna (1980-2006) (Source: Final master plan report 2008)

5.5.4 SUNSHINE HOURS AND CLOUD COVER

Kaduna is exposed to about hours of sunshine annually during the dry months (November to April). The monthly variation in the amount of sunshine follows the general trend of an increase from over 275 hours in the state (approximately 92 hours per day). Essentially, there is a general decrease in sunshine hours as rainy season progresses and an increase in sunshine hours as the rain slowly diminish in August.

Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Insulation, kWh/m²/day	5.66	6.49	6.72	6.63	6.41	6.03	5.44	5.03	5.47	5.76	5.80	5.40
Clearness, 0 – 1	0.65	0.69	0.66	0.63	0.61	0.58	0.53	0.48	0.54	0.60	0.66	0.64
Temperature, °C	23.31	25.17	27.67	27.36	26.11	24.61	23.63	23.56	24.22	24.95	25.65	23.87
Wind speed, m/s	3.99	3.86	4.30	4.31	4.21	3.60	3.43	3.24	2.96	3.17	3.69	4.17
Precipitation, mm	0	1	7	56	120	160	218	275	243	71	2	0
Wet days, d	0.1	0.1	0.7	3.6	8.2	11.8	15.3	16.8	13.8	4.6	0.0	0.0

Fig 5.7: Kaduna, Nigeria- Solar energy and surface meteorology. (Source: NASA Langley Research Center Atmospheric Science Data Center; New et al. 2002)

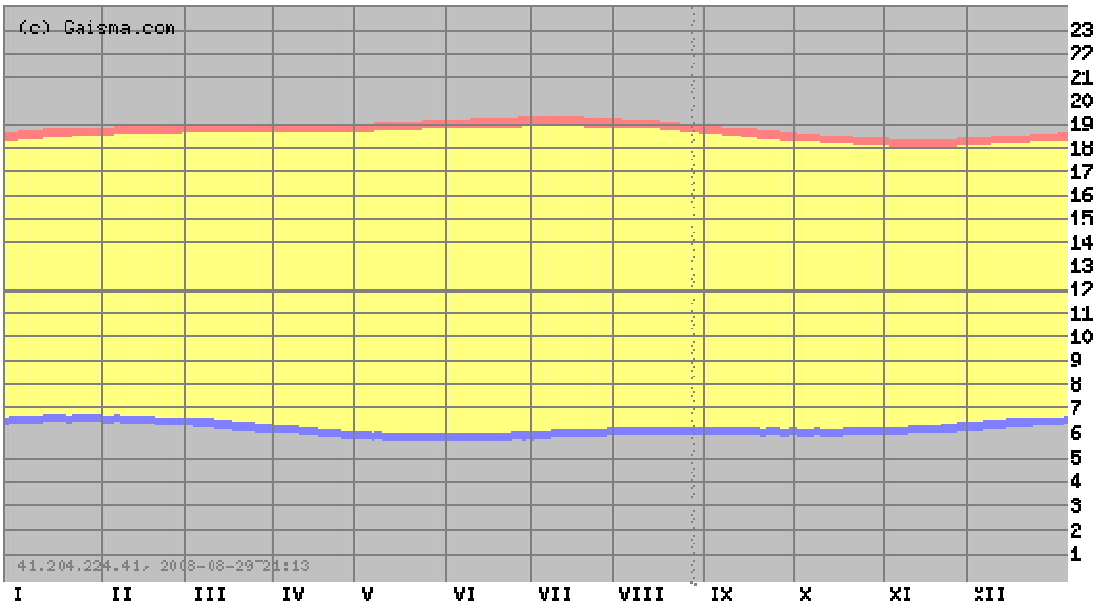


Fig 5.8: Kaduna, Nigeria – Sunrise, sunset, dawn and dusk times graph.

5.5 CLIMATIC IMPLICATIONS ON DESIGN

Climatic factors have a profound influence on planning and design decisions. They are critical to the understanding of creating a comfortable environment within which people can function efficiently. Human comfort is a product of dry and wet bulb temperatures, air velocity and radiation heat exchange between the human body and environment with those criteria in mind, some of the most important consideration involved in design as follows:

- ✓ The Building should be as compact as possible, so that the various parts of building create mutually beneficial shade.
- ✓ The exterior surface of the buildings should be minimized to reduce exposure to solar radiation.
- ✓ The design should achieve the basic geometry of the architecture and its urban configuration, particularly in high density area.

- ✓ Pedestrian Walkways should be shaded with arcades or vegetation to protect people from the direct solar radiation and rainfall.
- ✓ Strategically located areas of dense vegetation within the planning environment will improve the microclimate in general, especially within residential areas. It is preferable to have a larger number of smaller vegetation areas as exposed to a few large open spaces.
- ✓ Full account of the site natural drainage pattern should be noted in the general design of site drainage.

CHAPTER SIX

DESIGN REPORT

6.1 DESIGN BRIEF

The hospital is designed as such that the peculiar need of a specialized child healthcare institution is strictly adhered to as well as the need for a user friendly environment that can aid in the healing process. The hospital complex has nine different buildings that are grouped into four main sections:

- The treatment section
- Child care section
- Administrative and research section and
- Auxiliary section

6.2 DESIGN SYNTHESIS

The summary of goals for this design is to design a facility that meets the needs of the child patient and their caregivers and at the same time provide a conducive environment to aid in healing process where various units of specialization work in harmony to provide quality health care. These goals are set forth to:

1. Provide a functional design that ensures efficient, safe and appropriate work spaces.

2. Accommodate technical requirements for highly sophisticated equipment.

4. Create a humane environment for patients and staff.

5. Develop building systems that can accommodate rapid change.

6. Blend technical and functional requirements into a design that brings delight

to those who use the building and those who pass by it.

The following objectives have been achieved to arrive at these goals.

i. Case studies and investigation into the current trends in medical practice and technology.
ii. Effective study of the nature of the changes associated with these trends as well as the background history that will necessitate the change.
iii. Creating a functional and quality based hospital that allows for a free flow of services and personnel.
iv. To effectively balance the need for changes with also the need for a protective and enclosed environment that comes up as a whole.

6.3 DESIGN CONCEPT

The concept adopted to cater for the changes that are inevitable is such that the complex is segregated into spaces that are susceptible little or no change, moderate change and significant changes. The units that are subject to little change were located around the central area; the core, these may include spaces like consultation clinics, the GOPD, waiting areas and lounges.

The spaces that are subject to more change are arranged respectively outwards depending on the degree of change with the most unstable ones on the outer boundaries of the complex. These may include spaces like the nursing units diagnostic spaces, laboratories etc. This is to ensure access to the spaces in the event of alterations and upgrades. with this concept in mind the design has abundant introduction of good landscape that is appealing to the patient and their caregivers.(fig.2.5 page 23).

6.3.1 FUNCTIONAL CONCEPT

The functional concept of the pediatric hospital is to have an open plan form of buildings connected with courtyards to act as a single unit.

6.3.2 AESTHETIC CONCEPT

This is based on the balance achieved in the overall conceptualization process, the massing and arrangement of forms. The idea portrayed can then be interpreted as a combination of pure geometric form structure and materials in a beautiful composition.



Plate 6.1: perspective view of the hospital complex

6.3.3 SUSTAINABILITY CONCEPT

The adoption of a stack air movement effect throughout the complex facilitates free and natural movement of air around reducing dependence on non-renewable energy sources. This is facilitated by adjoining courtyards between different units which also facilitate lighting. All these measures are aimed at minimizing dependence on electricity to keep the complex at optimum conditions.

6.4 FUNCTIONAL ANALYSIS

The patient/visitor route is clearly depicted on arrival at the hospital. The arrival is either through the emergency department or through the main entrance hall of the GOPD. The first point of call is the enquiry/information desk which is located strategically near the entrance. From there other facilities like the staff facilities, pharmacy, consultation rooms, cash points, lounges, enquiry/information office which are located within the patients reach on the ground floor occupied by the GOPD. This building connects all the vital divisions of the hospital inter-connected by stairways, covered walkways and lush open courtyards. The surgery facilities being sensitive and important units of the complex are located in isolated wings for privacy reasons but are conveniently located to be accessed by the accident and emergency unit.

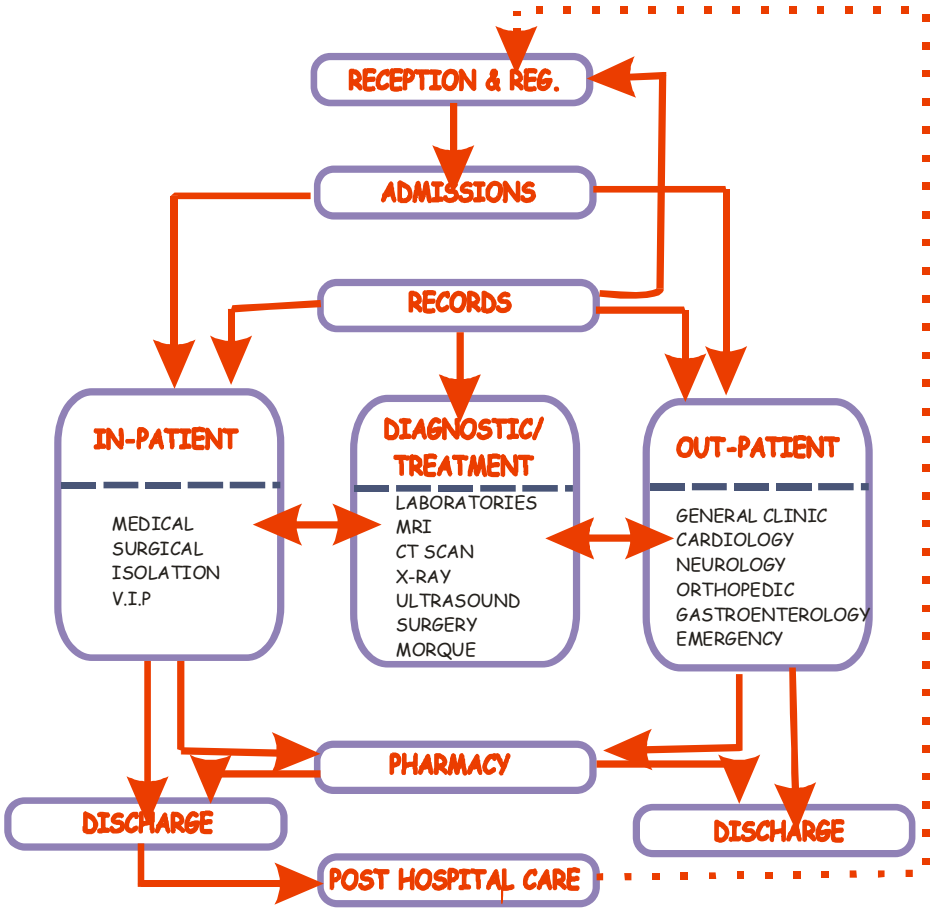


Fig 6.1: Major Clinical Relationships
(Source: Hospital &Health Care Facilities Whole Building Design Guide)

The emergency unit with its own conspicuous separate entrance is located uninterrupted from any encumbrance to free access during emergencies. With ample considerations for different kinds of emergencies ranging from emergency diagnostic facilities, emergency surgery facilities, observation room and waiting lounge.

The first floor of the GOPD is the administrative section which caters for the unique activities of the management of the hospital. These include Chief Medical Director, finance departments, clinical services department, library and conference facility and general administration offices. .

The intensive care units are have a separate entrance and is located close to the emergency departments, radiology and labs and is located on the first floor.

The ward blocks comprises two floors and house the in-patient unit with wards, and female. Other support facilities to the wards include the play rooms, prayer rooms and lounges. In between the wards, storage and support staff facilities and nurses' stations are strategically located to aid constant supervision.The level of the wards is such that provides the required privacy conducive for proper healing. They are segregated and free from encumbrances from the daily chaotic activities of a hospital. Spread around with views of beautiful landscape.

6. 5 DEPARTMENTS/UNITS

The Kaduna Paediatric hospital is such that adheres strictly to the needs of a specialized child-healthcare institution while addressing specific needs of pediatric age group,their families and caregivers .The hospital complex consists of the following unit ,also classified as departments according to their different functions:

6. 5.1 GOPD (THE GENERAL OUTPATIENT DEPARTMENT):This is the first point of call to patients as they come to the hospital except for cases of emergency, where they will be taken directly to the accident and emergency department. The GOPD is where the patients register, for first timers or report,,consult the doctors and receive their treatments.It must be designed properly so as to make the patient at ease,and ease staff work for maximum staff efficiency, accommodate the highly technical nature of a hospital system. The GOPD block is made up of two floors:the GOPD itself and the administrative section. This is located on the upper floor of the GOPD and this department houses the top administrative officers who generally oversee the running of the complex as one piece. This includes offices in the core like the CMD's, Finance department, Clinical services department, library/conference room, departmental heads' offices, general office and staff facilities.

6.5.2 ACCIDENT AND EMERGENCY DEPARTMENT:This department is primarily for accidents and cases of emergencies it has has two floors ,provision for spaces like the treatment rooms,operating rooms ,x-raywaiting rooms, consulting rooms , stretcher storage and doctors call lounge,it also connects to the labs on the ground floor ,and the radiology department on the upper floor.

6.5.3 LABORATORIES:The lab has its own main entrance but has another link to the the accident and emergency department,on the upper floor the radiology department is located which houses the c.t scan,mri,and clinical labs.

6.5.4 RADIOLOGY:This department is on the upper floor of the labs and has a direct link from the accident and emergency department

6. 5.5 THE SURGERY DEPARTMENT:This houses all the operating theatres. It is centrally located to be in close proximity to the wards, the accident and emergency, the laboratories and the GOPD.

6.5.6 INTENSIVE CARE UNIT: This departent is closely located to the labs,radiology and accident and emergency units.

6.5.7 WARDS: This unit is for the in-patient and is where the child-patient on admission in the hospital stays,there is the need therefore to design it in a most comforting manner such that the patient and their families wil lfind the environment friendly and not feel stressed out.the wards have spaces like the patient rooms,nurses station, children play area and prayer rooms.

6.5.8 OTHER AUXILLI ARY UNITS:These include restaurant,laundary and the mortuary which are located on the site.

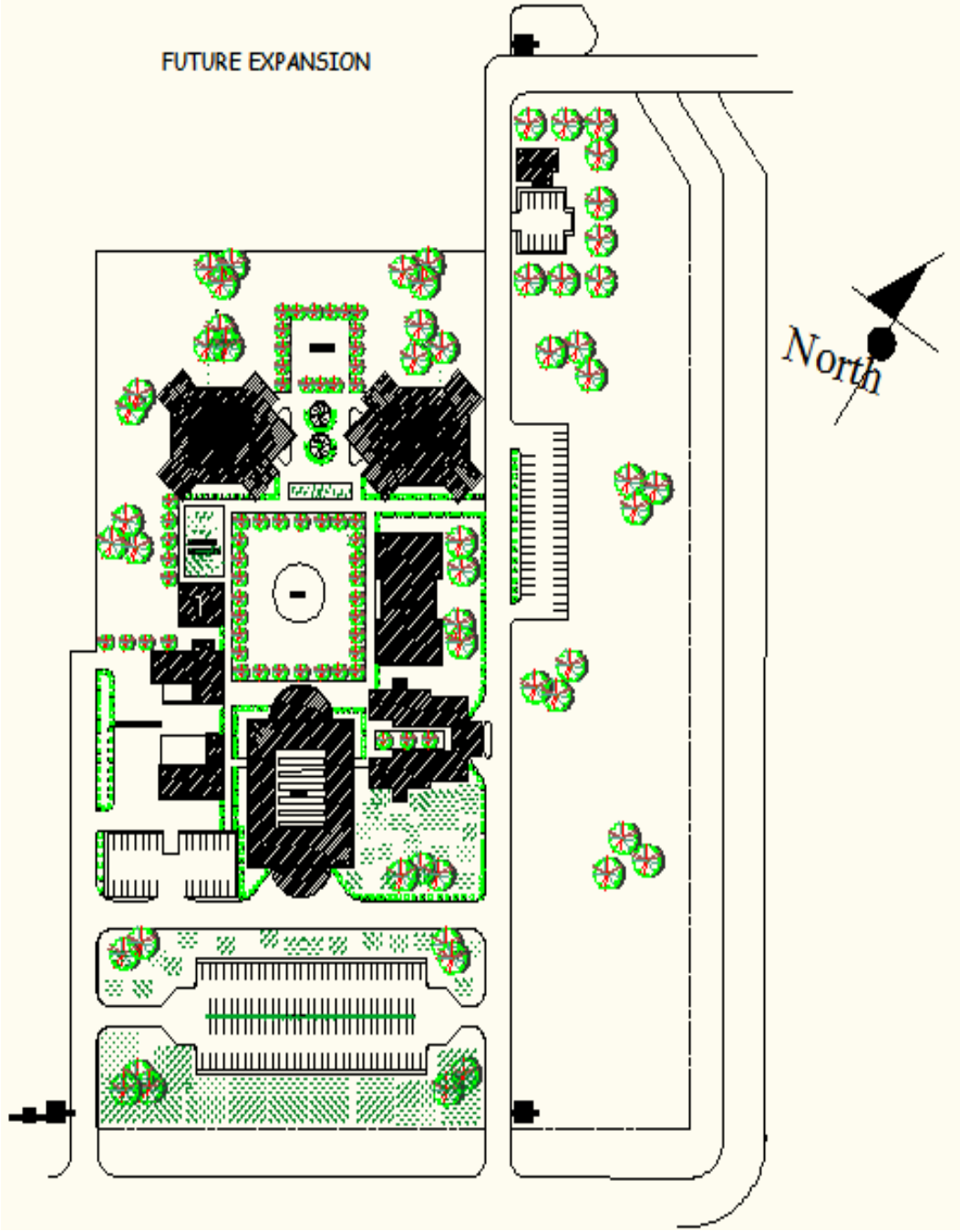


Fig. 6.2: Site layout of the proposed Kaduna Paediatric Hospital,Kaduna

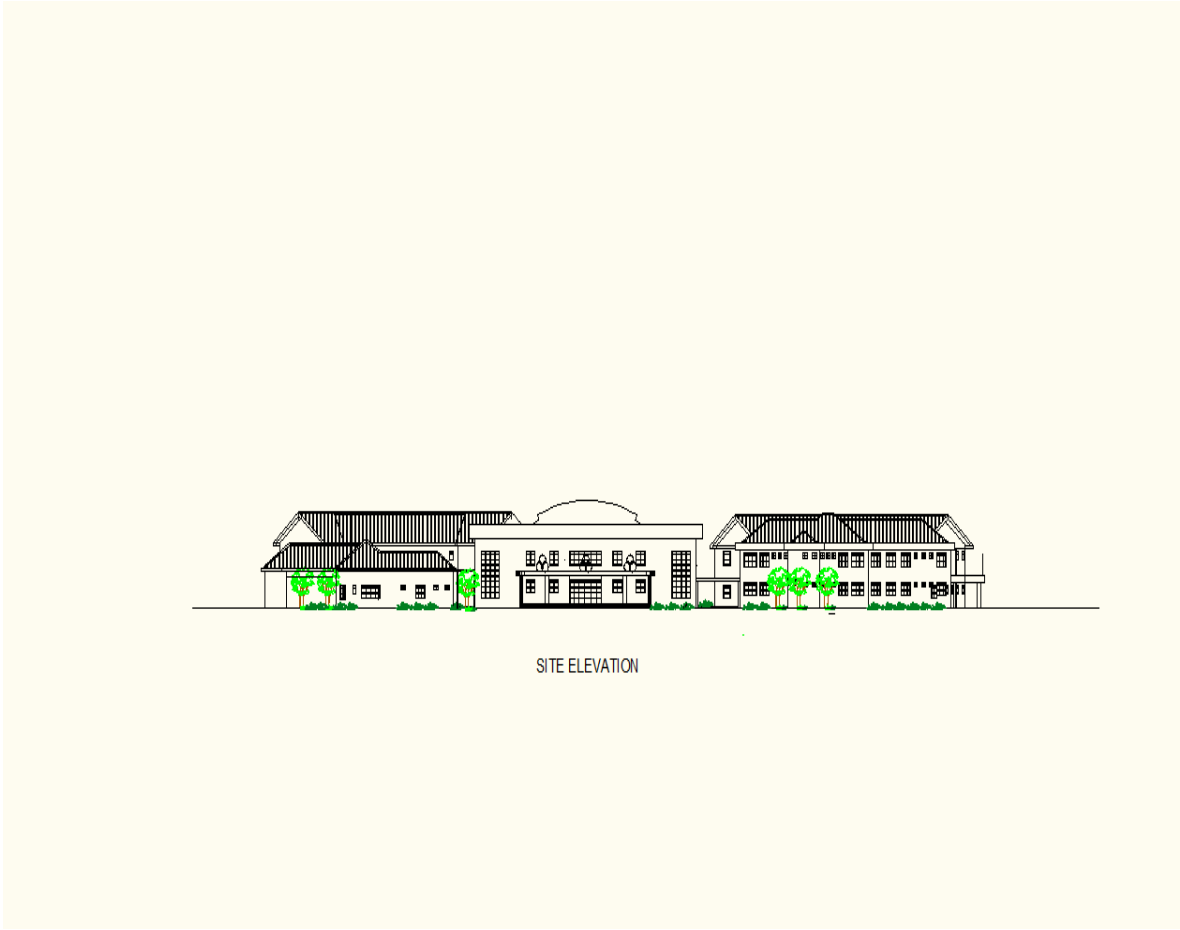


Fig. 6.3: Site Elevation of the proposed Kaduna Paediatric Hospital,Kaduna

6.6 DESIGN METHODOLOGY

The research study conducted on pAediatric hospital design has shown the need for pediatric hospitals to be homely and relaxing for the patient and their families as well as reducing the stress of staff working condition through the design. These two individuals; a patient and staff are the major people that make use of the hospital as such this design methodology is to respond to the needs of the patients,their caregivers and the ever growing need for a pediatric hospital that will strike a balance between functionality and aesthetics while encouraging the

use of of nature as a healer,the complex is a fusion of building block system that spreads evenly to allow for future expansions made possible by the open plan concepts of hospital design.

6.7 SPECIAL DESIGN CONSIDERATIONS

6.7.1 USER-FOCUSED DESIGN: The sole aim of designing hospitals is to cater for the needs of the patients whom are vulnerable and require care. The word hospital in literal terms mean to accommodate or to cater for.The hospital staff are burdened with the task of patient care and recovery,they also need a conducive and serene environment in order to put in their best. The design of this complex has put into cognizance this idea in other to ease the patients plight and caregivers needs through a friendly and mild atmosphere. Some of these measures include the use of landscape, resting /relaxation spaces, ample natural climate control, safe color schemes and efficient circulation within and outside the complex.

6.7.2 FUTURE EXPANSION: The ever changing needs of a dynamic complex like this hospital require a lot of considerations for alterations and additions to the existing units. This will help make the complex an evolving one with the needs of the time.

This was achieved by having the units separate but connected to each other strategically to aid access. This allows each one to grow at its own rate independent of problems associated with enclosed complexes.

6.7.3 DRAINAGE SYSTEM: In general, systems used and material will conform to standards for hospital construction. However, systems serving laboratories, especially the waste lines are subjected to harsh use. The type of waste to be disposed from each laboratory should be the basis for the selection of piping materials and design systems.

Where there is extensive use of radioisotopes, a separate drainage system is required discharging to a stainless steel tank. Stainless steel is recommended as drainage material here because it can be made leak tight and its smooth interior allows easy flushing.

6.7.4 CONSTRUCTION METHODS:The construction is a reinforced concrete cast-insitu frame structure with partition wall in fills within the interior, intertwined with aluminum partitions. The different units are constructed independent of each other but connected with the use of expansion gaps that will allow for differential loading conditions and settlement.

Foundations: The individual units are constructed on strip foundations with deep rooted column bases that allow for extra floor addition in the future.

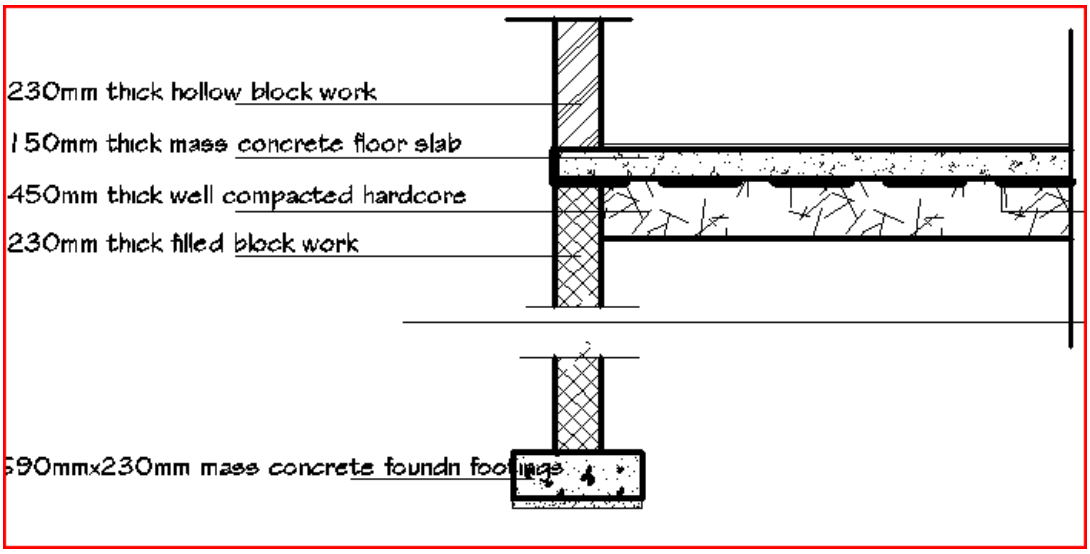


Fig 6.4: Foundation detail (Source: Author 2011)

Structural Frame: Structural frame is a cast-insitu reinforced concrete frame consisting of concrete columns, beams and floors slabs.

External Walls: These are sandcrete hollow blocks that are laid in stretcher masonry bonds all around the building envelope.

Internal walls and Partitions: These are of two major types and also extra cladding for radiation prone areas. The partitions for static spaces like the stairways, lift shafts, ramps, toilets, etc are made of 150mm sandcrete hollow block walls. The partitions of flexible spaces like the offices, waiting areas and other such spaces that do not require much security risk, are demountable aluminium partitions which are modular and repetitive. Extra cladding of lead panels is used for the walls and partitions of radiation prone spaces.

6.7.5 SERVICES OF THE COMPLEX: The services arrangements are within the ducts systems which are located in strategic positions to conceal vertical composition of pipes and trunking systems. The IT cables and intercommunication cables are enclosed in the network of the whole cabling system for the building with outlets where necessary. Copper piping is recommended for Oxygen systems. An emergency shut-off valve should be provided and accessible too and also the location of oxygen bulk supply should be such that it does not provide any fire hazard.

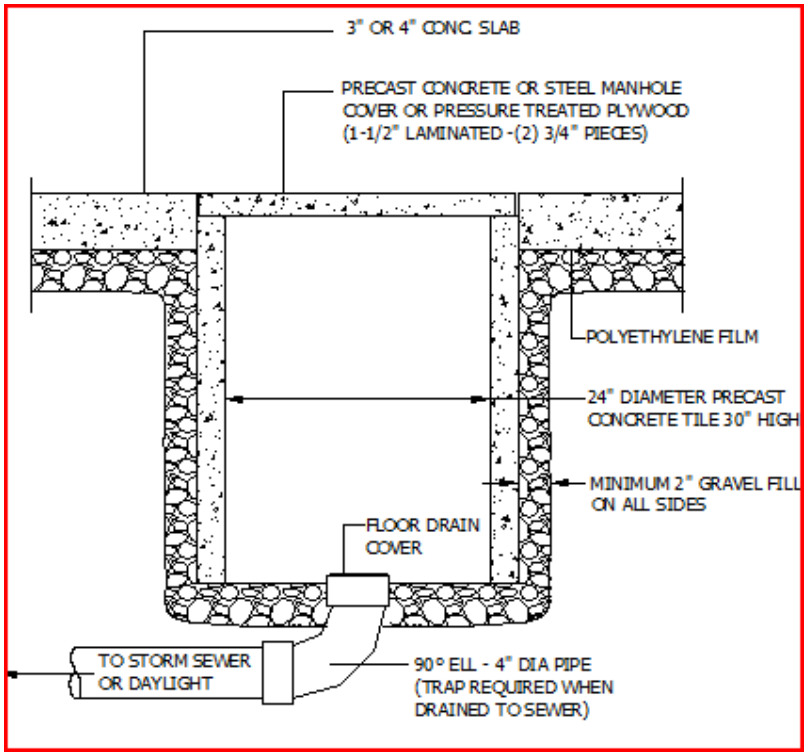


Fig 6.5: Service trunk detail (Source: Author 2011)

6.7.6 MATERIALS AND FINISHES:

The use of materials in various spaces is influenced by the function of the space. Laboratories, preparation rooms and utility rooms should have floor finishes which are smooth and acid resistance, (vitrified tiles recommended). Walls of stain and chemical prone spaces like the labs, preparation rooms, treatment rooms and procedure rooms should have finishes that are easily cleaned and smooth (glazed wall tiles recommended).

Generally walls and ceilings should be stain/dirt resistant and should have easy procedure. The walls in specialized areas like the MRI unit should be free from magnetic based materials that will obstruct the magnetic field intensity. Also spaces with high radiation risks like the Imaging units should have lead panels on the walls and lead glazing to prevent

the escape of radiation. Other spaces that are of fewer technicalities should have materials that are pleasing and appealing to the ailing patients.

6.8 SCHEDULE OF ACCOMODATION

(i) Wards

Table 6.1 Schedule of accommodation for the Wards

	Space	**Number of Units**	**Sizes (m^2)**	**Total Area (m^2)**
1	1 Bed Room	16no	$12m^2$	$192m^2$
2	2 Bed Room	4 no	$28m^2$	$112m^2$
3	4 Bed Room	8no	$40\ m^2$	$320m^2$
4	Isol. Room(2Bed)	4 no	$28m^2$	$112m^2$
	Total Beds 64 Beds			**736 m^2**

ii) Out Patient Department

This provides consultations investigation, diagnosis and treatment for patients who require little or no recovery services afterwards.

Number of consulting and examination room required:

In determining these average weekly attendance and consultation time are employed. The calculations are as follows:

$$\mathbf{Y = {}^{M\,x\,t}/s}$$

Where,

Y = critical number of sessions held.

M = average weekly attendance

T = average consulting time in minutes

S= total length of each session.

Therefore number of consultation rooms C= Y/n

Where n = number of sessions/week. 5 working days

For an average weekly number of patients of 1680. An average consultation time of 5 minutes, total length of daily sessions to be 420 minutes (between 8:00 am – 3:00 pm)

(between 8:00 am – 3:00 pm)

Y= 1680 X 5 / 420 = 20 sessions weekly.

Therefore number of consultation rooms c= Y/n

C = 20/5

= 4 consultation rooms.

a. Operating Suites

The number of operating suites required is dependent on the nature of the surgical operations. For a hospital with 64 Beds of which 16 are surgical. Assuming an 8 day average stay, and 100% occupancy, estimated number of annual operations:

= 32 x 100% x 365 / 8 day average stay = 1460 annual operations.

Therefore number of operating suites

Assuming 5 working days weekly, about 3 operations per room daily,

Number of Suites = 1460 / 260 working days/year x 3 no operations daily.

= 1.87 app 2 operating suites.

Considering the different specialties two extra suite will make it 4 no suites.

Number of recovery beds is around 1-2 beds per suite. Taking the lower value, 1 x 3 = 3 recovery beds.

b. Pathology Department

This consists of laboratories, haematology micro-biology, pathology and dialysis unit.

Table 6.2 Pathology department

	Space	Number of Units	Sizes (m^2)	Total Area (m^2)
	Recep/Waiting	1 no	$12m^2$	12 m^2
	Changing Room	1no	$4m^2$	$4m^2$
	Pathology	1 no	$40m^2$	40 m^2
	Haematology	1 no	30 m^2	30 m^2
	Micro-biology	1 no	14 m^2	14 m^2
	Dialysis	1 no	20 m^2	30 m^2
	Office	1no	15 m^2	15 m^2
	Records	1 no	15 m^2	15 m^2
				160 m^2

c. Emergency Unit

This provides 24 hour trauma services to patients of different severity of cases. The number of emergency beds is determined by a minimum of 4 beds in 2 rooms plus an additional 2 for each 100 beds.Therefore in this hospital of 64 beds, number of beds = 4 observation beds.

Table 6.3 Emergency unit

	Space	Number of Units	Sizes (m^2)	Total Area (m^2)
1	Reception/Walk-in	1 no	$36m^2$	$36m^2$
2	Ambulance parking	1 no	$30\ m^2$	$30\ m^2$
3	Treatment	1 no	$12\ m^2$	$12m^2$
4	Emergency Theatre	2no	$50\ m^2$	$100m^2$
5	Observation Room	2 no	$20\ m^2$	$40\ m^2$
6	Emergency Diagnosis	1 no	$25\ m^2$	$25\ m^2$
7	Stretcher storage	1 no	$8\ m^2$	$8\ m^2$
				$250\ m^2$

d. Radiology

This department deals with the penetrating power of the X-rays to produce images.

Table 6.4 Radiology

	Space	Number of Units	Sizes (m^2)	Total Area (m^2)
1	Reception/wait	1 no	$9\ m^2$	$9\ m^2$
2	Changing Room	1no	$4\ m^2$	$4\ m^2$
3	X-ray	1no	$20\ m^2$	$20\ m^2$
4	Ultra-sound	1 no	$15m^2$	$15\ m^2$
5	Viewing Room	1no	$12\ m^2$	$12\ m^2$
6	MRI	1no	$30\ m^2$	$30\ m^2$
7	CT Scan	1no	$30\ m^2$	$30m^2$
				$120m^2$

Table 6.5 Intensive care Unit

	Space	**Number of Units**	**Sizes (m^2)**	**Total Area (m^2)**
1	Nurse station	1 no	12 m^2	12 m^2
2	Changing Room	1no	4m^2	4 m^2
3	Patient bays	1no	48 m^2	48 m^2
4	Lying in ward	1 no	9m^2	9 m^2
				73m^2

Ancillary Services

This consists of all the services that aid the proper functioning of the hospital.

This may include the kitchen, central general stores, central sterile unit, maintenance unit, mortuary etc.

a. Kitchen/Dining

Table 6.6 Kitchen / Dining

	Space	**Number of Units**	**Sizes (m^2)**	**Total Area (m^2)**
1	Cold Store	1 no	8 m^2	8m^2
2	Dry Store	1 no	12 m^2	12 m^2
3	Gen. Store	1 no	15 m^2	15 m^2
4	Preparation Area	8 no	25 m^2	25 m^2
5	Cooking Area	1 no	25 m^2	25 m^2
6	Dining Area and Serving Area	1 no	70 m^2	70m^2
				155m^2

b. Laundry and House-keeping

Table 6.7 Laundry and House-keeping

	Space	**Number of Units**	**Sizes (m^2)**	**Total Area (m^2)**
1	Collection/Sorting	1 no	18 m^2	18 m^2
2	Washing Area	1 no	30 m^2	30 m^2
3	Mending/Ironing	1 no	20 m^2	20 m^2
4	Clean Storage	1 no	30 m^2	20 m^2
5	Storage/Supplies	2 no	20 m^2	40 m^2
				128 m^2

c. Central General Stores/Central Sterilizing Unit

Table 6.8 Central General Stores/Sterilizing Unit

	Space	Number of Units	Sizes (m^2)	Total Area (m^2)
1	Office	1 no	32 m^2	32 m^2
2	Gen. Store	1 no	30 m^2	30 m^2
3	Sterile Store	1 no	40 m^2	40 m^2
4	Soiled Utility	1 no	20 m^2	20 m^2
5	sorting	1 no	27 m^2	27m^2
				149m^2

CHAPTER SEVEN

SUMMARY, CONCLUSION AND RECOMMENDATION

7.1 SUMMARY OF FINDINGS

The idea that nature has a soothing, restorative effect is nothing new.From medieval monastic infirmary gardens to the landscaped grounds of nineteenth-century mental asylums, enlightened carers have recognized that access to the outdoors has a salutary effect on a person's mental and physical health.With the onset of modern medicine and its emphasis on treatment via surgery and drugs, this knowledge was lost or deemed 'unscientific'.High-rise construction techniques created medical settings where patients were divorced from the outdoors.

From the early 1990s a change began to happen in healthcare design – termed patient-centered care, there were marked changes in the interior design of hospitals. Then, in the late 1990s, three books appeared documenting the therapeutic value of outdoor spaces in healthcare. The era of the healing garden had arrived. The basics of healing garden design relate to the issue of stress, as the relief of stress helps to bolster the immune system and stimulate the body's natural healing proclivity. There is credible scientific evidence that four elements that can be supported by design help reduce stress: the distraction provided by green nature; exercise; social support; and a sense of control.The more we are engaged with the environment through all our senses, the lower are our rates of anxiety and the less we are aware of pain.Thus,a healing garden needs to provide a multi-sensory experience with colorful flowers,varying shades and textures of green,the sights and sounds of water,elements that attract birds and butterflies,fragrances,and ornamental grasses which move with the breeze. This outdoor space needs to be a garden, not a paved courtyard – a lush green setting with an optimal ratio of green to hard surfaces of 7:3. Exercise has many beneficial effects on both

physical and mental health. Thus, depending on the size of the garden, there needs to be a variety of longer and shorter pathway loops for strolling and exercise. These must be surfaced to reduce glare, for example with tinted concrete, and there needs to be attention to details such as edging to prevent those using wheelchairs rolling into planting beds, and expansion joints in paving of no more than one-eighth of an inch in width to prevent the wheels of intravenous (IV) poles getting caught and stuck. There is also evidence that the more social support a patient receives from family and friends, the better they are able to heal. A garden is one place where a patient and visitor can converse in private in an attractive setting. It is essential that sensitive planting design and site furnishings provide semi-private niches for one or two people or for a family group to be alone. A hospital garden, if sensitively designed, can be a place for a family to visit with an in-patient, perhaps with children and even the family dog in tow; where a person can digest the news of a troubling prognosis; where a family can wait for someone in surgery or an outpatient wait for a prescription to be filled; or where staff members can relax together on their lunch break.

7.2 CONCLUSION

Patient-specific gardens encompass a general understanding of the restorative benefits of nature, together with the recognition of the needs of a particular patient population. The garden has become a potent treatment milieu, complementing the provisions located indoors. In this respect, such gardens represent a third stage in the recognition and acceptance of nature-based therapy in health care. The first stage is encompassed by examples of eighteenth- and nineteenth-century hospitals where views and access to nature were intuitively considered therapeutic, but with no understanding of why. The second stage was prompted by the emergence of credible scientific evidence that views to, or even brief

visits in, a green, garden setting can have measurable physiological effects such as on blood pressure and the immune system.

This, together with a move to more patient-centred care in hospital design, starting in the 1990s, prompted the provision of usable outdoor spaces, sometimes termed healing gardens.

This work demonstrates the importance of interaction with nature for human health, the garden has become a potent treatment option complementing the provisions located indoors. Successful patient-specific gardens can only come about as a result of a carefully orchestrated participatory process involving the designer, clinical staff, current or former patients and family members. Only through such a process can a garden successfully meet the needs of the patients it is intended to serve.

This work if given due consideration will go a long way in addressing issues affecting the health of the society. A healthy society is a wealthy society.

On the other hand the Kaduna state Pediatric hospital will be a major player in the delivery of pediatric healthcare and requires a conducive atmosphere to perfect the system and also to penetrate the highly potential healthcare sector of Nigeria. The hospital will go a long way in filling the gap in the healthcare sector. This is so because of the near non-existence of hospitals and other healthcare facilities to cater exclusively for children's health needs.

7.3 RECOMMENDATIONS

It is recommended that:

- Modern hospitals should endeavor to dedicate portions of their space to healing gardens, courtyards, playgrounds, and outdoor spaces.

- In future work, healthcare professionals, designers and researchers need to collaborate in discerning the therapeutic benefits of gardens specifically designed for those patient populations whose needs have not yet been widely discussed or explored, including children with autism, cystic fibrosis or cerebral palsy; and those recovering from heart surgery.

7.4 CONTRIBUTION TO KNOWLEDGDE

This work clearly shows that:

1. Landscape elements provide therapeutic benefits to patient through reduction of stress and anxiety commonly associated with illness. Reduced anxiety and stress result in speedy recovery.

2. Certain elements of the outdoor environment enhance positive moods, behavior and wellbeing of individuals, and when incorporated in hospital design, provide a lively environment for patients and their caregivers which in turn results in better patient management and care.

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APPENDICES

(DESIGN DRAWINGS OF THE UNITS OF THE HOSPITAL COMPLEX)

GENERAL OUTPATIENT DEPARTMENT



G.O.P.D.

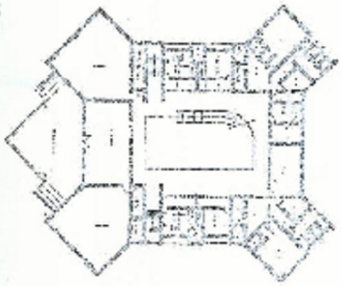


ADMINISTRATIVE DEPARTMENT

WARD

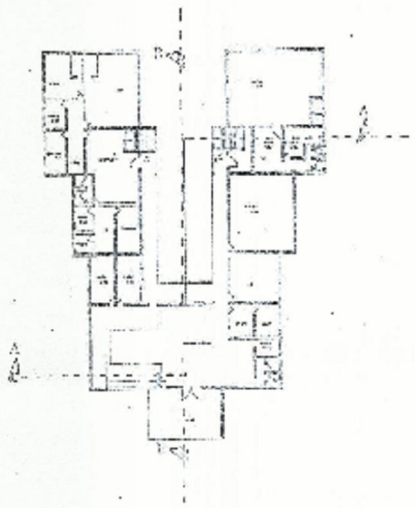


GROUND FLOORPLAN



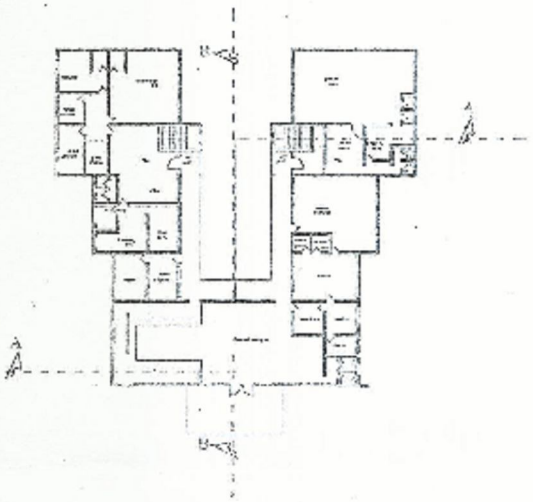
FIRST FLOORPLAN

ACCIDENT AND
EMERGENCY



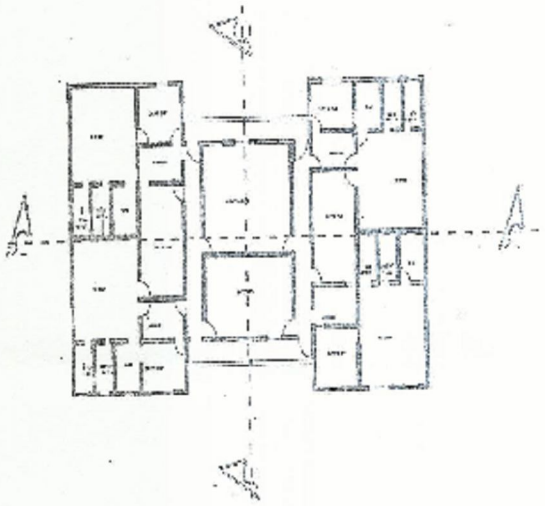
GROUND FLOOR PLAN

ACCIDENT AND
EMERGENCY



FIRST FLOOR PLAN

OPERATING THEATRE



FLOORPLAN

LAUNDARY



FLOORPLAN

CSSD



FLOORPLAN

CAFETARIA



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MORTUARY



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