RIVERS STATE UNIVERSITY, PORT HARCOURT

MY INHERITANCE, MY CALAMITY; AN AVOIDABLE POSTHUMOUS CATASTROPHE

AN INAUGURAL LECTURE

By

PROFESSOR KENNETH SHELU ORDU

MB,BS; MSC, PhD (UPH)

Professor Of Genetics, Molecular/reproductive Biology And Developmental Anatomy

SERIES NO. 71

Wednesday 24th November, 2021

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PICTURES

PROTOCOL

The Pro-Chancellor and Chairman of Council
The Vice-Chancellor and Chairman of this Occasion
The Deputy Vice-Chancellor (Administration)
The Deputy Vice-Chancellor (Academics)
The Registrar and Secretary to Senate
The University Liberian
The University Bursar
The Provost, College of Medical Sciences
The Dean, School of Postgraduate Studies
Deans of Faculties/Student Affairs
Directors of Centres/Institutes
Heads of Departments
Distinguished Professors and other members of Senate
All Academic, Administrative and Technical Staff
Students of this Great University
Respected Guests, Friends, Associates and Well Wishers
Gentlemen of the Press
Distinguished Ladies and Gentlemen

1.0 PREAMBLE

Vice-Chancellor sir, I have always clinched to the phrase; "GOD IS UNLIMITED". This is because the Grace of God in my life knows no bounds. The days of my pilgrimage so far has been bespangled with grace. Even when I was born, nurtured, schooled and grew up in the village, without any exposure, grace made available angels in human form at every step of my life to shape the curve of my destiny. I was one of the bright pupils in my primary and Secondary School days in Omerelu, however, lost my dear mother Mrs. Evelyn Wuzor-Arum Ordu soon after my O' Levels (whose memory I cannot forget). She sold salt in local markets at Omerelu and neighbouring villages to train us.

Physics and Mathematics were my best subjects for which I wanted to study Marine Engineering, but for my uncle and father, Mr. Lawrence Nwandikom; the first angel. He encouraged me to study Medicine, the first twist of my life.

Today, I do not regret that decision. He took over my upbringing, solely trained and paid all my fees through medical school and beyond, God bless you, my Father.

Another turn of events was my choice of specialization in Human Anatomy. I wanted to be an Orthopaedic surgeon and was preparing for primaries after National Youth Service Corps (NYSC) while working as a Medical Officer at the Health Services Department of the then Rivers State University of Science and Technology. Thereafter my academic father Prof. B. C. Didia encouraged me to come to anatomy; the second twist of my life. Today I am a proud Anatomist with a specialization in Genetics, Reproductive/ Molecular Biology and Developmental Anatomy. This is my second missionary journey to this echelon of academic pursuit now as a professor.

Vice Chancellor Sir, swearing-in ceremony of medical students by the Medical and Dental Council of Nigeria (MDCN) and Inaugural Lectures are events that act as excellent fillip for any waning

ambition to studying. These two events had always spurred me to add impetus to my pursuing excellence. I have always imagined the day I will stand on the podium to give an inaugural lecture and today, the dream is a reality. Let God's name be praised.

While contemplating on the topic of the inaugural lecture, I stumbled upon Proverbs 13: 22a ***"A good man leaveth an Inheritance to his Children's Children"***. Searching further, I discovered that inheritance appear about 262 times in the bible suggesting that inheritance is godly and desirable. The concept of inheritance is very important in the Bible and refers not only to the passing on of land and possessions from one generation to another, but also earthly and spiritual gifts which God plans to give to those who are his 'children. However, the situation in society suggest the contrary.

Vice-Chancellor Sir, these days, a man will live with four (4) children and wife, train them in school up to Post-graduate level only to discover that they are not his children after a DNA test. Today, children show up at the demise of a man to lay claim to his properties because they were children born out of wedlock by side chicks. There are cases of pretentious pregnancies in a bid to cover infertility. People buy children from maternity homes or exchange children in hospitals while others sell babies for money. These days corpses are kept for up to 10 years post demise because of court cases and infighting between children. Lives are lost, violent communal conflicts arise due to claims to ancestral or hereditary benefits. The inheritance of chieftaincy stools and who takes over the reign of a clan have consumed humanity. Indeed, man's inheritance is now a calamity contrary to the plan of the creator.

It is then exigent to find simple ways of parentage and paternity determination in our poor resource limited environment while the parents are alive. This then makes the topic ***My Inheritance, My Calamity; An Avoidable Posthumous Catastrophe*** congruous, expedient and spot on.

Inheritance is defined legally as the process of transferring property, titles, debts, rights and obligations to the legal heir of a person before death of that person. The transfer can either be by way of Will or through prevalent laws and or consent to cultural norms of succession by a group of people. The legal heir must go through formalities and fulfill the required criteria to acquire the property.

Cultural norms for passing on possessions differ from one community to another. In many communities the girl child has no place for an inheritance. Polygamous families share properties based on the number of wives. The first male child takes a lion share of particular properties. Inheritance of chieftaincy stools and who takes over the reign of a clan has laid down rules.

Questions might arise as to how this relates to anatomy? People believe that as Anatomists we only deal with cadavers (dead bodies) and should only study morphology. Morphology is the structural architecture of the body formed on the foundation of genetic template. The transfer of the genes varies among individuals resulting in the similarities and varieties which exist between individuals.

Mr. Vice-Chancellor Sir, in this lecture, I will marry morphology and genetic make-up (morphogenetic) and relate it to how hitherto unnoticed physical characteristics in offspring and parents can serve as a means of mitigating inheritance calamities and posthumous catastrophe.

2.0 INTRODUCTION

Inheritance in genetics is the transmission of phenotypical characteristics from parents to offspring. Phenotypical characteristics are physical observable traits or appearances seen in individuals. These physical traits are observable characteristics acquired from parents and are known as phenotypes (Winchester, 1975). Characteristics exhibited by offspring are found in the parents (Tortora and Derrickson, 2006; Van De Graaf, 2002). Offspring resemblance of parents might be more of one parent but a critical observation will

reveal subtle traits from the other parent showing that there are contributions of both parental characteristics to form that of the offspring.

The similarities that exist between parents and offspring are due to the transmission of traits influenced by a parental genetic constitution (Thibodeau and Patton, 1992; Tate *et al.*, 1994), which is known as genotype, that is, from the genes (Clarke-Stewart *et al.*, 1987). Genes are small particles that are part of DNA that occupy a specific locus on the chromosome (Seeley *et al.*, 1996; Gottfried, 1994) containing information received by offspring from its parents. Genes store this information needed for the cell to assemble protein which eventually yield specific physical traits. Multiple genes are grouped to form chromosomes, which reside in the nucleus of the cell. Every cell (except eggs and sperm) in an individual's body contains two copies of each gene. This is because both mother and father contribute a copy at the time of conception (Martin *et al.*, 2000; Freberg, 2006). This original genetic material is copied each time a cell divides so that they contain the same DNA.

Nucleic acids are made up of a double helix with a sugar backbone on the outside and nitrogenous bases on the inside. They are macromolecules responsible for the storage and expression of genetic information and exist in two natural forms called deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) which are made up of repeating units called **Nucleotides**. Each Nucleotide has three components (a) Phosphate (b) sugar and (c) nitrogenous base. Nitrogenous bases include **purines** such as Adenine and Guanine, and **pyrimidines** such as **Cytosine** and **Thymine** (in DNA) or **Uracil** (in RNA). There is one purine and pyrimidine per turn. The base pairing is such that a purine pairs with a pyrimidine (A-T; C-G). There are two hydrogen bonds between adenine and thymine and three between cytosine and guanine. There is polarity in each strand of DNA molecule in that one end of DNA will have 5' phosphate and the other has a 3' hydroxyl group.

The manners and ways in which genes interact to produce physical characteristics or traits and how these traits are passed on from parents to offspring follow a pattern, termed pattern of inheritance. Genetics is the study of these patterns (Hugo *et al.*, 2003). Genetics is also the science dealing with heredity and variation (Macdonald, 2011). Furthermore, genetics is a precise and somewhat mathematical science, dealing with specific offspring ratios which are predictable based on the known genetic constitutions of the parents (Adams *et al.*, 2012).

Most human traits are products of interaction between several genes but a few traits are due only to one gene. A trait has two or more variations, called alleles (Mader, 2006). An individual may inherit two identical or two different alleles from their parent (Louisa, 2009), and when two different alleles are present, they interact in specific ways. The interaction can be controlled by a single gene either in a dominant or a recessive manner. Dominant alleles are always manifested, even when a recessive allele is present. Traits due to recessive alleles are only manifested when two complementary recessive alleles are present (Molly *et al.*, 2010).

2.1 Patterns of Inheritance

The manner and ways with which characteristics are passed from genes of the parents to produce the physical traits in the offspring is called the Patterns of Inheritance. The transmission of the traits can either be by a single gene or multiple genes, dividing the manner or patterns in which they interact into

(1) Single Gene Inheritance Mendelian Inheritance which is subdivided into four types (a) Autosomal Dominant (b) Autosomal Recessive (c) X- linked Recessive (d) X- linked Dominant

(2) Multifactorial or polygenic inheritance

(3) Mitochondrial inheritance.

2.1.1 Single Gene Inheritance.

The trait is controlled by a single gene. It follows the transmission pattern observed by Gregor Mendel in his research of Pea Plants. Depending on the chromosome on which gene is located and the manifestation of its allelic constitution. It is further divided into

(a) Autosomal Dominant:

The gene responsible for the phenotype is located on one of the 22 pairs of chromosomes called autosomes (non-sex chromosomes) and manifest itself in heterozygous or homozygous forms. If mutation or disease conditions affecting such allele. The mutation will manifest even when it is only one copy. In this case, no carrier parent or offspring are observed, male and female offspring will be affected equally. It takes only one copy in a parent to transmit to the off-spring. Each offspring has 50% chances of inheriting the disease. A typical example is Achondroplasia (Short Limbs-Dwarfism)

Picture 1: A family where the mother is a Dwarf and all Offspring Dwarf while Father is normal

(b) Autosomal Recessive:

This is located at the autosomal chromosomes but manifest only in homozygous allelic forms. It takes two copies of the Alleles to be present for its manifestation. Both parents who are not sufferers can only have offspring who are sufferers if they are carriers; example is Albinism.

Picture 2: A family where the mother has normal Skin while offspring is an Albino

(c) X-linked Recessive:

The gene is located in the X-chromosomes manifest in homozygous allelic forms in the female (XX), but manifest in only one copy in male offspring heterozygous forms of XY. The female offspring can only manifest the characters if it is in homozygous form. Female offspring can be carriers. A man can either manifest the trait or not. A man cannot transmit the trait to his son but can transmit to his daughter. A mother can transmit both to the son & daughter. All sons of a mother who manifest the trait must have the characteristics. Example is Haemophilla

(d) X-Linked Dominant:

Occurs in one or two of the chromosomal strands of the female or one of the X-chromosome strand of the male offspring. It manifests both in heterozygous and homozygous forms so it takes only one copy of the gene to be manifest phenotypically. All daughters' (female offspring) of the affected male parent will manifest the character.

2.1.2 Mitochondrial Inheritance:

Despite the nucleus, DNA is also found in the mitochondria. So the mitochondria possess the capacity to transmit genetic material. Only the mitochondria from the mother transmits its characteristics to the offspring. This is because the ovum has mitochondrion, but the sperm sheds off its cytoplasm before fertilization. It is a rare pattern of inheritance.

2.1.3 Polygenic Inheritance:

Involves more than one gene and results from the interplay between genetic and environmental factors. It is characterized by no clear distinction in the traits concerned. There is gradual manifestation of the traits since they are made up of several genes contributing to their manifestation. Example: skin colour, height etc.

2.2 Gregor Mendel

Picture 3: Gregor Mendel

He was born on July 22, 1822, to a poor farming family who lived in a village in Northern Moravia, which is now part of the Czech Republic. He was a private scientist (physicist and mathematician) who became an Augustinian Monk in Brunn at the instance of his teacher. Gregor Mendel is described as the "Father of genetics" due to his work in pea plants which led to the understanding of the principles of inheritance. He was a lover of flowers that endeared him to the study of pea plants in the monastery's botanical garden where he spent many hours a day breeding fuchsias and pea plants. At first Mendel just wanted to create a hybrid pea plant and observe the outcome of the hybridization. Abinitio he did not plan to conduct a well-controlled and brilliantly-designed experiment in genetics and inheritance. He cross bred the plants and observed some special traits like colour of a flower, shape of the seed, colour of seed etc. The first offspring he called the first filial generation and self-pollinated these offspring and observed the interesting outcome. His observations led to more experiments, which eventually led to unusually prescient conclusions. The following were his conclusions (a) that characteristics were inherited as discrete units and their inheritance were independent of each other (b) Parents have pairs of these characteristics but only pass one to the offspring c) that certain forms of the traits were always manifesting over another when they occur together.

From the forgoing Mendel postulated the three laws of inheritance which are

Law of Segregation: States that for gametes to form the genes divides into alleles which are randomly united

Law of Independent Assortment: State that when gametes are formed the alleles do not depend on each but are assorted independently.

Law of Dominance: States that in a cross between pure contrasting traits, the dominant trait will be observed in the phenotype while the recessive trait will be mashed

Mendel's work was not recognized until about 30years after, when efforts were made to either prove or disapprove his assertions. Today genetics is the basis for all things

2.2.1 Monohybrid inheritance cross:

This is an inheritance whereby the parents differ in a single given trait. The parents may be homozygous for the trait but possessing different alleles for that particular trait. The two parents that are cross are termed (first filial) fi-Parent while the first offspring are called (first filial) fi- generation, the fi generation are usually all heterozygous for the specific trait and expresses the dominant phenotypes.

For example if we use E for the detached earlobe and e for the attached earlobe. The first filial parental allelic constitution will be EE and ee and the f1 generation will be Ee

F1 Parents E E X e e

F1 Offspring Ee Ee

If the fi-generation mates each other, they produce the 2nd filial generation that will be produced in 2 phenotypical ratios of 3:1. The genotypical ratio is 1:2:1.

F2 Parents E e x E e

F2 Offspring EE Ee Ee ee

Figure 1 Monohybrid Cross

These can also be represented in a **punnet** square as

	E	E
E	EE	Ee
e	Ee	Ee

2.2.2 Dihybrid inheritance/ cross:

This is an inheritance that the parents differ in two traits, the offspring inherit 2 (two) alleles for each gene so the parents have different pair of alleles for each trait. The parents have the homozygous for a specific trait.

The two parents that are cross are termed fi-generations while the first offspring are called (filial) fi- general, the fi general are usually all heterozygous for the specific trait and expresses the dominant phenotypes.

If the fi-generation mates each other, they produce the 2nd filial generation that will produced in 4 different phenotypical appearances 9:3:3:1 and 8 different genotypes. For example if we use E for detached earlobe, H for the straight hairline, e for the attached earlobe and h for curved hairline. The first filial parental allelic constitution will be EEHH and eehh and the f1 generation will be EeHh

The punnet square is used to represent the crosses for the f2 parents as follows

	EH	Eh	EH	eh
EH	EEHH	EEHh	EeHH	EeHh
Eh	EEHh	EEhh	EeHh	Eehh
eH	EeHH	EeHh	EeHH	eeHh
eh	EeHh	Eehh	EeHh	eehh

2.3 Cellular Division and Gametes formation and Fertilization

Gametes formation involves cell division for fertilization to occur. Cellular division is the multiplication of the number of cells from one cell. Cell division enhances growth and development of the organism. It is divided into two Mitosis and Meiosis.

2.3.1 Mitosis:

Is the cell division that results in duplication of the cell to two daughter cells that has the same genetic and morphologic constituents as their parent cell it has four 4 stages viz;

i. Prophase
ii. Metaphase
iii. Anaphase
iv. Telophase.

Prophase stage: The organelles involved in cell division becomes very prominent, these includes the centrioles, microtubules and chromosomes. Chromosomes are longer and thicker with prominent centromere.

Metaphase: the centrioles diffuse to the opposite poles, microtubules develop mitotic spindles, chromatids line up in the equatorial plane held at the centromere by mitotic spindle from the centrioles.

Anaphase: The mitotic spindles shorten the centromere of each chromosome divides, then there will be migration of chromatids to opposite poles.

Telophase: The chromosomes uncoil and nuclear envelop reappears dividing the cytoplasm forming two daughter cells.

2.3.2 Meiosis:

Is a reduction division because it involves the reduction of the chromosome number by half. It is divided into two phases; the first meiotic phase and second the meiotic phase.

The first meiotic phase starts with a prophase stage that is very slow and is further subdivided into four stages;

i. Leptotene
ii. Zygotene
iii. Pachytene
iv Diplotene

Leptotene: At this stage, the chromosome becomes very visible.

Zygotene: There is the pairing of the homologous chromosome also an alignment of the chromosome parallel, very close and remain opposed to each other. This pairing in a parallel alignment opposed to each other is called synapsis or conjugation. The paired chromosome is called a bivalent.

Pachytene: The paired chromosomes become distinct, each with two chromatids making four distinct chromatids called tetrad, with two close to each other centrally and two peripherally. Each of the two central chromatids become coiled over the other, and they cross each other at several points. This is called crossing over. At the point where they cross each other they become adherent; this point is called chiasmata.

Diplotene: The two bivalent chromosomes try to move apart by so doing they separate or break at the chiasmata, then each bivalent now has small pieces of the opposite chromosomes.

Metaphase: The nuclear membrane disappears, spindles form and chromosome are attached at the centromere.

Anaphase: Each pair of chromosome moves to the either poles, after splitting at the centromere

Telophase: The chromosome in each half is reduced to half.

2.4 Gametogenesis:

Is the process whereby a germ cell is converted into either a male or female gamete. Germ cells start as primordial germ cell. Primordial germ cells are undifferentiated cells that appear inutero at the 3rd week of gestation

2.4.1 Oogenesis:

The process whereby an oogonium is transformed into oocyte. In a genetic female the germ cells differentiate into oogonia. The oogonia mitotically divides and arrange themselves in clusters and is surrounded by a flat layer of epithelial cells known as follicular cells. Each cluster represents a single primordial gem cell. The follicular cells organize from the surface of the ovary. The process of oogenesis has 4 stages depending on the differentiation of the oogonia and follicular cells. The stages are (i) Primordial follicle, (ii) Primary follicle, (iii) Secondary follicle and (iv) Tertiary follicle

2.4.2 Spermatogenesis:

The Process whereby a spermatogonium is transformed into spermatozoa. In males the primordial germ cells are maintained until puberty while the female begins inutero. Before puberty in early life the germ cells are seen as sex cords of the testis surrounded by supporting cells.

The fate of the sex cords (Germ cells) and surrounding supporting cells differs. The surrounding cells forms sustentacular or sertoli cells while the sex cords acquire lumen and become seminiferous tubules containing the germ cells. The cells contained in them transforms into 2 sets of spermatogonia; — Sperma togonia type A and Spermatogonia type B.

Type A spermatogonia divide continuously by mitosis producing millions of spermatogonia. Type B give rise to primary spermatocytes and some of type A. The primary spermatocyte rapidly transformed into secondary spermatocytes. On completion of meiosis I stage after a prolonged delay of about 22days in 1st meiotic prophase phase. The secondary spermatocytes forms Spermatids that have 23 chromosomes.

Spermiogenesis: Is the process of transforming spermatid to spermatozoa. The Golgi material in the cytoplasm of the spermatid cell attaches to the nucleus forming acrosome granules. The nucleus gets bigger and moves towards the plasma membrane with half of the nuclear surface covered by an acrosome that contains an enzyme that aids in the fertilization of the eggs. There is condensation in the nucleus, formation of head, neck and tail with the shading of the cytoplasm forming spermatozoa.

2.5 Fertilization:

This is the fusion of the female (oocyte) and male gametes (spermatozoa). Spermatozoa when deposited in the vagina pass through the cervix, uterine cavity to the ampulla of the fallopian tube where fertilization occurs. For sperm to fertilize the oocyte they must undergo capacitation and Acrosome reaction.

Capacitation involves the removal of seminal plasma protein and glycoprotein coat of the semen. Capacitation helps the spermatozoa to penetrate the corona radiata of the oocyte.

Acrosomal Reaction Involves the release of enzymes to penetrate the zona pelucida, so that the spermatozoa can come in contact with plasma membrane of the oocyte. Immediately the sperm comes in contact with the oocyte there is a release of lysosomal enzymes. These enzymes inhibit the penetration of another sperm by deactivating the receptors for spermatozoa. As the spermatozoa approaches the oocyte its nucleus gets swollen forming male pronucleus while the tail and neck detach and disintegrate. The two pronuclei eventually lose their nuclear envelop. They replicate their DNA; the chromosomes align at the centromere and sister chromatids move to opposite poles. Then appears a furrow on the cytoplasm and then divides it into two cell stages. Then cleavage is initiated.

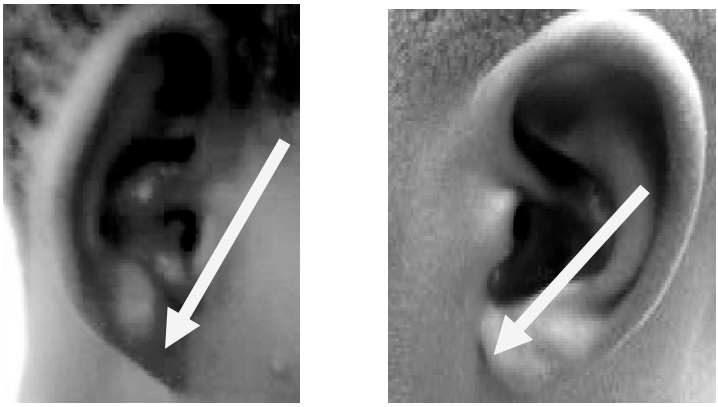
3.0 MORPHOGENETIC TRAITS

Morphogenetic traits are expressions of genetic factors through the phenotypic appearance of individual characteristics determined by specific segments of DNA called genes. There are over 100-200 traits that are transmitted and inherited from parents to offspring (Onyije e*t al.*, 2012). Mid-digital hair, little finger curvature, thumb curvature, attachment of earlobe, shape of nose, shape of hairline, big toe length, index finger length, presence of dimples and hand clasping, are examples of morphogenetic traits. These traits are normal traits; there are no associated abnormalities with their occurrence. The variations in them occur in high incidence in the population. The gene which determines them has been shown to be closely linked genetically so can be useful in linkage studies.

3.1 Earlobe Attachment.

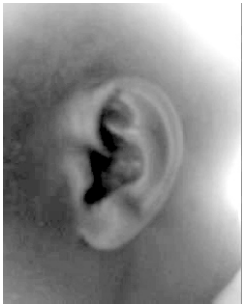
Earlobe attachment refers to the way the bottom of the ear is connected to the head. There are two types of earlobe attachments; the detached earlobes or free hanging earlobes and attached earlobe. Detached earlobe is away from the head

while an attached earlobe is directly attached to the head. Detached is slightly bigger than the attached earlobe (Anadi *et al.*, 2007). The earlobe is composed of tough areolar and adipose (fatty) connective tissues, lacking the firmness and elasticity of the rest of the pinna (Moore & Dalley, 2006). Since the earlobe does not contain cartilage it has a large blood supply and may help to warm the ears and maintain balance, however earlobes are not generally considered to have any major biological function (*Azariaet al.,*2003).

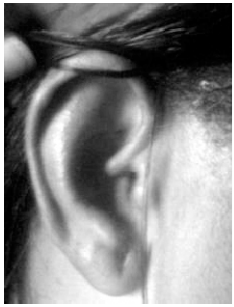


Picture 4: Earlobes Attached and Detached

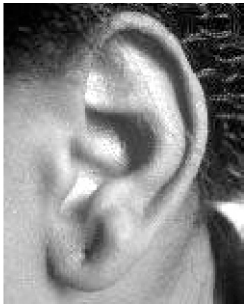
Vice Chancellor sir, **Ordu et al** in 2004 studied the Inheritance Pattern of Earlobe Attachment amongst Nigerians. In the study the manner and ways the earlobe of 760 Nigerians from 200 families with 400 parents and 360 offspring within the ages of 5months-60years were investigated. First the photographs of earlobe attachment of the subjects were taken and observed according to respective families. They were categorized into a) Both parents have Detached Attached b) Father Detached and mother attached c) Father Attached and Mother Detached with their resultant offspring manifestations **(Ordu *et al* 2014)** These are as shown in the pictures below



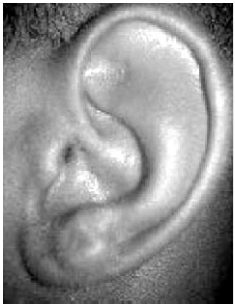
Father



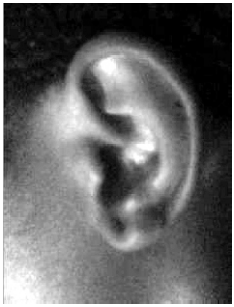
Mother



Offspring F

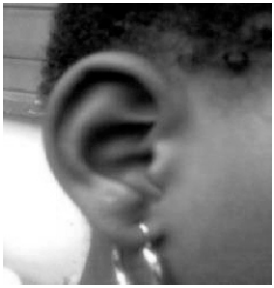


Offspring M

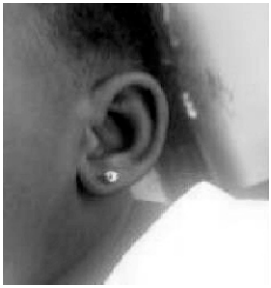


Offspring M

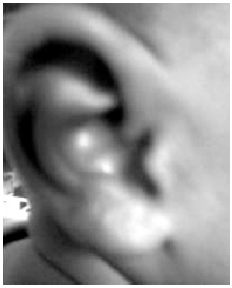
Picture 5: Father, Mother and All Offspring Are All Dettached

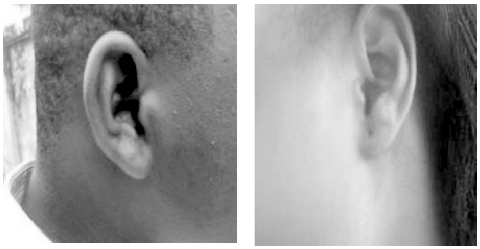


Offspring F
spring F



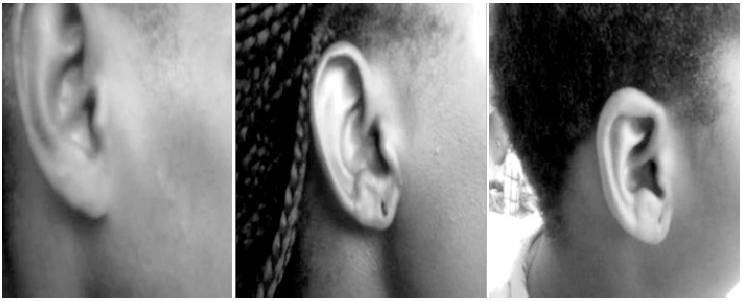
Off
Offspring M





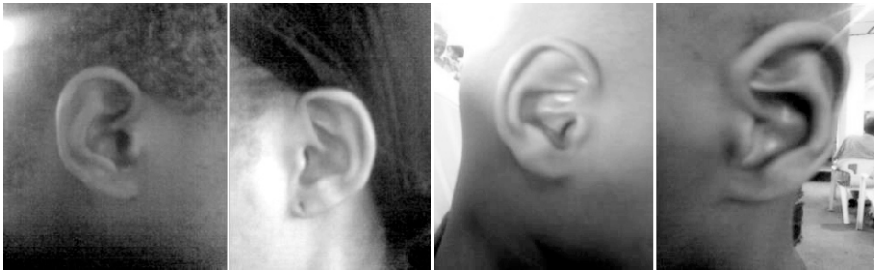
Father Mother

Picture 6: Father, and All Offspring Are Detached While Mother is Attached



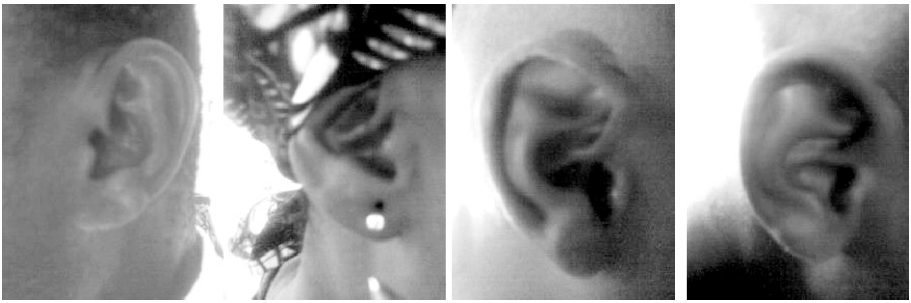
Father Mother Offspring M

Picture 7: Father Attached, Mother All Offspring Are Detached While Mother is Attached

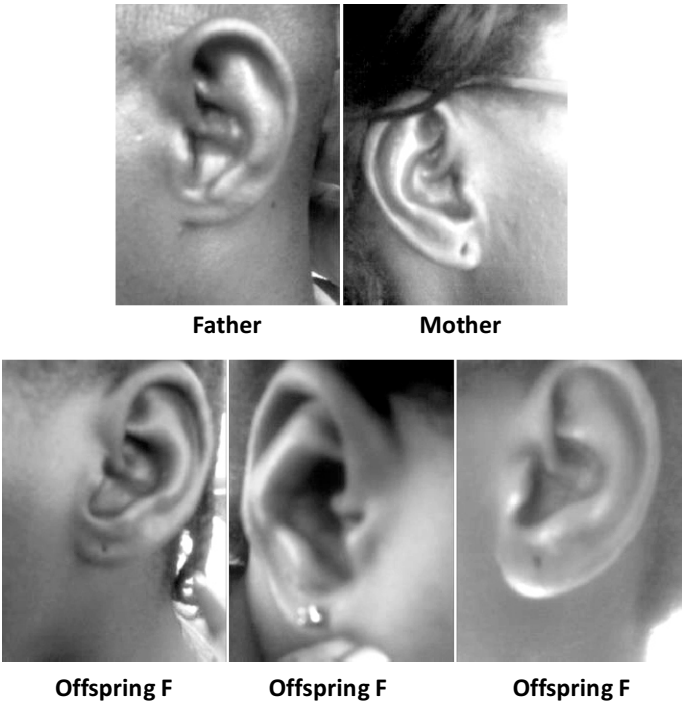


Father Mother Offspring M Offspring M

Picture 8: Father, Mother and all Offspring Are Attached



Picture 9: Father Attached Mother Detached and all Offspring Are Detached



Picture10: Father, and one Offspring Are Attached While Mother and One Offspring Are Detached

Secondly earlobe attachments were represented as families in tabular form with each family trait considered as a single group of traits.

Again Mendelian Chi-square Analysis was used to test the observations statistically to determine the closeness of the observed offspring outcome to the expected Mendelian ratio. The expected outcome calculated from the Mendelian assumption of segregation of allele was used to compare the conformity of the observed outcome to that of the Mendelian outcome and inference subsequently drawn from the result. This is shown in the table below

TABLE 1: Frequency table showing offspring with detached earlobe

	Total no of Offspring			**No of male Offspring**		**No of Female Offspring**		**Cal Chi- value**	**Critical value**	**Inference**
Parental Combination Earlobe Attachment	Detached	Attached	**Total**	Detached	Attached	Detached	Attached			
Father Detached Mother Attached	57	32	**89**	27	19	30	13	7.02	3.84	Significant
Mother Detached Father Attached	43	27	**70**	23	16	20	11	3.66	3.84	Not Significant
Both Parents Detached	160	22	**182**	100	12	60	10	16.57	3.84	Significant
Both Parents Attached	7	12	**19**	3	4	4	8	2.58	3.84	Not Significant
Total	267	93	**300**	153	51	114	42			

All these can be represented using a Mendellian monohybrid cross on the assumption that detached earlobe is the dominant (E) and attached earlobe recessive (e) allele.

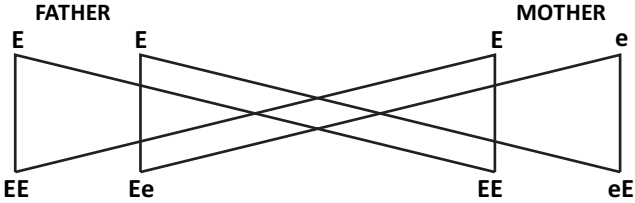


Figure 5 Both parents are with detached earlobe; one homozygous and another heterozygous. Expected offspring ratio is 1:0 (detached: attached), all offspring will have detached earlobe.

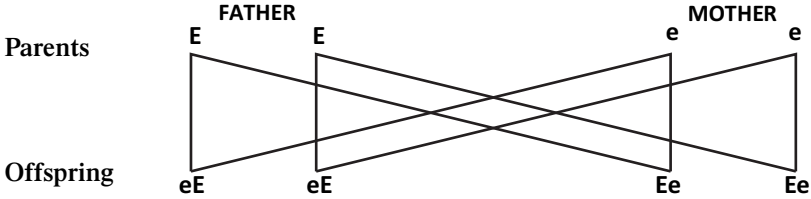


Figure 6: One of the parents is detached homozygous and another attached homozygous. Expected offspring ratio is 1:0 detached: attached all offspring will have detached earlobe

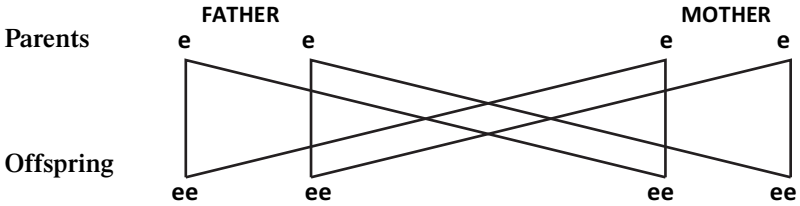


Figure 7: Both parents are attached; homozygous. Expected ratio is 0:1(detached:attached), all offspring will have attached earlobe

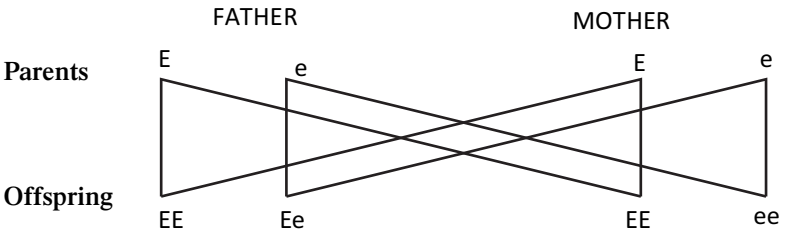


Figure 8: Both parents are detached; heterozygous. Expected offspring ratio is 3:1 (detached:attached), 75% of offspring will have detached earlobe while 25% will have attached earlobe

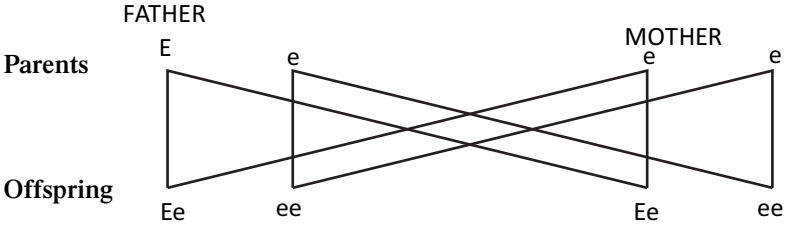


Figure 9: One of the parents is detached heterozygous and another attached homozygous. Expected offspring ratio is 1:1 (detached: attached), 50% of offspring will have detached earlobe while 50% will have attached earlobe

From the above we can conclude that detached earlobe is the dominant allele and attached earlobe is recessive of the trait earlobe attachment. Therefore, a person whose genes contain one allele for free earlobes and one for attached lobes will display the free hanging lobe trait (Frank *et al.,* 2009). So when detached earlobe is present the individual will be both homozygous or heterozygous dominant, and when earlobe is absent, the individual is homozygous recessive (Mohendra, 2008).

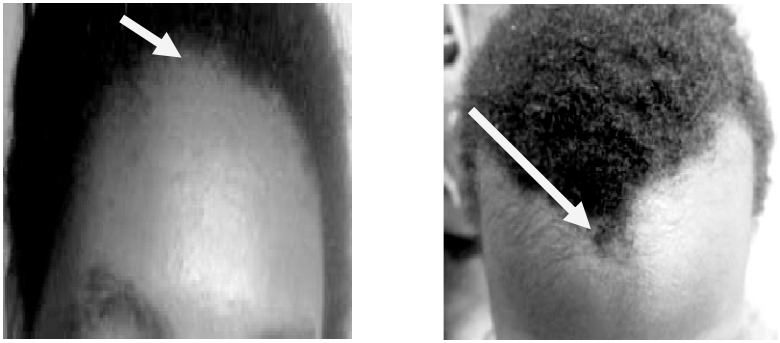
The inheritance pattern of earlobe attachment amongst Nigerian followed a simple dominant- recessive pattern with the detached dominant over the attached earlobe and do not

differ among the tribes with no significant difference in gender distribution of the trait in the population (Ordu *et al*, 2014).

Vice Chancellor Sir, Earlobe Attachment can be used to avoid a Posthumous Catastrophe and prevent blood bath.

3.2 Hairline Shape

Hairline is the line demarcating the hairs of the scalp from the forehead. It can either be straight or curved in shape. People with curved hairlines have a prominent v-shaped point at the front of their hairline. Those with straight hairline have hairline that goes straight across the front of the face. These represent two alleles that control hairline shape (McDonald, 2011; Hugo *et al.*, 2003)



Picture 11: Curved and Straight Hairline Shapes

Ordu and Agi, 2013 investigated the inheritance pattern of hairline shape in a cross section of Nigerian population using 300 Nigerians from 100 families comprising 200 parent and 100 offspring. The expression of hairline shape in the families were observed and noted. It was noticed that hairline shape is a morphogenetic trait controlled by two contrasting allele curved and straight hairlines. The trait follows simple dominant-recessive pattern of inheritance with the curved

dominant over the straight hairline shape. 86.3% and 13.7% of the population had straight and curved hairline respectively despite the straight hairline being recessive. This might be due to inbreeding resulting from intermarriage. No significant difference in the gender distribution of the trait in the population. The results obtained suggest that observation of hairline shape trait might be suitable for genetic analysis and can be used to determine possible parentage (**Ordu** and Agi, 2013). 20

Vice Chancellor sir, hairline shape is another simpler, demystified, economic non-invasive ways of avoiding court cases and wastage of resources posthumously.

Table 2: showing the frequency of distribution hairline shape amongst population of Nigeria

Hairline trait	No. of Populations	Males	Females	Fathers	Mothers	Offspring	Male offspring	Female offspring
Straight	259 (86.3%)	122 (40.6%)	137 (45.7%)	82 (82%)	89 (89%)	88 (88%)	40 (88.9%)	48 (87.3%)
Curved	41 (13.7)	23 (7.7%)	18 (6.0%)	18 (18%)	11 (11%)	12 (12%)	5 (11.1%)	7 (12.7%)
Total	300 (100%)	145 (48.3%)	155 (51.7%)	100 (100%)	100 (100%)	100 (100%)	45 (100%)	55 (100%)

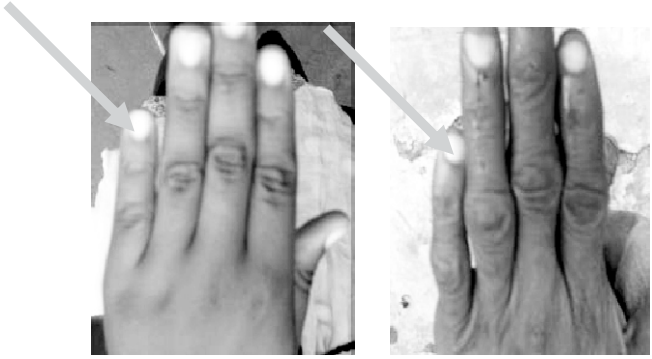
Table 3: showing the number of offspring that lacked or exhibited a trait from different parent combinations of trait in the respective families in the population

Hairline shapes of parents	No. of families	Total no. of offspring	Male offspring		Female offspring	
Curved	Straight	Curved	Straight	Curved	Straight	
Father curved & Mother straight	12	7	5	3	1	4	4
Mother straight & Father curved	5	2	3	0	3	2	0
Both parents curved	6	3	3	2	2	1	1
Both parents straight	77	0	77	0	34	0	43
Total	100	12	88	5	40	7	48

3.3 Little Finger Curvature.

The little finger is the smallest finger of the human hand, opposite the thumb, next to the ring finger. Four muscles control the little finger: Three intrinsic muscles comprising a group called the hypothenar eminence, and one extrinsic, the extensor digiti minimi (McMinn, 1994). When you hyperextend your fingers, the little finger takes an orientation. It is either curved or straight at the distal interphalangeal. It appears a dominant allele causes the last joint of the little

finger to dramatically bend inward toward the 4th finger while straight little finger is caused by a recessive allele (Port, 2007).



Picture 12: Straight and Bent Little Fingers

Ordu and Nwosu in 2015 investigated the "Little finger curvature: as a morphogenetic trait inherited by Mendelian Pattern among the Igbo ethnic group of Nigeria". Here we investigated 1022 subjects from 315 families of Igbo extraction with 630 parents and 392 offspring. We made sure that both couple in a family and their both parents were all of Igbo origin since it is a genetic study. The little finger curvature was observed physically in the father, mother, and at least a child in each family and recorded. The results were analysed by testing the significance of the observed values to the expected values. On assumption that offspring outcome conforms to Mendelian simple dominant-recessive monohybrid cross. Statistically chi-square test at $p<0.05$ was used for the test and inheritance pattern of the finger curvature was determined. The results showed that the little finger curvature observed in this study was genetically determined and follows Mendelian single gene dominant-recessive pattern with the allele for curved little finger dominant over the allele for straight little finger (**Ordu and Nwosu, 2015**)

Table 4: Showing the test for frequency of Little Finger Curvature pattern among Igbo tribe

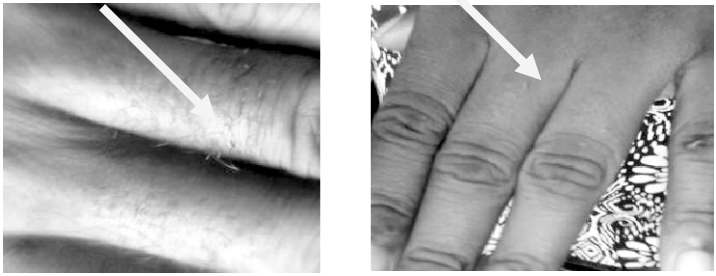
Parents Little Finger curvature combinations	If straight is dominant			If curved is dominant		
	Chi-test value			Chi-test value		
	Calculated chi - value	Critical chi - value	Inference	Calculated chi - value	Critical chi-value	inference
Father straight & Mother curved	18.28	3.84	Significant	18.28	3.84	Significant
Mother straight & Father curved	0.01	3.84	Insignificant	0.01	3.84	Insignificant
Both parents straight	38.51	3.84	Significant	0.72	3.84	Insignificant
Both parents curved	4.50	3.84	Significant	2.67	3.84	Insignificant

Vice Chancellor sir, yet another way of avoiding Posthumous Catastrophe

3.4 Mid-Digital Hair

The upper extremity just as the lower extremity have five digits with each digit formed by phalanges, joined at the interphalangeal joints and surrounded by soft tissues (McMinn, 1994). The proximal phalange articulates with the carpal bones at the metacarpophalangeal joint (Agur and Lee, 1991). Every human finger normally has a nail on its distal phalanx. In between the joints is the mid digit. On the middle

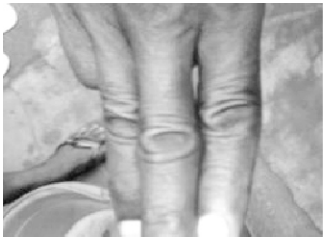
segment of fingers there can be presence or absence of hair. The presence or absence of mid-digital hair in human beings is a trait that is determined genetically (Danforth *et al.*, 1921).



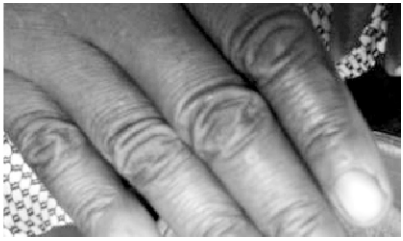
Picture 13: Presence and Absence of Mid Digital Hair

The inheritance pattern of mid-digital hair among Igbo tribe of Nigeria was investigated by **Ordu** and Ojobor 2013. A total of 648 individuals were studied comprising 400 parents and 248 offspring (121 males and 127 females) from Igbo families. The expression of mid-digital hair trait was observed, noted and pictures taken. After analysis of data obtained from the 200 families, it was observed that mid-digital hair was more common in males than females. The presence of mid-digital hair was found to be dominant over its absence following an Autosomal Dominant- Recessive pattern of inheritance (**Ordu and Ojobor 2013).**

Below are family prototypes under which other families fall:



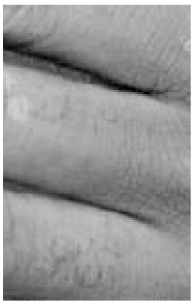
Father (absent)



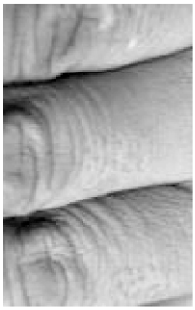
Mother (absent)

Child (absent)

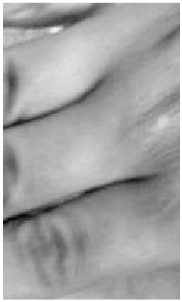
Picture (14) The trait is the same in father, mother and child



Father (present)



Mother (present)

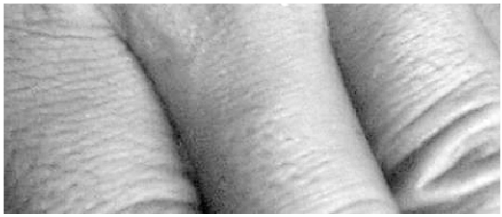


Child (absent)

Picture (15) The trait is the same in both parents but different in child

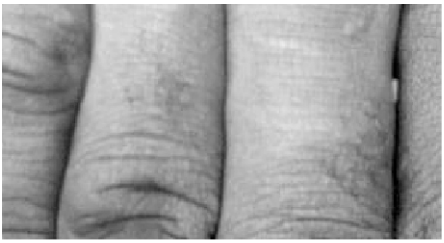
Father (absent)

Daughter (absent)



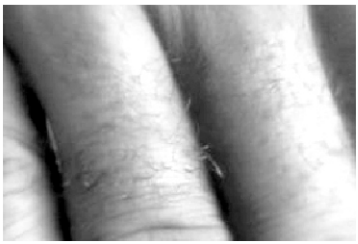
Mother (present)

Picture (16) The trait is the same in father and daughter but different in mother



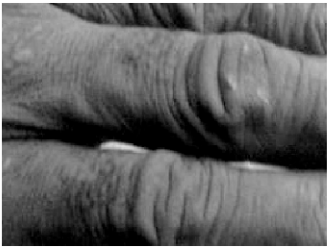
Father (present)

Mother (absent)

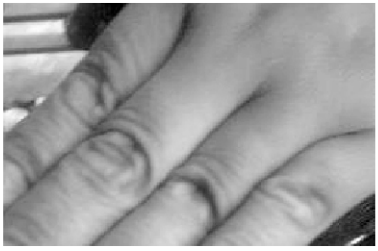


Son (present)

Picture (17) The trait is the same in father and son but different in mother



Father (present)



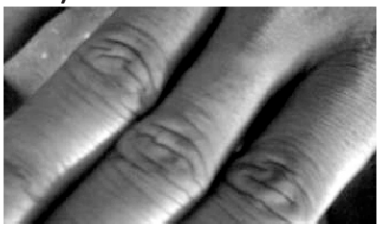
Mother (absent)

Daughter (absent)

Picture (18) The trait is the same in mother and daughter but different in father

Father (present)

Mother (absent)

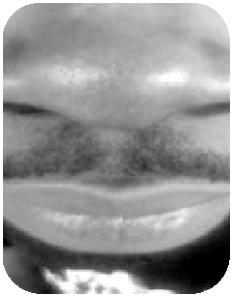


Son (absent)

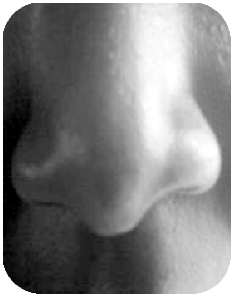
Picture (19) The trait is the same in mother and son but different in father

3.5 Shape of the Nose.

A nose is said to be narrow when the ala of the nose is in between the epicanthi fold of the eye, which is the nostril span restricted to the space between the eyes and broad when the ala is beyond the epicanthal fold of the eye that is nostrils extend beyond the space between the eyes. Narrow and broad noses are examples of a phenotypic expression of genetic constituency of parents and offspring (Julie, 2002).



Broad Nose



Narrow Nose

Picture (20) Broad and Narrow Nose

Ordu *et al* in 2016 undertook another research on the Evaluation of nose shape as a Mendelian-inherited trait in the determination of parentage among Nigerians in Port Harcourt. The study was aimed at determining the inheritance pattern of nose shape in the bid to ascertain its usability in parentage determination. Three hundred and thirty-seven subjects from 101 families comprising 202 parents and 135 offspring were recruited for this study. The families were randomly selected from within Port Harcourt by a multistage sampling technique. Their nose shape were observed physically in the father, mother, and at least a child in each family and documented. The offspring traits were tabularized in patterns of parental combinations (when both parents' nose are broad, both parents' nose are narrow, and a combination of broad and narrow). SPSS IBM (r) version 20 was used to analyze the data. Descriptive statistics and test for association between sex and nose shape was carried out by Chi-square analysis and the conformance to Mendelian inheritance pattern was analyzed using Mendelian Chi-square gene distribution model. The results are as tabulated on the next page.

Table 5: Distribution of nose shape within the observed populations

	Nose Shape		
	Total (%) Broad (bNS)	Narrow (nNS)	Total
Father			
Count (%)	92 (27.3)	9 (2.7)	169 (50)
Percentage within members	91.10	8.90	
Son			
Count (%)	65 (19.3)	3 (0.9)	
Percentage within members	95.60	4.40	
Total males (%)	157 (92.9)	12 (7.1)	
Mother			
Count (%)	88 (26.1)	13 (3.9)	168 (50)
Percentage within members	87.10	12.90	
Daughter			
Count (%)	53 (15.7)	14 (4.2)	
Percentage within members	79.10	20.90	
Total females (%)	141 (83.9)	27 (16.1)	
Total	**298 (88.4)**	**39 (11.6)**	**337**

bNS - Broad nose shape, nNS - Narrow nose shape

Table 6: Chi-square test of association of sex and nose shape

	Trait (Allele)	df	Calculated (χ^2)	Critical (χ^2)	P value calculated	Inference
Sex	Nose shape	1	0.256	3.841	0.613	No significant association

Table 7: Number of offspring that had broad or narrow nose shape from different parental combination of nose shape

Parents nasal shape combinations offspring	Total number of offspring (%)								
	offspring Female						Male		
	Broad	Narrow	Total	Broad	Narrow	Total	Broad	Narrow	Total
Broad nose in both parents	106 (98)	2 (2)	108 (80)	58	0	58	48	2	50
Expected outcome (if broad nose is dominant)	79.5	26.5							
Expected outcome (if narrow nose is dominant)	0	106							
Narrow nose in both parents	0 (0)	4 (100)	4 (3)	0	2	2	0	2	2
Expected outcome (if broad nose is dominant)	4	0							
Expected outcome (if narrow nose is dominant)	1	3							
Broad in father and narrow in mother	9 (64)	5 (36)	14 (10)	6	1	7	3	4	7
Expected outcome (if broad nose is dominant)	10.5	3.5							
Expected outcome (if narrow nose is dominant)	3.5	10.5							
Narrow in father and broad in mother	3 (33)	6 (67)	9 (7)	1	0	1	2	6	8
Expected outcome (if broad nose is dominant)	2.25	6.75							
Expected outcome (if narrow nose is dominant)	6.75	2.25							
Total	118 (87)	17 (13)	135	65	3	68	53	14	67

Table 8: Mendelian Chi.square test for frequency of nasal shape pattern (expected to observed outcome)

Parents nasal shape combinations	If broad is dominant			If narrow is dominant		
	Calcu-lated	Critical	Inference	Calcu-lated	Critical	Inference
Broad nose in both parents	30.864	3.841	Significant	0.037	3.841	Insignificant*
Narrow nose in both parents	0.000	3.841	Insignificant	0.333	3.841	Insignificant*
Broad in father and narrow in mother	1.786	3.841	Insignificant	5786	3.841	Significant
Narrow in father and broad in mother	4.000	3.841	Significant	1.000	3.841	Insignificant*

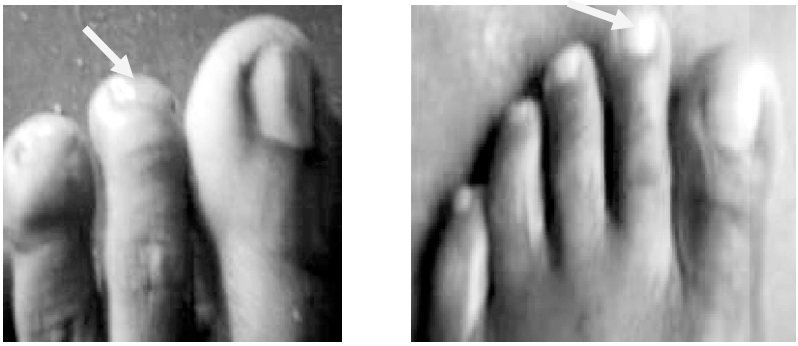
*More insignificant distribution with lower *P* value observed indicating indifferent distribution from the expected outcome as proposed by Mendel

Their study also showed an interesting result, broad nose shape was more frequent with 298 (88.4%) when compared to narrow nose shape (11.6%). About 46.9% of males had broad nose against 41.5% for females. However, this distribution was not observed to follow any sexual preference ($\chi 2 = 0.141$, $P > 0.932$). The observed and expected outcome were tested for significance on the assumption that offspring outcome conforms to Mendelian simple dominant-recessive monohybrid cross. The distribution of nose shape was observed to be genetically determined and follows Mendelian single gene dominant-recessive pattern with the allele for narrow nose dominant over the allele for broad nose **(Ordu *et al* 2016)**

Vice Chancellor sir, I think it is obvious at this point that Posthumous Catastrophe is avoidable.

3.6 Big Toe Length (Morton's Toe)

The length of the big toe and the second toe is compared in relation to each other. They are measured from the creases to the top. In some people the big toe is longer than the second toe and is called longer big toe while other people have the big toe shorter than the second toe. Anatomical variations have been genetically linked and the difference in the length of the big toe relative to the second toe (Morton's toe) is not an exception; however, its prevalence and inheritance pattern has been a scientific debate (Hawkes, 1914).



Picture 21: Big Toe Length

Another research on the prevalence and inheritance pattern of Morton's toe among Nigerians in Rivers State was investigated with a total of 101 families comprising of 101 parents (fathers and mothers) and 135 offspring were conveniently sampled. The observed big toe pattern was described as "LBT" and "SBT" representing big toe longer than the second toe and big toe shorter or equal to the second toe, respectively.

The offspring trait was tabulated alongside the parental combination patterns (i.e., when both parents had LBT, both parents SBT and a combination of LBT and SBT). XLSTAT

2012 (version 4.2.2) Chi-square analysis tested the association between sex and Morton's toe.

Mendelian Chi-square gene distribution model was used to evaluate the conformance to simple dominance-recessive pattern.

The results gotten were that LBT (218; 64.7%) was more in the studied population than SBT (119; 35.3%); with males (63; 18.7%) having slightly higher proportion of SBT (Morton's toe) than females (56; 16.6%), which was without sexual preference ($\chi 2 = 0.141$, $P > 0.932$). The test of offspring gene distribution in conformance to Mendelian simple dominant-recessive monohybrid cross had rather weak result (Aigbogun *et al,* 2019).

Aigbogun *et al,* 2019 concluded that Morton's toe could be said to be genetically linked, however, its inheritance pattern does not conform to the simple dominant-recessive model, but a more complex pattern. It should be noted that the large frequency of a trait in a population does not make it dominant.

Table 9: The frequency, percentage, and distribution of big-toe length with respect to parental combination

Parents big- toe length combinations	Total no. of offspring (%)			Male offspring			Female offspring		
	L_{BT}	S_{BT}	Total	L_{BT}	S_{BT}	Total	L_{BT}	S_{BT}	Total
Long big-toe length in both parents	52 (81)	12 (19)	64 (47)	24	6	30	28	6	34
Expected outcome (if long big-toe length is dominant)	48	16							
Expected outcome (if short big-toe length is dominant)	0	64							
Short big-toe length in both parents	3 (18)	14 (82)	17 (13)	1	8	9	2	6	8
Expected outcome (if long big-toe length is dominant)	0	17							
Expected outcome (if short big-toe length is dominant)	4.25	12.75							
Long in father and short in mother	15 (60)	10 (40)	25 (19)	7	5	12	8	5	13
Expected outcome (if long big-toe length is dominant)	18.75	6.25							
Expected outcome (if short big-toe length is dominant)	6.25	18.75							
Short in father and long in mother	14 (48)	15 (52)	29 (21)	7	10	17	7	5	12

	L_{BT}	S_{BT}	Total	L_{BT}	S_{BT}	Total	L_{BT}	S_{BT}	Total
Expected outcome (if long big-toe length is dominant)	14.5	14.5							
Expected outcome (if short big-toe length is dominant)	14.5	14.5							
Total	84 (62)	51 (38)	135	39	29	68	45	22	67

LBT: Longer big toe; SBT: Shorter big toe

Table 10: Mendelian Chi-square test for frequency of big toe length pattern (expected to observed outcome)

Parents big.toe length combinations	Calculated	If L_{BT} is dominant Critical	Inference	Calculated	If S_{BT} is dominant Critical	Inference
Long big-toe in both parents	1.333	3.841	Insignificant	2.250	3.841	Insignificant
Short big-toe in both parents	0.529	3.841	Insignificant*	0.123	3.841	Insignificant
Long in father and short in mother	3.000	3.841	Insignificant	12.250	3.841	Significant
Short in father and long in mother	5.523	3.841	Significant	6.284	3.841	Significant

*More insignificant distributions with lower *P* value observed for long big.toe; therefore, it can be stated that longer big toe expressed dominant over SBT. SBT: Shorter big toe

3.7 Prevalence and Inheritance Pattern of Midline Diastema among Ijaws of Nigeria

Midline diastema is the space between the medial surfaces of central incisors greater than 0.5mm. In the vain Johnson, Olotu and Ordu conducted a study to establish inheritance pattern of natural midline diastema among the Ijaw ethnic group of South-South Nigeria. The study involved 363 respondents (109 males and 254 females) with natural midline diastema. The result showed that the trait midline diastema occurs in two contrasting allelic forms and genetically transmitted by Mandellian recessive-dominant pattern with the presence of the diastema dominant over its absence. Therefore, midline diastema has sexual dimorphism showing more prevalence in females (Johnson, Olotu and **Ordu 2017**).

Parents and diastema Combinations	Total number of Offspring			Male Offspring			Female Offspring		
	Present	Absent	Total	Present	Absent	Total	Present	Absent	Total
Present in both parents	306 (86.4%)	48 (13.6%)		137	24	161	169	24	193
Exp. outcome (if presence of diastema is dominant)			**354**						
Exp. outcome (if absence of diastema is dominant)									
Absent in both parents	490 (67.4%)	237 (32.6%)		17	38	55	29	32	61
Exp. outcome (if presence of diastema is dominant)			116						
Exp. outcome (if absence of diastema is dominant)									
Present in father and absent in mother	490 (67.4%)	237 (32.6%)		233	118	351	257	119	376
Exp. outcome (if presence of diastema is dominant)			727						
Exp. outcome (if absence of diastema is dominant)									
Absent in father and present in mother	807 (68.3%)	374 (31.7%)		358	186	544	449	188	637
Exp. outcome (if presence of diastema is dominant)									
Exp. outcome (if absence of diastema is dominant)									
Total	1649 (%)	729 (%)	2378	745	366	1111	904	363	1267

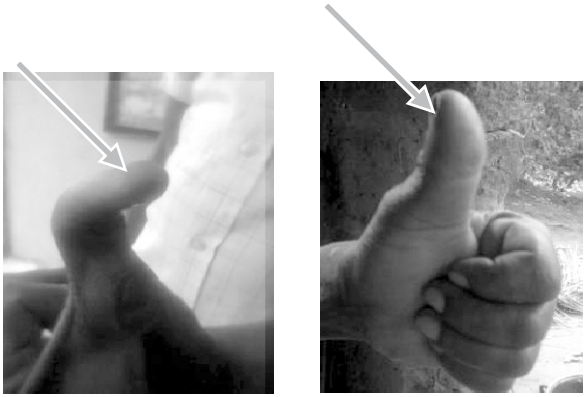
*Nonconformance to parental distribution

Table 12: Mendelian chi-square test for the inheritance of diastema (expected to observed outcome)

Presence or absence of diastema	If presence is dominant			If absence is dominant		
	Calculated	Critical	Inference	Calculated	Critical	Inference
	2.347	3.841	Insignificant*	280.347	3.841	Significant
Absent in both parents	18.241	3.841	Significant	42.241	3.841	Significant
Present in father and absent in mother	22.394	3.841	Significant	697.061	3.841	Significant
Absent in father and present in mother	28.006	3.841	Significant	1182.673	3.841	Significant

3.8 Thumb Curvatures.

The thumb is the first finger of the hand (Austin, 2005). In anatomical position with the palm facing front, the thumb is the outmost of the digits. It is made up of two phalanges the first and second (Brown *et al.*, 2004). Variations exist between them when the thumb is in "thumb up" position. Thumb up position is when there is hyperextensibility of the first interphalangeal joint and complete fist of the other four digits (Brunelli, 1999). The thumb can either be straight at 00 or curved ("Hitchhiker's thumb") upto 900 in that position. Bent or curved thumb, thought to be an autosomal recessive allele is more formally known as "distal hyperextensibility of the thumb" while the straight thumb is the dominant allele (McDonald, 2010).

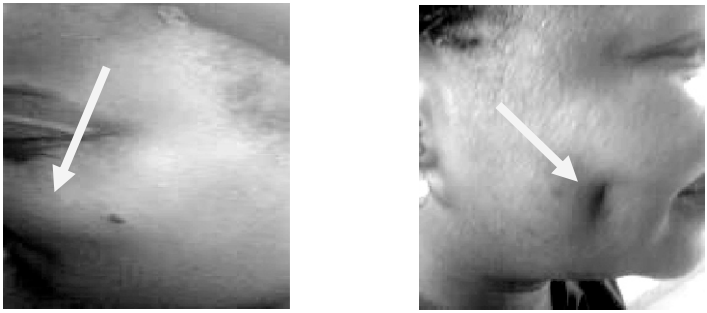


Picture (22): Curved and Straight Thumb

3.9 Dimples.

Dimples are small visible indentations on the surface of the skin. They may appear on various parts of the body like the abdomen, back, shoulder or limbs. When they occur on the face they are called chin dimples. It is thought to be caused in different ways; the pull up of the facial skin by shortened facial muscles when a person smiles, splitting of the zygomaticus major muscle into inferior and superior during development and their contraction during smiles, and indentation in the jaw bone. Dimples on the face are highly prized because the face is highly visible, and it is an important outlet for expressing thoughts and emotion beyond words (Omotoso, 2010). Dimples tend to accentuate a smile, thus increasing the perception of attractiveness, sociability and facial beauty. However, some people see dimples as disgusting, and would rather have their dimples removed than have them created, this aversion is more for chin dimples (Bao *et al.*, 2007). Dimples could be transient or permanent, depending on the cause or factor responsible for their occurrence. The process of growth and development could contribute to this. Excessive fat deposition, which disappears with the aging

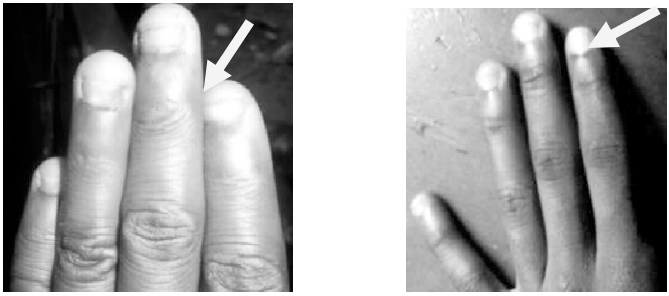
process, causes transient dimples, so also is the stretching or lengthening of muscles during growth, leading to gradual obliteration of the defect. This explains why some dimples are commoner and more conspicuous in the younger age groups. Cheek dimples occur to a defect created by muscles on the face. It occurs lateral to the angle of the mouth. It is caused by the presence of double or bifid Zygomaticus major muscle. Smiling makes the overlying skin draw inwards and the defect becomes bigger, thereby making the dimples more visible. Either or both of the cheeks could present with one or more dimples, but it is more common to have dimples occurring on both cheeks (bilateral) than only one cheek (unilateral). Incomplete fusion of the two halves of the mandibular bone in utero is responsible for a cleft chin resulting in a Y-shaped fissure at the centre of the lower jaw bone (Smith, 2010). Facial dimples are inherited as autosomal dominant traits, and people having the homozygous recessive genotype lack the ability to express the facial dimples (Oladipo and Amangi-Peters, 2005).



Picture (23) Absence and Present of Dimples

3.10 Index Finger Length

The length of the second finger (index finger) is measured from the basal crease to the apex of the second finger while that of the fourth finger (ring finger) is also measured from the basal crease to the apex of the fourth finger. When the second finger is longer than the fourth finger it is said to be long index finger and vice versa when it is shorter. The relative length of the second and the fourth varies differently in different people. The second to fourth digit ratio (2D:4D) is the ratio of the length of the second digit to that length of the fourth digit (Manning, 2003). In some people, the second (index) finger is longer than the fourth (ring) finger that is, higher 2D:4D while in others it is shorter (lower 2D:4D). It has been known for some time that the ratio between the length of the 2ndand 4thdigits (2D:4D) is a sexually dimorphic trait (Baker, 1888; George, 1943). This relative length between the two is genetically influenced. The morphogenetic trait is strongly associated with sex.



Picture 24: Length of Second Finger compared to the Fourth Finger

Vice Chancellor Sir **Ordu et al** decided to study this morphogenetic trait in another perspective, we investigated the 2nd to 4th digit ratio of infertile women in Port Harcourt South South Nigeria. With aid of vernier caliper the 2nd and 4th digits length of 105 women (73 with primary infertility and 32 with secondary infertility) who attended infertility

clinic of University of Port Harcourt Teaching Hospital were examined. Sir, **Ordu et al** found out that there is relative lower mean digit ratio masculine in nature for the women with primary infertility of 0.97±0.032 and 0.971±0.032 for the right and left hands respectively. For women with secondary infertility the mean digit ratio was higher as seen in a normal female population of 0.983±0.044 and 0.984±0.032 for right and left hands respectively. This implies that the 2nd to 4th digit ratio can be used as a predictive marker for infertility. If you have a daughter check the ratio ***(Ordu et al, 2012)***

3.11 Interlaced Fingers or Hand Clasping.

When people interlock their fingers, their left thumb is either placed over their right thumb or verse versa. If hands are clasped together (without thinking about it!), and either of the thumb is placed on top of another is a trait that is genetically controlled. Two allelic interlocking forms results viz either the left thumb over the right (dominant allele) or right thumb over the left (recessive gene) (Amold, 2009). However, interlacing fingers is not purely a genetic trait. There could be environmental factors that could come into play and interfere with the expression of genes. These environmental factors are potentially numerous and can be cellular, sub-cellular (such as other genes) or factors that exist in the macro-environment (Amold, 2009).

Picture (25) The trait is the same in mother and son but different in father

Deductions from the Lecture

The results obtained from the above studies

1. The Lecture has unveiled the ignorance of how simple observable readily available morphogenetic traits can be transmitted to the offspring from parents. This awareness can
2. Might also be useful as a Medico-legal tool in settlement of parental dispute.
3. Understanding and awareness of the lecture will be used for genetic counselling.
4. Would be useful in forensic studies,
5. can be used in comparative anatomy.

4.0 GENOTYPE

Haemoglobins are a group of proteins whose function is to transport oxygen from lungs and carbodioxide in the reverse direction. They are the backbone of red blood cells. It is composed of polypeptide chains called globulin and iron protoporphyrinhaeme group. A specific sequence of amino acids constitutes each of the polypeptide chains. The normal haemoglobin molecule has a pair of alpha chain and a pair of non-alpha chains (Wintrope1967; Schneider, 1978). Mutation in the sequence of the amino acid of alpha chain leads to a structural abnormality called Sickle cell disease. Sickle cell disease is an inherited group of disorders where the red blood cells contort to a sickle shape. The process of determining individuals genotype is called genotyping. However, a person can either be of the genotype AA, AS or SS (Okoduwa, 2013). An individual with AA is normal, AS is a carrier while SS is a sicklier. It is well known that inheritance of Sickle cell disease fellows Mendelian pattern. It can be used as a preliminary tool for parentage identification. Genotyping and morphogenetic traits showed some association in our research. (Aigbogun *et al* 2019)

5.0 ALLELE FREQUENCY DETERMINATION USING HARDY-WEINBERG EQUATIONS

Using Hardy-Weinberg equations for calculating the allele frequency in the population of the observed morphogenetic traits; the underlisted equation was imputed into the excel sheet and the outcome documented

Where; κ_ρ=*population prevalence for the trait*

ρ^2=*frequency of the homozygous domianat trait*

φ^2= *frequency of homozygous recessive trait*

$2\rho\varphi$=*frequency of heterozygous dominant trait*

Population	N	Total allele
Parents	202	404
Offspring	135	270
Total	337	674

$$\varphi^2 = \frac{observed\ dominant\ trait}{total\ population}$$

$$\varphi = \sqrt{\frac{observed\ dominant\ trait}{total\ population}}$$

$\rho = 1 - \varphi$ and $\rho^2 = (1 - \varphi)^2$ ..... *equation II*

Therefore;

$$2\rho\varphi\ (frequency\ of\ heterozygous\ dominant\ trait) = 2 \times \rho \times \varphi$$

Explanation:

The H-W equation is a confirmation of how the trait under investigation aligns with the Mendelian theory. The Hardy–Weinberg principle, also known as the Hardy–Weinberg equilibrium, model, theorem, or law, states that allele and genotype frequencies in a population will remain constant from generation to generation in the absence of other evolutionary influences.

The Mendelian principle explains that are expressed as dominant-recessive should not be influenced by other traits that are inherited. By calculating the allele contributions between Parents and F1 generation, we can infer on how closely related and the distributional stability of the traits. When the ratio of a trait (eg nose shape) of the parent is similar to that of the offspring. This provides the following scientific basis;

1. That we can distinguish between predominance (distribution) and dominance (genetics)
2. That we can put an end to the pseudoscientific propositions of population/race/ethnic/region supremacy.
3. It gives us scientific confidence that the trait is with little or no evolutionary influence; thus, significant for forensic purpose (e.g., comparing the parent to the offspring). The Hardy–Weinberg (H-W) equation was used to compare the allele frequency of the parent's big toe length (B) to that of the offspring. The H-W equation showed a similarity of offspring allele distribution (1:3:2.5) from the parents (1:3:2)

Vice Chancellor, in our quest to prove that our assertions are true we studied the Big toe length and calculated the allele frequencies of the parents and offspring and compared their distribution and occurrence within the generations. It was discovered that it obeyed the Hardy–Weinberg's law (Aigbogun *et al,* 2019).

Table 13: Parental allele frequency determination for big toe length (B)

Gene	Description	Proportion	Percentage (%)	Total allele
	Total population	202		404
Bb	Homozygous short big toe; SBT (q2)	0.34	34	
B	Allele	0.58		
B	Allele	0.42		
BB	Homozygous long big toe; LBT (p2)	0.18	18	
Bb	Heterozygous long big toe; LBT (2pq)	0.49	49*	Ratio=BB : Bb : bb 0.18 : 0.49 : 0.34.1:3:2

Total population	Long big toe
Actual number of homozygous L_{BT}	36
Actual number of heterozygous L_{BT}	98*

BB: Homozygous for long big toe; Bb: Heterozygous form for long big toe; bb: Homozygous short big toe; S_{BT}: Shorter big toe; *Highest contributing allelic form

Table 14: Offspring allele frequency determination for big toe length (B)

Gene	Description	Proportion	Percentage (%)	Total allele
	Total population	135		270
Bb	Homozygous short big toe; SBT (q2)	0.38	38	
B	Allele	0.61		
B	Allele	0.39		
BB	Homozygous long big toe; LBT (p2)	0.15	15	
Bb	Heterozygous long big toe; LBT (2pq)	0.47	47*	Ratio=BB : Bb : bb 0.15 : 0.47 : 0.38:1:3:2.5

Total population	Long big toe
The actual number of homozygous L_{BT}	20
The actual number of heterozygous L_{BT}	64
Total	84*

BB: Homozygous for long big toe; Bb: Heterozygous form for long big toe; bb: Homozygous short big toe; S_{BT}: Shorter big toe; *Highest contributing allelic form

Table 15: Summary of the genotypic ratio of the various traits

Ratio	Big toe length BB: Bb: bb
Parental genotype (ratio)	1:3:2
Offspring genotype (ratio)	1:3:2.5 (2:6:5)*

6.0 DEOXYRIBONUCLEIC ACID (DNA) ANALYSIS

The heart of human science lies in the study of the genetic system. Diseases, therapy, security, warfare are all studied at the level of the genetic composition of humans.

It is the process of identifying changes in DNA sequence (genetic variants) DNA carries genetic instructions for the growth, functioning, and reproduction of living organisms. It is also used to determine genetic profiling. DNA profiling is the process of determining an individual's DNA characteristics. The genomic structure is analyzed. **Sources of human DNA** Samples includes but are not limited to blood, semen, saliva, urine, fingernail clippings, chewing gum, bite marks, feces, hair, cigarette butts. As little as 3ng of DNA gotten from these tissues is enough for DNA analysis. The process of DNA analysis involves; DNA Extraction, DNA Impression, DNA Determination and finally DNA sequencing.

6.1 Methods of nucleic acid extraction

1. Organic (Phenol-Chloroform) Extraction
2. Non-Organic (Proteinase K and Salting out)
3. Chelex (Ion exchange Resin) Extraction
4. FTA Paper (Collection, Storage, and isolation
5. Silica Based (Silica exchange Resin-Qiagen)

Organic methods.

This method involves; Cell Lysis Buffer-lyse cell membrane, nuclei are intact, peeled nuclei. Resuspend nuclei, add Sodium Dodecyl Sulfate (SDS), Proteinase K. Lyse nuclear membrane and digest protein. DNA released into solution is extracted with phenol-chloroform to remove proteinaceous material. DNA is propitiated from the aqueous layer by the addition of ice cold 95% ethanol and salt. Precipitated DNA is washed with 70% ethanol, dried under vacuum. DNA/RNA is re suspended in TE buffer or nuclease free water. Also known as Phenol-chloroform DNA extraction. In summary it is in four stages

i. Homogenization/Lysis,
ii. Phase separation,
iii. Extraction/Precipitation and
iv. Resuspension.

It yields relatively pure, high molecular weight DNA good for PCR, RFLP and other downstream analyses

Non-organic method (Non-Phenol Chloroform based extraction of DNA.).

In this method Cell Lysis Buffer –lyse cell membrane, nuclei are intact. Re-suspend nuclei in Protein Lysis Buffer containing a high concentration of Proteinase K. lyse nuclear membrane and digest protein at 650c for 2 hours. Temperature

helps denature proteins, and Proteinase K auto digests itself. To remove proteinaceous material, LiCl is added to a final concentration of 2.5M, and incubated on ice, Proteins precipitate out and are pelleted by centrifugation. DNA is precipitated by the addition of room temperature isopropanol. LiCl will not precipitate with DNA. Precipitated DNA is washed with 70% ethanol, dried under vacuum and re-suspended in **TE** buffer. It is Fast and simple to perform, uses nontoxic materials and therefore no need of fume hood, Produces high-quality DNA

Flinders Technology Associations (FTA) Paper.

FTA (Flinders Technology Associations) cards are cotton based, cellulose paper containing chemicals that burst cells, denature proteins and protect DNA, leaving a sample suitable for molecular identification without the risk of disease contamination. It 8is a unique mixture of strong buffers, protein denaturants, chelating agents, and a UV absorbing, free radical trap. The reagents are impregnated into a cellulose-based filter matrix such as Whatman BFC180 or 3IET paper. What does FTA card Do? Kills blood borne pathogens on contact. Immobilizes DNA within the matrix. Protects DNA from degradation. Allows for long-term storage at room temp. Samples compatible with FTA Blood. Cell culture. Allantoic fluid issue impressions or scrapings. Tissue swabs. Bacterial culture solution

Types of FTA cards.

FTA cards are available in either **white (classic) or (indicating)** formats. Although both classic and indicating cards can be used for sampling, it is recommended that classic FTA cards be used only for blood, as other samples may not show up very well on the white background. Indicating cards may be used for all types of samples as they contain a color-changing

component that allows the user to see exactly where the sample was placed. FTA cards come in a variety of configurations, allowing multiple options for the user. Some of the most commonly used FTA cards have a 4 circle configuration.

Handling of FTA Cards

- ❖ Unused FTA cards should be stored at room temperature in a zipsealed plastic bag if possible.
- ❖ Cards should be protected from light to ensure that the chemicals contained within are not damaged.
- ❖ Always wear gloves when handling FTA cards.
- ❖ Use fresh tissues for sampling
- ❖ Use ethanol to disinfect handling equipment between samples.
- ❖ Clearly label the card/and or application circles with the identity of the sample.
- ❖ Items needed for FTA sampling include Scissors, Scalpel, Forceps, Gloves, Sterile swabs in individual containers, FTA Card, Pencil for identifying sample and syringe for liquid samples.

Procedure for taking tissue impression on FTA card

- ❖ Step 1 Cut the organ open so that either the mucosa or the internal tissue is exposed.
- ❖ Step 2 Using a scalpel and forceps, cut a sample of tissue and make a generous impression of the FTA card by pressing and rubbing the cut tissue from the card, leaving behind the impression.
- ❖ Step 4 Let the impression air dry on the card for at least 30 minutes, keeping the card away from extreme heat, humidity or direct sunlight

Methods of Nucleic acid quantification

- UV Spectrophotometry
  — Nanodrop
- Ethidium Bromide Staining
  — Gel Electrophoresis Analysis
- Fluorometric Quantification
  — PicoGreen
  — Qubit
  — Hoecst 33258 dye
- Real Time PCR

UV Spectrophotometry

- Bimolecules absorb light in UV range
- Allows us to estimate the amount of DNA by its absorbance
- DNA: 260nm and 280nm
- Proteins: between 215-230nm and 280nm

Ethidium Bromide Staining

- Binds to Nucleic Acid and gives orange fluorescence
- Gel Electrophoresis Analysis
- Calculate band size using software from imager. Comp-are fluorescence intensities of ladder and sample to estimate DNA concentration
- Create graph with linear trendline to calculate mass concerning intensity numbers.

Fluorimetric quantification; Uses fluorescent dye

- ❖ Picogreen; binds dsDNA
  - — Measure fluorescent intensity of PicoGreen dye with spec.
  - — DNA quantified by comparing the sample to set of standards u
- ❖ Qubit; binds DNA, RNA or protein depending on the kit
- ❖ Hoechst 33258 dye, specific to DNA
- ❖ Advantages; High output, increased sensitivity and less chance of contamination
- ❖ Disadvantages: Special equipment/reagent, long prep time

OTHER METHODS

Real time PCR

- ❖ Fluorescent dye binding to dsDNA as it accumulates during process
- ❖ Tagets specific region of DNA template u
- ❖ Used for sequencing prep, to verify quantity of DNA libraries u

Bioanalyzer

- Automated electrophoresis
- Size, quantitation and purity assessments
- Small volume of sample needed
- Multiple platforms (RNA, DNA)
- Both low and high concentration samples
- Easy to use, but expensive

The usefulness of DNA analysis

1. Forensic investigation
2. Paternity test
3. Ancestry tracking
4. Identification of disease agents
5. Genetic engineering
6. Genome sequencing
7. Vaccine development
8. Determining the genetic basis of disease

6.2 *Molecular Characterization of Mycobacterium tuberculosis using IS6110 Gene with Nested* PCR- Clinical Relevance for the Disease Characterization

Vice Chancellor Sir we now ventured into molecular biology by the isolation of Mycobacterium tuberculosis in a research titled *"Molecular Characterization of Mycobacterium tuberculosis using IS6110* Gene with Nested PCR- Clinical Relevance for the Disease Characterization". This was done in India with help of one of my student. The work was conducted using a faster and advanced method of Nucleic Acid Amplification Technology to characterize Mycobacterium tuberculosis using IS6110 gene. Using collected 50 Clinical samples. The DNA was isolated using silica column method, amplification of DNA in Nested PCR machine, post amplification using Agarose Gel Electrophoresis and result interpretation in E-gel Imager trans-illuminator.

We discovered that of the 50 clinical samples processed, 10(20%) were positive and 40(80%) were negative for IS6110 gene. In age-wise distribution, 21-60(years) had 32(64%)

clinical samples with the highest positivity rate of 9(28.1%) compared to other age group distributions and 23(78.9%) were negative. In gender-wise distribution, 34(68%) were males with 9(26.5%) positive and 25(73.5%) negative. The female clinical samples were 16(32%), of which 1(6.3%) was positive and 15(93.7%) were negative (Ekpo et al 2017).

Amplification technologies offer the potential for the diagnosis of tuberculosis in a few hours with a high degree of sensitivity and specificity. To prevent the spread of the disease, early diagnosis using molecular assay especially with IS6110 or mpb64 as target gene is more efficient due to the long incubation period of tuberculosis which does not favor culturing process and prompt treatment of cases being the best option.

It is of note that Mycobacterium tuberculosis (MTB) is a pathogenic bacteria species in the genus Mycobacterium and the causative agent of most cases of tuberculosis.

6.3 Deoxyribonucleic Acid (DNA) Analys is Selected Morphogenetic Traits

Since gene mapping offers firm evidence of how genes are inherited and expressed (as traits) and some morphogenetic traits have shown to be inherited as single gene Mendelian pattern These patterns can be explained by genetic profiling and observing their relative ***loci*** and ***activities*** on the chromosome; hence confirm or refute all observatory and mathematical hypothesis.

Ordu et al are to investigate the pattern of inheritance exhibited by selected morphogenetic traits and how they could be applied in forensic and population genetics by analysing the DNA of some selected morphogenetic traits. We designed the study in three (3) broad aspects; (A) DNA

analysis, (B) software design and analysis and (C) population genetic models for explaining allele frequency changes. DNA Samples will be obtained through buccal swab and blood samples (collected from researchers, family members and associates). A total of 10 samples (comprising of at least a father, mother and offspring) will be obtained after an elaborate orientation and signed informed consent. Standard DNA sample collection and preservation protocol; as described by the U.S Department of Justice will be followed. Aspect A (DNA analysis) will be carried out at DNA Forensic Laboratory, 44F/9 Rajendra complex, India. Results will also be sent to the DNA Sequencing and Genotyping Facility, 3304 Throckmorton Plant Sciences Center, Kansas State University, USA for confirmation. Upon establishment of facts in aspect A, it initiates aspect B which involves the subjection of all identified morphogenetic trait that conforms to the Mendelian-inheritance pattern to MTC (MORPHOGENETIC TRAIT COMBINATION) software analysis (the software will be designed in collaboration with the Kansas State University Bioinformatics Center). Upon completion of aspect A and B, aspect C initiated which involves the modification of certain genetic models to explain the allele frequency dynamics; with keen interest on the Nigeria population; however it could apply to any population. DNA analysis will identify the location, relation and characteristics of the genes expressing the morphogenetic traits while software analysis will determine the possibilities of having identical combinations in our population. The possible combinations are a factor of binomial expression (ax, where a=2 observed to dominant AA or recessive aa and x=number of traits observed to express single gene inheritance). The genetic model will be used to explain allele frequency dynamics ([ORAA and ORAa] and [Δa X(t)]) and prediction the how long a recessive allele can exist before it

becomes extinct; taking into consideration, circumstances that may interfere with such event. These attempts could lead to a breakthrough in medical, forensic and population genetics; hence, attracting global interest

6.5 Limitations to Genetic studies

1. Lack of finance and grant opportunities
2. No available high tech laboratory
3. No trained manpower to handle molecular procedures
4. Lack of commitment in investment adequately in research

7.0 RECOMMENDATIONS

1. Creation of awareness on inheritance pattern
2. DNA analysis to determine the genetic makeup of these traits
3. Gene mapping to determine the loci of the traits and their distance in space
4. More funding of central laboratories for multidisciplinary & collaborative research
5. Establishment of national genetic database.

8.0 ACKNOWLEDGMENTS

My gratitude goes first to God for His love, compassion, mercies and endless grace. He alone can make a man great out of nothing. To him I give all the glory, honour and adoration for not only making this day possible but also for giving the Rivers State University a Pro-Chancellor and Chairman of Council in the person of **Justice Iche Nwenenda Ndr (Rtd)** who doubles as a father to all with no exceptions.

In keeping with the Biblical principle that says 'Give honour to whom honour is due', I want to sincerely appreciate our amiable Vice-Chancellor, **Prof. Nlerum S. Okogbule** for all the good works that he is doing in the University, the ambient environment that he has created for both staff and students to thrive effortlessly.

The Deputy Vice- Chancellor (Administration) Prof. N.S. Okoroma is a man in whom we are well pleased. His doggedness at achieving and maintaining excellence is incomparable. I also immensely appreciate our Deputy Vice - Chancellor (Academics) Professor Omubo Pepple, my friend, indeed a round peg in a round hole. May I also appreciate our Registrar, Dr. Sydney Enyindah, a Prince and a Chief, the son of a good man, fine boy no pimple, a great administrator who leaves no stone unturned at synthesizing innovative ways of doing his job and advancing the University. I do also appreciate the Liberian and Bursar, for their immense efforts and commitment in the discharge of their duties which has had a strong effect on the smooth running of the University. Not forgetting the immediate past Deputy Vice-Chancellor (Academics) who acted as the Vice-Chancellor in the person of Professor Opuenebo Binya Owei, a Rural and Urban Planner Per Excellence, a virtuous woman of God. It will interest you to know that she is the only female Vice-Chancellor that the University has had so far. Sir Prof I. K. E. Ekweozor the Chairman of Senate Inaugural Lectures Committee Chairman thank you for this recommendation to give this lecture today. God will reward you abundantly for all you do behind the scene for success of inaugural lectures.

I also do deeply appreciate the Provost of College in the person of Professor C. G. Orluwene, who since his assumption of office has taken the College to a sophisticated and digital level far beyond our imagined horizon. You are indeed an epitome of excellence, a sharp-witted Professor with a knack for greatness. Other Deans of the College Professor Solomon Elenwo, Dean of Clinical Sciences, and Professor Kaladada Korubo, the Dean of Basic Clinical Sciences; my Associate Dean Dr Ezekwe Ahamefula a brother from another mother, and the Heads of Departments: Professor Watson Jacks, Dr. Tamunotoye Korubo-Owiye; Dr. Christine Brisibe; Dr. Elizabeth Okankwo whom I have enjoyed their support immense.

I have enjoyed benevolence from people who have helped to shape the course of my life. First amongst all is Professor B.C. Didia, my academic father, supervisor at Masters and Doctorate programmes. The Vice-Chancellor sir, it will interest you to know that my journey as an anatomist began with a phone call from Prof. B.C Didia asking me to come and put in application for an academic job in the Department of Anatomy, University of Port Harcourt in 2007. Before then, I had planned to go in for Residency in Orthopaedic Surgery but he encouraged me to come into Anatomy, and I harkened to his advice which has culminated to what is happening today. I am proud that I followed in your footstep. Following the appointment of Professor B.C. Didia as the Vice-Chancellor with the mandate of His Excellency the Visitor of the Rivers State University, Governor Ezenwo Nyesome Wike to establish a medical school in Rivers State University, he brought me to head the Department of Anatomy as the pioneer Head of Department (HOD) on sabbatical, the University Council and Management of the Rivers State University found me fit to be appointed a Professor of Anatomy in 2017. I remain eternally grateful to God and to you Professor B.C. Didia because God used you to exalt my horns like that of a unicorn. You are a great man who has written his name in the sands of time, an academic edifice, a colossus.

My gratitude will not be complete if I do not mention another man God sent to my life, Professor Raphael Oruamabo, a Professor of Paediatrics, one of the ancestors of paediatrics. A man with a golden heart with a perspicacious sight who saw into my future and made sure that it came to fruition, one man that God used to quicken my success. I learnt so much under you sir.

There is yet another man whose name elicits a nostalgic feeling in my life, being Dr. CookeyGam a man of sagacity who took me in as a young medical officer in the Health Service Department of the Rivers State University after my return from the national youth service. Till this day has maintained that unique love he had for me, I am profoundly grateful to you sir. A man is nothing if he cannot give back to society. This man Dr. Iko Ibanga while in Jos taught me how to give back to society via medical missions. My short stay with him has had a lasting effect on my life as a Christian missionary doctor. I appreciate you dearly for all that you imparted to me back in Jos. Till this day, there is hardly any Local Government in Rivers State and other states in Nigeria that I have not gone for medical missions. Again, I appreciate Dr. B.U. Okafor, the Managing Director New Mile 1 Hospital where I worked for eleven years as a Locum Doctor who in my stay with him taught me medical entrepreneurship, till this day I bask and luxuriate in reminiscence of your skills and kindness to the people around you in which I am a beneficiary.

A true son never forgets parental sacrifice. I do humbly appreciate my late mother Mrs. Evelyn Wuzor-Arum Ordu who gave her best to ensure that I am successful against all odds. I still reminiscence my late mother as a petty trader who gave all that she had for my education until her death. Furthermore, I appreciate my Mother-in-Law Mrs. Grace Sapira who gave me a good wife, and I have enjoyed her continual motherly support to this day. I will not fail to mention my Uncle Chief Lawrence Nwandikom who doubles as my father. He trained me through medical school and provided all

that I needed to succeed as a student. I am grateful Daddy for all that you did for me, I am proud to have you as a father. Again, Mrs. Silverline Nwandikom whose motherly role helped to strengthen and build me whilst growing up.

To my dear siblings Ngozi Didia, Okechukwu, Lawrence, Precious Amadi, Hejiere Omereji, Goodluck, Onyemaechi, Obinali, Nduweze, Udonwo Didi and the entire Wokanulo Omunde, I appreciate you all for your moral support, advice and positive criticisms that made me a better person than I am today. May my God bless you all in Jesus Name, Amen.

To my beloved church, St. Mathew's Anglican Church (SMAC), Nkpogwu Primatial Chaplaincy, the flame of Anglican revival, members and Primatial Church Council (PCC). I am deeply grateful for your spiritual support and counsel that has helped to keep me in the faith of our Lord and Saviour, Jesus Christ. I love you all with the love of God. What of Faith Anglican Church Omuhombia Omerelu that feeds me continually with the spiritual food. God will strengthen your hands.

To my dear colleagues and brethren, the 'Young Men in Missions' of SMAC, I appreciate you all for your unflinching support in prayers and missionary outreaches, I bless God for bringing us together to enhance His kingdom. SMAC Christian Men's Fellowship, I hail you; "Men, We Understand. In understanding, We are Men. I pray that God will keep you in faith and doing great things for God till the return of our Lord and Saviour Jesus Christ. SMAC medical personnel, a group of health professionals in SMAC. You have taught me how to love in unity. God bless you for what you do.

I do acknowledge the supports of the Christian Medical and Dental Association (CMDA) Nigeria, we are caring for the whole man spirit, soul and body and our part we will play to accomplish the mission. The energetic and ever-loving Students Christian Movement (SCM) Rivers Sector. Friends of Professor K.S. Ordu headed by

Dr. Bright Owhorji, Dr Holy Brown and Silverline Igweagbara, I truly appreciate your financial support. Committee of Friends lead by Dr Peace Okpara, Pearl Ajie and Progress Victor, (Inaugural Lecture organizing committee) you were the foot soldiers whose time, energy and doggedness culminated to the success of today's lecture, I say thank you. My Secondary School Mates GOSSO 91, ICONS of Excellence Class of 2003, the executives and members of Association of Specialist Medical Doctors in Academics (ASMeDA), Nigerian Medical Association (NMA) Rivers State Branch,

My students, Dr. John N. Paul, Dr. Eric O. Aigbogun, Ibinabo Johnson, ThankGod C. Omuruka, and Nkechi Nwosu and Christiana Ojobo etc. May God bless you all.

To my dear heartthrob, confidant and adviser, my dear wife Dr. Mrs. Leesi Ordu, an unassuming personality, resilient and meticulous surgeon. The wife of my youth, a mother in Isreal. I will describe her with 3B's; Bold, Beauty and Brain. My wife is as bold as the lion, of course as you can see she is an epitome of beauty, and crowned with palpable intelligence. For the peace and absolute tranquility, you have brought to the home. God will not only bless you but continue to make you a blessing. My three offspring (Chimekwatalam, Sonichianya & Ochijulamonu), Your inheritance will neither be a calamity nor result in a posthumous catastrophe as I bless you all with the blessing of a father.

Finally, Men and brethren we have a father who have left so much inheritance for us here on earth and in the world to come. He made us in the same morphogenetic traits as His. He is God Almighty. He said in Eph 1:11 that "In Christ we have obtained an Inheritance having been predestined according to the purpose of him who works all things according to the counsel of His will" The question is do you have His Inheritance? Manisfest it now and “Avoid Posthumous Catasthrophe” thereafter.

Thank and God bless you all.

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10. CITATION OF PROF K.S ORDU

Education

Prof Kenneth Shelu Ordu was born about 5 decades ago in Omunde, Omotogbula Omuhombia Omerelu in Ikwerre LGA of Rivers State, Nigeria. He started his primary education at State School III Omerelu in Ikwerre LGA where he obtained his First School Leaving Certificate in 1985. Being a very brilliant chap proceeded to the Government Secondary School Omerelu, for secondary education from 1986-1991 where he had 8 credits in SSCE. Following this outstanding result, he proceeded for tertiary education at the University of Port Harcourt in 1996 where he bagged a Bachelor of Medicine, Bachelor of Surgery (M.B, B.S) degree in 2003 in flying colours. He did not stop there, but advanced to do a master's degree programme in Human Anatomy from 2007-2010 and bagged a Master of Science in Anatomy degree with Distinction. He again, furthered to a doctorate programme at the same University of Port Harcourt from 2010-2014 where he bagged the Doctor of Philosophy degree in Anatomy (Genetics) with Distinction. He is indeed a man of distinction.

Career

Following his graduation from medical school in 2003, went to Braithwaite Memorial Specialist Hospitals, Port Harcourt, Rivers, Nigeria from June,'03-May'04 as a House Officer. Shortly after that, he moved to Pro-Health International, Jos, Plateau State, Nigeria from June-Aug,'04 as a Volunteer Missionary Doctor, being a man who loves to give back to society. After this short period, he went on for his National Youth Service with the Department of State Services, Abia Command, Umuahia, Abia State, Nigeria from Sep'04-Aug'05 as Corper Doctor. On his return from Youth Service, he proceeded to the Health Service Department, Rivers State University of Science and Technology, Rivers, Nigeria from Jan'06-Feb'07 as a Medical Officer II. Being a man of excellence and distinction he thought it

to impact the same to younger generations, he therefore advanced a career in academics at the Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Rivers State, Nigeria in March'07-Sep.'10 2007 as a Lecturer II. He grew through the ranks and became a Senior Lecturer in the same Department of Anatomy in September 2014. After protracted years of teaching, research and community service, he went for a sabbatical at the Rivers State University; and continued the good works that he is renowned for. Seeing all his achievements, the Management of the University appointed him the pioneer Head of Anatomy in the Faculty of Basic Medical Sciences, College of Health Sciences, Rivers State University from Sep'20 17- Nov'2018. He has supervised over 150 undergraduate students, 5 Master's Thesis, and 2 PhD Dissertations. Having met all academic, administrative, and research requirements with several publications; he was promoted to the ranks of a Professor of Anatomy in September 2017. He is specialized in Genetics, Molecular/Reproductive Biology and Developmental Anatomy. Professor K.S. Ordu had a couple of other appointments from his days at the University of Port Harcourt and here at Rivers State University. Some of which are: Coordinator Part 1 MBBS/BDS Professional Examination, College of Health Sciences University of Port Harcourt, Nov' 2014 – Dec'2015. College Representative in Faculty of Environmental Sciences Faculty Board, RSU Jan'2018-Nov'2018, Pioneer Head of Department, Department of Human Anatomy, Rivers State University (RSU), Dean, Faculty of Basic Medical Sciences, College of Medical Sciences, Rivers State University (RSU) Nov' 2018 – Till Date; Member, 13th Governing Council of Rivers State University from Feb'2020 – Till Date; Chairman, University Medical Board, Rivers State University; External Examiner, Department of Anatomy and Cell Biology, Delta State University, Abraka Delta State Sep'2018 – April'2021; External Examiner, Department of Human Anatomy, Niger Delta University, Wilberforce Island, Amasosoma, Balyelsa State, Sep' 2016 – April'

2019; External Examiner, Anatomy Department, University of Uyo, Uyo, July'2021-Till date; Member, Anatomical Society of Nigeria; Member, Society of Experimental and Clinical Anatomist of Nigeria.

He is a dynamic, hard-working, highly dedicated, visionary and intelligent medical Doctor, Anatomist and Researcher with enormous energy and ability, full of creativity and innovative ideas with excellent communication and interpersonal skills. Always ready to make the best of every learning opportunity aimed at improving knowledge and attaining distinctive professional and personal capacities. Prof K.S. Ordu is currently coordinating the setting up of state of the art institutional collaborative research centre in the College of Medical Sciences, Rivers State University with facilities that will encourage multi and interdisciplinary research.

Professor K.S. Ordu is not only known in the world of academics, but he is also involved in the work of God as a Christian man. He has served in the Anglican Church in various capacities. In his local church; Member, Parochial Church Council of Faith Anglican Church, Omuhombia, Omerelu Parish, Diocese of Ikwerre March' 2010 – Oct'2014; Chairman, Harvest Thanksgiving Committees in various occasions. Diocesans officer, and Member Diocesan Board, Diocese of Ikwerre Anglican Communion Feb'2020 – Till Date. Here in Port Harcourt, he is Chairman, Medical Consultative Committee of St Matthew's Anglican Church, Nkpogwu, Primatial Chaplaincy April'2017 – Till Date; Chairman Medical Outreach Committee, Young Men in Mission International and House Fellowship Leader. In other Christian Associations; Eastern Zonal Mission Secretary Christian Medical and Dental Association (CMDA) 2015-2019, Chairman, CMDA Rivers State Chapter 2016 – 2019. currently, the National Vice-President East CMDA Nigeria and Chairman Eastern Zonal Council of CMDA; Member, Board of Governing Board of CMDA; Patron, Student Christian Movement (SCM) UNIPORT chapter; Chairman, Electoral Committee of SCM in Rivers-Bayelsa Sector Biannual Conference 2021.

The medical profession and his community are not left out of his commitment to service. He is the Pioneer National Secretary-General, Association of Specialist Medical Doctors in Academics (AsMeDA); Chairman, AsMeDA, RSU branch; Member, State Executive Committee of Nigerian Medical Association (NMA) Rivers State; Chairman, Wokanulo Omunde; Chairman, Amala Omotogbula Constitution Review Committee; Member, Omerelu Special Committee.

Family life

Prof. K.S. Ordu is married to Dr. (Mrs) Leesi Ordu, a lecturer in the Department of Obstetrics & Gynecology Rivers State University, and consultant Obstetrician & Gynecology Rivers State University Teaching Hospital. She is a virtuous woman and strong pillar of support to her husband. God specially blessed them with three Godly children namely: Chimekwatalam, Sonichianya & Ochijulamonu who are doing well in their respective schools following the good examples of their parents.

He is a reference frame for inspiration and motivation for both young and old. He plays with and mentors young colleagues as well as sit in high places with the mighty. Such is the depth of his impact and humility.

Ladies and gentlemen, I present to you an Icon, a pacesetter, an academician, a researcher, a medical Practitioner and missionary doctor, a man with an unassailable intelligence and insight **Professor Kenneth S. Ordu The 71st Lecturer.**


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