# PERCEPTION AND AWARENESS OF MATERNAL AND PATERNAL DISPUTE RESOLUTION USING DNA TECHNOLOGY AMONG BENIN CITY RESIDENTS


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**A PROJECT SUBMITTED TO THE DEPARTMENT OF MEDICAL LABORATORY SCIENCE, SCHOOL OF BASIC MEDICAL SCIENCES, UNIVERSITY OF BENIN IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF MEDICAL LABORATORY SCIENCE (BMLS) DEGREE IN THE DEPARTMENT OF MEDICAL LABORATORY SCIENCE**

**SEPTEMBER, 2025**

## DECLARATION

I hereby declare that this project work titled "**Perception and Awareness of Maternal and Paternal Dispute Resolution Using DNA Technology among Benin City Residents"** was conducted under my supervision and has not been submitted in part or in full for any purpose.

## CERTIFICATION

This is to certify that this project write up is an authentic work carried out by **UGBO FAVOUR OSARETIN** with matriculation number **BMS2001206** under the supervision of **Prof. B. I. G Adejumo** in partial fulfillment of the requirement for the award of Bachelor of Medical Laboratory Science (BMLS) Degree of the Department of Medical Laboratory Science, School of Basic Medical Science, University of Benin, Ugbowo, Benin City, Edo state.

| | |
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## DEDICATION

I dedicate this project to God Almighty for making this project work a huge success.

## ACKNOWLEDGEMENTS

I give thanks to God Almighty for his grace upon my life and for seeing me through this project work.

My profound gratitude goes to my supervisor Prof. B. I. G Adejumo for his love, concern, constructive and supportive idea which has aided this project work.

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## ABSTRACT

Deoxyribonucleic acid (DNA) testing has become an essential tool in resolving disputes of biological relationships, particularly maternity and paternity cases, with significant social, legal, and emotional implications. In Nigeria, cultural traditions, limited awareness, and socioeconomic challenges influence the acceptance and accessibility of DNA technology. This study therefore aimed to assess the perception and awareness of DNA testing for resolving maternal and paternal disputes among residents of Benin City, Edo State, Nigeria. A cross-sectional descriptive survey design was employed. A total of one hundred and fifty-one (151) adult residents of Benin City were recruited using a random sampling technique. Data were collected using a structured 22-item questionnaire covering demographics, awareness, knowledge, and perceptions of DNA testing. Responses were analyzed with the Statistical Package for Social Sciences (SPSS) version 26.0, using Chi-square tests with significance set at $p < 0.05$. The findings revealed that 86.7% of respondents had heard of DNA testing being used to resolve maternity and paternity disputes, but only 34.7% reported personal or second-hand involvement. While 83.3% correctly identified DNA testing as a method to confirm biological relationships, only 42.0% were aware of existing facilities in Benin City. Practical exposure was limited, as just 28.0% had visited or knew someone who had visited a DNA testing facility. Nonetheless, perceptions were largely positive, with 71.3% affirming that DNA testing could accurately resolve disputes, and 79.4% expressing willingness to learn more about its applications. Knowledge gaps persisted, as 39.3% believed external factors could affect accuracy, with laboratory error most frequently mentioned. In conclusion, this study revealed that awareness and positive perceptions of DNA testing are high among Benin City residents, but actual utilization and technical understanding remain limited. The results underscore the need for public education, expanded access to affordable DNA facilities, and integration of counseling and ethical safeguards to enhance acceptance and prevent misuse. These findings highlight DNA testing's potential as a reliable, culturally sensitive tool for resolving family disputes in Nigeria.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

The application of DNA technology in resolving maternal and paternal disputes has become a pivotal tool in forensic and social sciences globally (Jobling and Gill, 2004). In Nigeria, where cultural, social, and economic factors significantly influence perception of family and identity, the awareness and acceptance of DNA-based dispute resolution are critical areas of study, (Iyamu-Ojo and Ehikhameanor, 2017).

Deoxyribonucleic acid (DNA) is the hereditary material in humans and most organisms, organized into genes that encode biological information (Brown, 2016). DNA technology, often synonymous with recombinant DNA (rDNA) technology or genetic engineering, involves the deliberate modification of genetic material to achieve specific outcomes in organisms or their products (Khan *et al.,* 2016). DNA technology has transformed the resolution of parental disputes by providing a scientifically reliable method to confirm or exclude biological relationships, with accuracy rates exceeding 99.99% through the analysis of short tandem repeat (STR) markers or single nucleotide polymorphisms (SNPs) (Jobling and Gill, 2004). Advances such as non-invasive prenatal paternity testing, using cell-free fetal DNA from maternal plasma, have further expanded access to such technologies (Ryan *et al.,* 2013).

Globally, DNA technology has transformed paternity and maternity dispute resolution by providing a scientific basis for legal and personal decisions. In high-income countries, services like 23andMe offer insights into maternal and paternal haplogroups for ancestry tracing.

Benin City, the capital of Edo State, Nigeria, is a culturally vibrant urban center where traditional values intersect with modern influences (Daniel, 2024). Edo State's social fabric emphasizes family lineage and patriarchal norms, which shape attitudes toward scientific interventions like DNA testing.

Research in Some Nigerian states like Ogun State indicates that cultural beliefs significantly influence healthcare utilization, with 25% of women preferring traditional birth attendants over modern facilities due to perceived compassion and accessibility (Ebuehi and Akintujoye, 2012). Such preferences suggest that trust in traditional methods may limit the adoption of DNA technology for dispute resolution, as community-based approaches, such as elders mediation may remain prevalent. Public awareness of DNA technology for dispute resolution in Nigeria, particularly in Benin City, remains underexplored.

The legal framework for DNA testing in Nigeria is evolving but remains underdeveloped compared to global standards (Adegbite, 2024). In Nigeria, courts increasingly rely on DNA evidence for paternity and inheritance cases (Iyamu-Ojo and Ehikhameanor, 2017).

The use of DNA technology for maternal and paternal dispute resolution represents a powerful intersection of science, law, and society. In Benin City, where cultural traditions and socioeconomic challenges shape public perceptions, understanding the awareness and acceptance of DNA testing is essential for its effective implementation.

## 1.2 Statement of Problem

The use of DNA technology for resolving maternal and paternal disputes has emerged as a critical tool for establishing biological relationships, with significant legal, social, and emotional implications globally (Bellis *et al.,* 2005).

In Nigeria, the adoption of DNA testing faces challenges due to an underdeveloped legal framework, limited public awareness, and cultural barriers that shape perceptions of family and identity (Adegbite, 2024).

DNA testing offers high accuracy in paternity disputes, with studies reporting exclusion rates of up to 27% in Nigeria (Ajayi, 2021), highlighting its effectiveness in resolving legal disputes. However, in Benin City, reliance on traditional dispute resolution mechanisms, such as elder mediation, may undermine trust in scientific methods, while socioeconomic barriers, including the high cost of testing, restrict accessibility (Iyamu-Ojo and Ehikhameanor, 2017).

The psychological impact of DNA testing outcomes, including emotional distress from non-paternity findings, underscores the need for counseling and public education. Despite global insights into paternal discrepancy rates (Bellis *et al.,* 2005), there is a significant gap in research on public awareness and perceptions of DNA technology specifically among Benin City residents.

This lack of localized data hinders the development of culturally sensitive interventions to promote DNA testing, potentially leading to unresolved disputes, inequitable legal outcomes, and social tensions in paternity, custody, and inheritance cases.

## 1.3 Justification of the Study

The study is justified by the need to address a significant gap in existing literature and provide localized insights into the perception and awareness of DNA technology for maternal and paternal dispute resolution among Benin City residents across various demographic groups, including those influenced by cultural, socioeconomic, and legal factors. It explores public understanding and attitudes toward DNA testing, which is under-researched in Nigeria, to inform targeted education and policy intervention, thereby facilitating tailored awareness campaigns, legal reforms, and counseling interventions.

## 1.4 Aim of the Study

The aim of the study is to investigate the perception and awareness of DNA technology for resolving maternal and paternal disputes among Benin City residents.

## 1.5 Specific Objectives of The Study

The specific objectives of the study are to:

1. to assess the level of awareness of DNA technology for maternal and paternal dispute resolution among Benin City residents.
2. to examine the perceptions and attitudes of Benin City residents toward the use of DNA testing in resolving maternity and paternity disputes.

## 1.6 Research Questions

1. What is the level of awareness of DNA technology for maternal and paternal dispute resolution among Benin City residents?
2. What are the perceptions and attitudes of Benin City residents toward using DNA testing to resolve maternity and paternity disputes?

## 1.7 Research Hypothesis

### 1.7.1 Null Hypothesis (H0):

- There is no significant level of awareness of DNA technology for maternal and paternal disputes resolution among Benin City residents
- Benin City residents have neutral or negative perception and attitude towards the use of DNA technology in resolving maternity and paternity disputes.

### 1.7.2 Alternative Hypothesis (H1):

- There is significant level of awareness of DNA technology for maternal and paternal disputes resolution among Benin City residents
- Benin City residents have positive perception and attitude towards the use of DNA technology in resolving maternity and paternity disputes

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Perception

Perception is widely regarded as a cognitive activity through which sensory experiences are interpreted and given meaning (Kajuru, 2015). Within the broader field of social perception, "person perception" specifically addresses how individuals view and evaluate one another, as well as the various factors such as attractiveness or eye contact that influence the impressions formed. The perception of events, however, goes beyond interpersonal judgments and is shaped by the interaction of physiological, cultural, and cognitive mechanisms operating within both individuals and groups (Kajuru, 2015).

Nwodu, Ezeoke and Ezeaka (2021) describe perception as a process of organizing, selecting, interpreting, and processing information. In a similar vein, Quick and Nelson (2017) define it as the act of making sense of information about other people or situations. This implies that the conclusions we reach about others or about circumstances depend not only on how much information is available but also on how effectively we can interpret it. According to Mohammed (Kajuru, 2015), the way a target audience perceives a message strongly influences the overall process of communication. In practice, this means that our perception of others directly shapes the way we communicate with them. Ojiakor and Obiora (2019) further note that perception influences the way individuals experience and evaluate others, which in turn affects their communicative interactions. They also emphasize its impact on self-concept, self-efficacy, and self-presentation. In a broader sense, perception refers to the ability to recognize and become

aware of stimuli through the senses. It is the means by which individuals analyze sensory input, although the judgments that result are usually subjective, being filtered through personal experience and prior awareness (Okoro & Shaibu, 2016). Public perception, in particular, may be seen as the gap between factual or absolute truth and a socially constructed "virtual truth" shaped by media coverage, reputation, or popular opinion.

### 2.2 Awareness

Awareness implies knowledge gained through perceptions. In fact, it is based not only in personal awareness but also controlled by the environment. Awareness is not something that is central to a specific decision; it is not things people focused on every moment of the day. It is arises when someone is paying attention in particular way; on purpose, in the present moment and non-judgmentally towards people's life experience (Jauriyah, 2020). Scholars have differentiated between internal and external awareness. Internal awareness includes recognition of feelings, thoughts, or bodily conditions, while external awareness refers to understanding environmental stimuli and social cues (McDonald, 2012). Levels of awareness may range from minimal sensory registration to reflective processes in which individuals not only notice stimuli but also evaluate and interpret them (Morin, 2011). Furthermore, awareness contributes to decision-making by integrating implicit knowledge, explicit reasoning, and emotional input, enabling individuals to adjust behavior to achieve optimal outcomes (Zhou & Guo, 2025). Despite its centrality, awareness is not identical with full conscious control. Subjective reports are vulnerable to reporting biases, and some stimuli can influence behavior without entering explicit awareness. This tension between conscious report and non-conscious influence underscores the methodological challenge of studying awareness and interpreting its role in communication and health outcomes (Merikle, 1984; McDonald, 2012)

## 2.3 Deoxyribonucleic Acid (DNA)

All cellular organisms have double-stranded DNA genomes. The origin of DNA and DNA replication mechanisms is thus a critical question for our understanding of early life evolution. For some time, it was believed by some molecular biologist that life originated with the appearance of the first DNA molecule (Monod, 1971). Deoxyribonucleic acid (DNA) is the hereditary material in humans and most organisms, organized into genes that encode biological information (Brown, 2016). The discovery of the double helix structure of DNA by James Watson and Francis Crick in 1953 laid the foundation for modern genetics (Brown, 2016). This breakthrough built on Rosalind Franklin's X-ray diffraction studies and enabled advancements in genetic analysis (Brown, 2016). Paternity testing evolved from early methods like blood grouping in the 1930s, which used ABO blood types (A, B, AB, O) for exclusion but lacked precision (Kayser, 2017).DNA profiling for relationship testing exploits Mendelian inheritance, comparing genetic markers principally autosomal short tandem repeats (STRs) across putative relatives to assess consistency with biological relatedness (Butler, 2012; Jobling and Gill, 2004). In parentage disputes, half of a child's autosomal DNA is expected from each biological parent; consistent multilocus STR matches support parentage whereas multiple incompatibilities exclude it (Butler, 2012; Jobling and Gill, 2004). By the 1980s, DNA research accelerated, leading to its use in establishing paternity in disputed cases (Jobling and Gill, 2004). The technique of DNA fingerprinting was invented in 1984 by Alec Jeffreys, revolutionizing paternity and relationship testing through analysis of variable regions in DNA (Jeffreys *et al.,* 1985). This method, also known as DNA profiling, allowed for individual-specific "fingerprints" using restriction fragment length polymorphism (RFLP) (Jeffreys *et al.,* 1985). In 1985, Jeffreys applied this to resolve an immigration case, marking the first practical use in kinship determination (Jeffreys *et*

*al.,* 1985). By the late 1980s and early 1990s, techniques advanced to include polymerase chain reaction (PCR) and short tandem repeats (STRs), improving accuracy and efficiency (Butler, 2012). Paternity testing was first developed in 1925 using blood typing, contributing to a drop in fertility rates in the 1930s due to increased certainty (Iyamu-Ojo and Ehikhameanor, 2017). Modern paternity testing now relies on PCR and RFLP, achieving probabilities exceeding 99.9% (Ryan *et al.,* 2013).

### 2.3.1 DNA Structure

The ability of DNA to function as the material through which genetic information is stored and transmitted is a direct result of its elegant structure. In their seminal 1953 paper, Watson and Crick unveiled two aspects of DNA structure: pairing the nucleotide bases in a complementary fashion (e.g., adenine with thymine and cytosine with guanine) and the double-helical nature of DNA (Watson and Crick, 1953). A molecule of DNA is made up of two long polynucleotide chains consisting of subunits known as nucleotides. A nucleotide comprises a nitrogenous base, a pentose sugar, and at least one phosphate group (Rudolph, 1994). A nucleotide can incorporate four main nitrogenous bases, two of which are purines and two that are pyrimidine, bases adenine (A), thymine (T), guanine (G), and cytosine (C) pair via hydrogen bonds, with A-T forming two bonds and G-C three, ensuring structural integrity (Travers *et al.,* 2015).

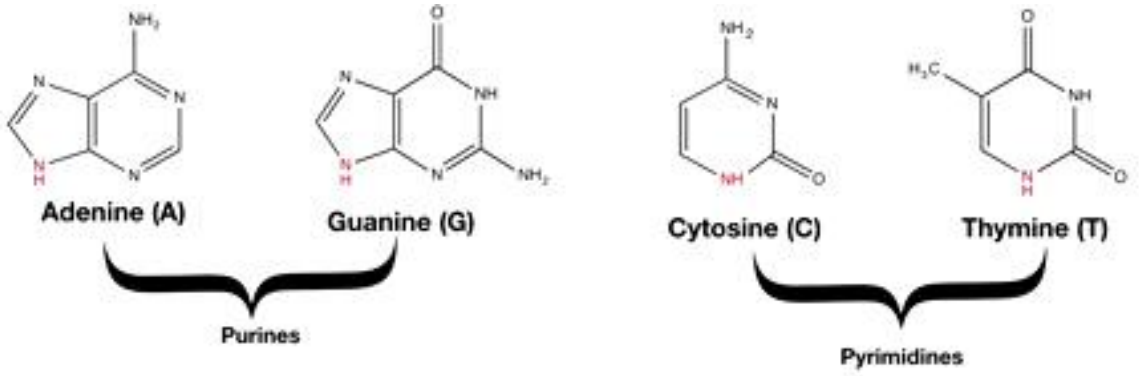

Figure 2.1 DNA Structure *Source:* (Ghannam *et al.,* 2023 Biochemistry)

In the case of DNA, the sugar is 2'-deoxyribose, and thus it has no hydroxyl group attached to its 2' (pronounced "two prime") carbon; this is in contrast to ribose sugar in RNA, which does not have the 2' position of its pentose sugar to be reduced (or deoxygenated). A phosphate group covalently binds to the 5' carbon of 2'-deoxyribose. Since the 2'-deoxyribose and the phosphate group are always present, the nitrogenous bases they incorporate distinguish the four DNA nucleotides (Travers *et al.,* 2015). Although four major nitrogenous bases make up the nucleotides of DNA, other uncommon non-primary or modified bases have been found to exist in nature (Kumar *et al.,* 2018).

Each strand of DNA is made up of a string of nucleotide subunits linked at their sugar moieties. Specifically, nucleotides in a DNA strand are bound together via ester bonds between the phosphate group attached to their 5' carbon and the hydroxyl group on the 3' carbon of an adjacent nucleotide (Ghannam *et al.,* 2023). The phosphodiester backbone imparts a negative charge, promoting solubility and enabling separation techniques like electrophoresis (Travers *et al.,* 2015). The phosphodiester bond forms via a condensation reaction during DNA synthesis. As a result, each strand of a DNA molecule has a series of nucleotides with their 5' phosphate and 3' hydroxyl group participating in phosphodiester bonds. Each strand of a eukaryotic DNA molecule has a "free" 5' phosphate group on one end, not bonded to a hydroxyl group, and a "free" 3' hydroxyl group on the other end, not bonded to a phosphate group. This asymmetry has led to the adoption of the convention where DNA is read in a particular direction, from its 5' end to its 3' end. The sequence of nucleotides that make up a molecule of DNA is referred to as its primary structure (Lehman, 1974). Supercoiling, induced by enzymes, modulates gene accessibility and transcription rates (Travers *et al.,* 2015). In nanotechnology, DNA's Watson-

Crick pairing facilitates self-assembly into complex architectures like origami (Bekkouche *et al.,* 2023). From 2015 to 2025, chemical modifications such as phosphorothioates have improved DNA stability against degradation (Bekkouche *et al.,* 2023). The three-dimensional shape of a DNA molecule, or its tertiary structure, is a right-handed double helix. The hydrogen-bonded bases on each strand are stacked in parallel and run perpendicular to the sugar-phosphate backbone. As indicated by its x-ray diffraction pattern, the bases are regularly spaced at 0.34nm apart along the axis of the helix (Damaschun *et al.,*1984). Additionally, there are about ten pairs of bases per turn, as a complete turn of the helix is made every 3.4 nm. DNA has a +36-degree rotation per base pair (bp) and a helical diameter of 1.9 nm (Damaschun *et al.,*1984). When focusing on the backbone of the DNA helix, two helical grooves exist with different widths, known as the minor and major grooves (Figure 2.2). The minor groove describes the space between the two antiparallel DNA strands that run closest together, while the major groove describes the space where they are furthest apart (Chaires *et al.,* 1982).

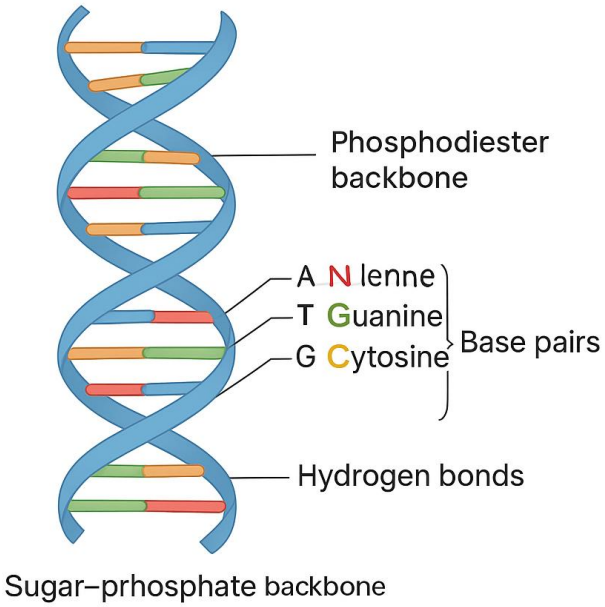


Figure 2.2 DNA structure *Source*: (Travers, 2015)

A notable property of DNA is the ease of reversible separation of its two strands due to hydrogen bonds being relatively weak compared to covalent bonds. This is important because fundamental cellular processes such as DNA replication and RNA transcription rely on proteins accessing individually separated strands of DNA (Rychlik *et al.,* 1990). Thus, during these processes, proteins known as helicases move down the DNA molecule and unwind the two strands by disrupting the hydrogen bonding between bases. However, when the cellular processes requiring strand separation are complete, the complementary strands can easily re-anneal. This property of reversible separation can be experimentally induced via the heating and cooling of a DNA molecule and is referred to as denaturation or "melting." (Ekundayo *et al.,* 2019). One notable structural phenomenon of DNA tertiary structure is supercoiling, or the coiling of the larger, already coiled DNA molecule. Specifically, in a DNA molecule that has its ends fixed, such as in the circular DNA found in prokaryotes or the smaller DNA segments that make up a larger chromosome in eukaryotes, separation of the individual strands of DNA during cellular processes causes the DNA to twist-up past the points of strand separation, leading to strain on the larger DNA structure (Ma *et al.,* 2016). This transient over-winding of the larger DNA structure when separating individual strands is known as positive supercoiling. Every cell has enzymes that keep DNA actively underwound to compensate for this, resulting in perpetual negative supercoiling, where the larger DNA structure coils in a left-handed fashion. This results in the strands of DNA needing less energy to be separated and keeps the molecule primed for easy separation in the events of transcription and DNA replication (Ghannam *et al.,* 2023).

### 2.3.2 Function of DNA Structure

The unique structure of DNA is ultimately responsible for its function as being the material that stores and transmits genetic information from one generation to the next. Specifically, the four

nitrogenous bases that comprise the sequence of nucleotides in a DNA molecule enable an enormous amount of information stored in minimal space (Travers *et al.,* 2015). DNA's sugar-phosphate backbone and helical structure make it more stable, less prone to damage, and more compact; however, the hydrogen bonds that hold the strands of DNA together make it more accessible for its biological functions as they are individually weak but cumulatively strong. Also, the complementary base pairing of nucleotides in DNA enables accurate semiconservative replication as each strand carries identical genetic information and serves as an independent template during DNA replication (Chaudhry and Khaddour 2023).

### 2.4 DNA Technology

DNA technology, often synonymous with recombinant DNA (rDNA) technology or genetic engineering, involves the deliberate modification of genetic material to achieve specific outcomes in organisms or their products (Khan *et al.,* 2016). This encompasses techniques for isolating, manipulating, and inserting DNA segments into host cells, enabling the expression of foreign genes (Shinde *et al.,* 2018). At its core, DNA technology utilizes enzymes such as restriction endonucleases to cut DNA at precise recognition sites and DNA ligases to join fragments, forming recombinant molecules (Suza *et al.,* 2021). Over the past decade, from 2015 to 2025, advancements have integrated CRISPR-Cas systems, allowing for targeted genome editing without traditional recombination methods (Zhu, 2022). In medical contexts, this technology has enabled the production of recombinant therapeutics like insulin and monoclonal antibodies, significantly improving treatments for chronic diseases (Parasuraman *et al.,* 2024). Agriculturally, it facilitates the development of genetically modified crops with enhanced resistance to pests and environmental stresses, contributing to global food security (Tollenaar and Charlesworth, 2025). Forensically, DNA technology supports profiling techniques that aid in

criminal investigations and ancestry tracing (Satam *et al.,* 2023). Environmentally, engineered microorganisms via DNA technology degrade pollutants like hydrocarbons, aiding bioremediation efforts (Khan *et al.,* 2016). Recent applications extend to synthetic biology, where DNA serves as a programmable scaffold for nanostructures and data storage systems (Grass *et al.,* 2022). Ethical implications, including biosafety and equitable access, have been increasingly addressed in policy discussions during this period (Dalal *et al.,* 2023). This chapter outlines the foundational aspects, paving the way for in-depth discussions on structure, techniques, applications, and distinguishing parameters.The scope of DNA technology has expanded to include genome-wide editing tools that permit multiplexed modifications across diverse species (Zeballos and Gaj, 2021). For example, CRISPR-Cas9 simplifies the process by using guide RNAs to direct nuclease activity, bypassing the need for complex vector constructions (Zhu, 2022). Historical progress within the last ten years includes the first human CRISPR trials in 2016 for cancer and the approval of therapies like Casgevy in 2023 for sickle cell disease (Chen *et al.,* 2023). These innovations have overcome earlier limitations in precision and efficiency, such as off-target effects (Chen and Liu, 2023). In agriculture, molecular markers derived from DNA sequencing accelerate breeding for traits like drought tolerance (Tollenaar and Charlesworth, 2025). Medically, gene therapies target inborn errors, with viral vectors delivering edited DNA to correct mutations (Parasuraman *et al.,* 2024). Forensic advancements incorporate next-generation sequencing (NGS) for rapid, high-resolution analysis of degraded samples (Satam *et al.,* 2023). The fusion of AI with DNA technology, exemplified by biological large language models in 2024, enables the design of novel editing enzymes (Porubsky and Eichler, 2024). Persistent challenges, including immunogenicity of delivery systems, are being mitigated through nanoparticle innovations (Bekkouche *et al.,* 2023). Collectively, DNA

technology's evolution from 2015 to 2025 highlights its role as a cornerstone of modern biotechnology (Ouyang *et al.,* 2020).

### 2.4.1 Evolution of DNA Technology

DNA technology has transitioned from foundational recombinant methods to sophisticated editing platforms like base and prime editors (Chen and Liu, 2023). Key milestones include the integration of NGS for comprehensive genome mapping, reducing costs and time (Satam *et al.,* 2023). In 2015, studies on ancient DNA using hybridization capture revealed population dynamics, setting precedents for modern applications (Allentoft *et al.,* 2015). By 2020, DNA-based data storage emerged as a viable alternative to traditional media, with encoding schemes achieving high density (Ouyang *et al.,* 2020). The year 2023 marked advances in prime editing, enabling versatile nucleotide changes without double-strand breaks (Chen and Liu, 2023). Structural variant discovery accelerated in 2024 through long-read sequencing technologies (Porubsky and Eichler, 2024). Projections for 2025 emphasize recombinant DNA's potential in microbial engineering for sustainable agriculture (Tollenaar and Charlesworth, 2025). These developments tackle global issues such as pandemics and climate change (Khan *et al.,* 2016). Interdisciplinary approaches, combining nanotechnology with DNA assembly, have yielded biosensors and drug delivery systems (Yuwen *et al.,* 2023). Ethical frameworks evolved, with debates on germline editing intensifying post-2018 controversies (Dalal *et al.,* 2023).

## 2.5 Technical Foundations of DNA-Based Parentage Testing

### 2.5.1 DNA Profiling

The methodologies and technologies used in Forensic DNA profiling differ in their ability to distinguish between two individuals and the speed and sensitivity of the results obtained. In recent years, there has been a significant improvement in the speed of performing forensic DNA profiling (Nwawuba *et al.,* 2020). Currently, there are several molecular technologies being used for DNA profiling. These include, but are not limited to, the Restriction Fragment Length Polymorphisms (RFLP), variable number of tandem repeat sequences (VNTR), and short tandem repeat (STR), which is considered the gold standard for generating profiles to be stored in the DNA database (Nwawuba *et al.,* 2020).

### 2.5.2 Polymerase Chain Reaction (PCR)

The polymerase chain reaction (PCR) is a frequently utilized laboratory nucleic acid amplification technique that uses Taq polymerase, a thermostable DNA polymerase isolated from *Thermus aquaticus*, to synthesize DNA following thermal denaturation and primer annealing (Ramesh *et al.,* 1992). Kary Mullis introduced PCR in 1985 and was later granted the Nobel Prize in Chemistry for this contribution. PCR enables precise detection and analysis of amplified DNA and has become a cornerstone of biomolecular research (Lorenz, 2012). This technique targets specific DNA fragments within a sample and amplifies them through repeated cycles of denaturation, annealing, and extension (Markham, 1993). Taq polymerase is favored for its thermostability, which preserves enzymatic function despite repeated exposure to high temperatures. PCR is considered the gold standard for diagnosing bacterial and viral infections and for screening genetic disorders because of its high sensitivity (Ghannam *et al.,* 2023).

### 2.5.3 Real-time Polymerase Chain Reaction

Real-time PCR is a widely used method for analyzing small DNA segments, offering advantages such as elimination of post-PCR processing, use of fluorescent dyes or probes, and real-time monitoring of amplicon formation (Khehra *et al.,* 2025). The primary distinction between real-time and conventional PCR is that real-time PCR allows immediate detection of amplified products during the reaction, rather than after amplification is complete. This process is accomplished through the incorporation of fluorescent molecules, either intercalating dyes or sequence-specific probes that emit signals proportional to DNA accumulation (Khehra *et al.,* 2025).

Despite these advantages, real-time PCR is more expensive than conventional PCR due to its specialized instrumentation and reagents. Additionally, some fluorescent dyes are not universally compatible with all platforms, owing to hardware limitations, such as excitation and emission wavelength incompatibility or insufficient filter sets (Mackay, *et al.,* 2002).

### 2.5.4 Reverse Transcription Polymerase Chain Reaction

Reverse transcription PCR (RT-PCR) uses messenger RNA as a template for DNA amplification by reverse transcriptase, often derived from retroviruses, to generate complementary DNA (cDNA). RT-PCR is often combined with conventional PCR to assess specific gene expression qualitatively (Khehra *et al.,* 2025). RT-PCR and real-time PCR may be used together to evaluate quantitative differences in gene expression across multiple samples. During the COVID-19 pandemic, RT-PCR served as the primary diagnostic method due to its high sensitivity, specificity, and rapid turnaround time. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) specimens are typically obtained from the upper respiratory tract (Khehra *et al.,* 2025).

Sample collection sites include the nasopharynx, oropharynx, nostrils, and oral cavity. Specimens are collected using swabs, washes, or bronchoalveolar lavage (Islam and Iqbal, 2020).

PCR is widely used in basic and biomedical sciences due to its high sensitivity, specificity, and rapid processing time, making it valuable in both laboratory and clinical settings (García-de-Lomas *et al.,* 1997). This technique is frequently employed to detect viral pathogens, including human papillomavirus, HIV, herpes simplex virus, severe acute respiratory syndrome coronavirus 2, varicella-zoster virus, enterovirus, cytomegalovirus, hepatitis B, hepatitis C, hepatitis D, and hepatitis E (Saleh *et al.,* 2025). The presence of bacterial, fungal, and parasitic organisms, as well as various immunodeficiencies, may be identified through PCR, making it an essential tool in clinical diagnoses and practice (Khehra *et al.,* 2025).

PCR is further employed to investigate the histopathology of viral and cellular genes for the diagnosis and understanding of malignant human diseases. Applications of PCR extend to forensic analysis, point mutation detection, DNA sequencing, and in vitro mutagenesis. This technique efficiently screens and identifies specific alleles, making it suitable for prenatal genetic testing for carrier status. PCR can also detect disease-associated mutations both in utero and in adult samples (Durland and Ahmadian, 2020).

### 2.5.5 Short Tandem Repeat (STR)

STRs are short sections of DNA, usually 2-6 nucleotides long, which are repeated in a consecutive manner at a specific location and accounts at least 6.77% of the human genome and exhibit high levels of genetic variation (Shortt *et al.,* 2020). The lengths of STR can be altered during DNA replication due to slip page events on misaligned strands, errors in DNA repair during synthesis, and the formation of secondary hairpin structures. This makes STR lengths

relatively unstable and prone to frequent mutations, which contribute to genetic variation in human populations. Compared to SNPs in non-repetitive contexts, STRs have a much higher mutation rate. Short tandem repeats are widely distributed in the human genome, its predominance in the noncoding region of the genome. Within this distribution, STRs are mostly found in the noncoding regions, but can also slightly be found in the coding (Jebor *et al.,* 2015). STRs are preferred markers in human identification analysis for several reasons. Firstly, they are highly polymorphic, which means they have a high capacity to differentiate between individuals. Second ly, they can be rapidly and easily analyzed using PCR-based technology and capillary electrophoresis automated fluorescent detection. Lastly, STRs have the ability to generate multiple DNA profiles simultaneously, and they are particularly useful for degraded DNA samples due to their short amplicon lengths (Gomes *et al.,* 2020).

Due to the highly polymorphic nature of STRs, the higher the number of STRs loci used for the purpose of identification, the greater the discriminating power (Ziętkiewicz *et al.,* 2012) . In the forensic settings, STRs are suitable marker for identification purpose owing to the following factors; suitability for easy amplification by PCR, its variable nature of short repeat sequences among individuals, small in size which gives it the advantage for degraded samples, low mutation rate and high power of discrimination [Dash *et al.,* 2018]. In light of this, the introduction of an amplification technology linked to STRs method of DNA profiling resulted to the availability of appropriate vigorous systems for the establishment of an effective and efficient DNA database (Machado and Silva, 2019).

### 2.5.6 Non Invasive Prenatal Parentage Testing

Noninvasive prenatal testing can infer paternity/maternity during pregnancy by analyzing cell free fetal DNA fragments circulating in maternal plasma. Informatics based approaches using high density SNPs have demonstrated high accuracy for prenatal paternity assessment under appropriate conditions (Ryan *et al.,* 2013).

In the late 1990s, Lo et al. discovered the presence of cell-free fetal DNA (cffDNA) circulating in the blood of pregnant women (Lo *et al.,* 1997). This DNA can be detected as early as the sixth week of gestation and results from trophoblast apoptosis during placental development (Alberry *et al.,* 2007). The process continues throughout pregnancy, leading to a progressive increase in cffDNA levels. Depending on the gestational week, the proportion of cffDNA in the maternal plasma ranges from 2 to 20%, with the remaining DNA originating from the mother (Wang *et al.,* 2013). Within a few hours after delivery, cffDNA is cleared from maternal blood, and therefore does not interfere with cffDNA detection in subsequent pregnancies (Lo *et al.,* 1997). The discovery of cffDNA initially revolutionized the field of fetal medicine by providing the foundation for noninvasive fetal DNA analysis. New methods, based on venous blood sampling from the mother, eliminated the risks of miscarriage associated with other more invasive procedures such as amniocentesis and chorionic villus sampling (Seeds, 2004), while also allowing cffDNA analysis at an earlier stage of pregnancy. Progress in cffDNA collection procedures has encouraged the development of new techniques for prenatal diagnostics and the advent of noninvasive prenatal paternity tests (NIPPT) (Firth *et al.,* 1994).

### 2.5.7 Marker Systems

Modern accredited laboratories typically use type 15–24 autosomal STR loci, generating genotypes for each tested individual; statistical evaluation combines locus specific likelihood

ratios into a Combined Relationship (or Paternity) Index (CRI/PI) that quantifies the strength of the genetic evidence (Butler, 2012; AABB, 2023). For complex scenarios (e.g., alleged father unavailable; deficiency cases; male lineage questions), lineage markers are informative: mtDNA sequencing can corroborate maternal lineage, while Y STR haplotyping informs patrilineal relationships but cannot differentiate between close male relatives sharing a Y haplotype (Kayser, 2017).

## 2.6 Parenthood Testing

Parentage testing (PT) is important for various purposes such as finding missing persons (Yu and Fung, 2018). identifying victims of disasters (Wright *et al.,* 2018), resolving inheritance disputes (Patidar *et al.,* 2015), and handling immigration cases (Wenk and Shao, 2014). Also, it's a crucial tool in the field of forensic genetics, with applications in various areas. It is important to compare the main differences between the PT and the maternity test (MT). In the case of the PT, the involvement of the mother's genotype enhances the identification of the biological father (Nothnagel *et al.,* 2010). However, if maternal data is not available, the test may yield inconclusive results. Inserting markers based on STR sequences and mitochondrial DNA sequence variations has been found to improve the efficiency of paternity testing. Specifically, markers linked to the analysis of sex chromosomes (X and Y) have shown to provide greater efficiency compared to markers linked to autosomal chromosomes (Auler-Bittencourt *et al.,* 2015). This is because of the inheritance pattern of the X chromosome, where the daughter receives an unchanged paternal X chromosome. Consequently, markers on the X chromosome

have a high power of exclusion (Tillmar *et al.,* 2017). The higher exclusion power of X-STRs is due to the difference in the number of alleles compared to autosomal alleles in male individuals (Martins *et al.,* 2017).

### 2.6.1 Paternity and Maternal Testing

Paternity testing refers to analytical procedures used to evaluate whether an alleged male is the biological father of a child, while maternity testing evaluates whether a woman is the biological mother; both primarily use autosomal STRs, optionally complemented by lineage systems such as mitochondrial DNA (mtDNA, maternally inherited) and Y chromosome STRs (paternally inherited among males) in complex cases (Butler, 2012; Kayser, 2017). “Dispute resolution” encompasses judicial determinations (e.g., child custody, maintenance, inheritance) and non-judicial processes (e.g., mediation, administrative determinations) that incorporate genetic evidence to resolve contested maternity or paternity (Slnger, 2007).

Early forensic parentage inference relied on serological systems such as ABO, MN, and Rh blood groups and later human leukocyte antigen (HLA) typing; these methods could exclude many non-fathers but could not conclusively prove paternity (Lawler (2025); Gutiérrez-Hurtado, (2025); Britannica, 2025). The invention of multilocus “DNA fingerprinting” by Alec Jeffreys in 1985 transformed relationship testing by providing highly individualizing patterns with far greater discriminating power than serology (Wilson, and Thein, 1985). Subsequent development of PCR based STR typing in the 1990s enabled robust, routine parentage testing across standardized marker sets and population databases (Butler, 2012; Jobling and Gill, 2004).

## 2.7 Quality Assurance and Best Practice Guidelines

Conventional PCR is considered the gold standard for screening and detection across a wide range of scientific applications due to its reliable results. Proper handling after amplification is essential to ensure accurate assessment of the amplicon. Inadequate post-procedural practices in conventional PCR may lead to uncontrolled dissemination of amplified DNA within the laboratory. To minimize contamination, PCR must be performed in a designated area of the laboratory isolated from general workspace activity. Limiting airflow and movement in this space is critical. Personal protective equipment, including face masks, gloves, and hair covers, must be worn consistently. All solutions must be prepared and stored using uncontaminated equipment such as pipettes, glassware, and plastic ware that have not been exposed to DNA.

Relationship testing quality is governed by international guidance emphasizing validation, population genetics, and transparent reporting. The AABB technical reports summarize statistical thresholds and reporting practices used by accredited laboratories (AABB, 2023). The DNA Commission of the International Society for Forensic Genetics (ISFG) issues recommendations on interpretation across marker systems including Y STRs and complex kinship scenarios underscoring the need to evaluate alternative relationships and to use appropriate population databases (Coble *et al.,* 2016).

### 2.8 Ethical, Social, and Cultural Considerations

International bioethics instruments (e.g., UNESCO's Universal Declaration on the Human Genome and Human Rights) stress respect for human dignity, privacy, and consent in genetic testing, principles echoed in professional guidelines and data protection regimes (UNESCO, 1997). Ethical risks in relationship testing include privacy breaches, unwelcome disclosure of misattributed parentage, coercion, and secondary use of genetic data; best practices require

transparent pretest counseling, secure data handling, and pathways to psychosocial support (Butler, 2012; AABB, 2023).

Nigerian qualitative and legal ethical scholarship documents how sociocultural norms, patriarchy, and stigma shape responses to DNA results, with concerns about trust, family stability, and potential conflict escalation where testing is pursued unilaterally or without counseling. Public debates around "paternity fraud" in Nigeria illustrate the need for measured communication of test capabilities and limitations, and for policies that minimize harm while facilitating just outcomes (Iyamu Ojo and Ehikhameanor, 2017).

### 2.8 Awareness and Perceptions: Evidence from Africa and Nigeria

Empirical work from African settings shows growing utilization of parentage testing driven by legal, emotional, and medical motivations. A recent analysis of routine parentage testing in Zimbabwe reported common mutation patterns and casework features, reflecting increasing demand and the need for rigorous interpretation (Thelingwani *et al.,* 2024). Nigerian studies though limited and regionally heterogeneous report varied awareness levels and mixed attitudes influenced by religious beliefs, costs, confidentiality concerns, and perceived implications for marriage and inheritance (Adegbite, 2024).

Within Benin City and Edo State, the intersection of strong lineage norms and urban exposure to biomedical services underscores the importance of localized evidence on awareness and acceptance. The present research is thus positioned to fill a documented gap by systematically assessing awareness, perceptions, and determinants among residents.

# CHAPTER THREE

# MATERIALS AND METHODS

## 3.1 Study Design

This study is a questionnaire-based approach designed to ascertain the perception and awareness of maternal and paternal disputes resolution using DNA technology. A well-structured questionnaire was administered to participant on reception of their informed consent. Questionnaires allow for the collection of standardized data, which can be easily quantified and analyzed statistically. This is particularly useful for measuring levels of awareness and perceptions among a large population like in Benin City. Responses can be compared across different demographic groups, facilitating insights into how awareness and perceptions vary by age, gender, education. Questionnaires can be distributed to a large number of respondents

simultaneously. Given that DNA technology and parental disputes can be sensitive subjects, questionnaires can provide respondents with anonymity. This may encourage more honest and open responses and respondent may feel more comfortable providing their true opinions without the presence of an interviewer, which can reduce bias in responses. Quantitative data collected from questionnaires can be easily analyzed using statistical software, making it straightforward to identify trends, correlations, patterns and results can be effectively presented through graphs and charts, enhancing the clarity of findings.

A questionnaire-based approach allows for efficient, standardized data collection that is capable of capturing a wide range of information on awareness and perceptions. The ability to maintain respondent anonymity while facilitating broader participation makes it particularly well-suited for exploring sensitive topics like DNA technology in maternal and paternal dispute resolution.

### 3.2 Research Setting

The study will be conducted in Benin City, the capital of Edo State, Nigeria. which has a diverse population that encompasses various ethnic and socioeconomic groups. This setting is ideal for exploring the perceptions and awareness of maternal and paternal disputes resolution using DNA technology. Benin City is home to a mix of urban and semi-urban communities, which presents an opportunity to capture representative samples of individuals from different walks of life.

### 3.3 Sample Size

The sample population of this study was one hundred fifty one 151 samples. Random sampling technique was used to collect the samples. A total of 151 questionnaires was completed, with

participants aged from 18 years. The study examined the responses of the 151 participants and was used to determine the result of the study.

### 3.4 Study Participants

The study participants consisted of adult residents of Benin City, Edo State, Nigeria, aged 18 years and above, selected to represent a diverse cross-section of the urban and semi urban population. The sample included both males and females from various socioeconomic backgrounds, educational levels, and cultural groups to capture a broad range of perspectives on DNA technology for maternal and paternal dispute resolution. Only subjects who gave informed consent and meet the inclusion criteria were enrolled in this study.

#### 3.4.1 Inclusion Criteria

1. Individuals aged 18 years and above.
2. Current residents of Benin City, Edo State, Nigeria.
3. Willingness to participate in the study and complete a structured questionnaire.
4. Ability to provide informed consent.

#### 3.4.2 Exclusion Criteria

1. Individuals under 18 years of age.
2. Non-residents of Benin City, Edo State, Nigeria.
3. Individuals unwilling or unable to complete the structured questionnaire.
4. Individuals unable to provide informed consent due to certain factors not accommodated by the study design.

### 3.5 Ethical Consideration

The ethical approval for the study was obtained from the research ethical committee of the Edo state Ministry of Health, Benin City, Edo state.

### 3.6 Sample Collection

Structured questionnaires, designed to assess knowledge, awareness, perceptions, and factors influencing the use of DNA technology for resolving maternal and paternal disputes among Benin City residents, was distributed to eligible participants that meets the Inclusion criteria, and providing informed consent. Questionnaires were administered in paper-based format, and distribution occurred over a 4–6 week period, prior to distribution, the questionnaire was pre-tested with a small group of people from a semi-urban community to ensure clarity and reliability. Completed questionnaires were collected and stored securely, ensuring participant anonymity.

**3.7 Research Instrument (Questionnaire):** The study utilized a pre-tested 22 items questionnaire to obtain information about perception and awareness of maternal and paternal disputes resolution using DNA technology among Benin City residents.

**3.7.1 Pretest:** The questionnaires were pre-tested in a sample (N = 20) of participants and necessary adjustments were made to suit the aims and objectives of the study.

**3.7.2 Section I - Demographics:** This portion of the questionnaire obtained information on sex, age, marital status, educational qualification, occupation and duration of working in their current hospital.

**3.7.3 Section II - Awareness of DNA Technology in maternal and paternal disputes resolution:** This part of the questionnaire was used to determine the level of awareness of DNA technology.

**3.7.4 Section III - Knowledge of DNA technology in maternal and paternal dispute resolution:** This part of the questionnaire specified on knowledge of DNA Technology; the meanings of deoxyribonucleic acid (DNA), Can DNA testing accurately resolve maternity or paternity disputes? Etc.

**3.7.5 Section IV - Perceptions and attitudes towards DNA Technology:** This section included general perception and attitudes of the participants towards DNA Technology in maternal and paternal disputes resolution.

**3.7.6 Validity:** A thorough review of the entire questionnaire was carried out on the entire questionnaire by senior researcher to ascertain its validity.

### 3.8 Statistical Analysis

Data were analyzed using SPSS (IBM) Statistics version 26.0 software. Results are presented as percentage. Categorical variables were tested using Chi-square. Statistical significance was set at $p < 0.05$.

# CHAPTER FOUR

## RESULT

Table 4.1 presents the socio-demographic characteristics of the study participants. The age distribution shows that the majority, 124 (82.6%), were within the 20–40 years age group, while only 26 (17.4%) fell within the 41–60 years range, indicating that the study population was predominantly young adults. With respect to sex, more males 88 (58.7%) participated compared to females 62 (41.3%). In terms of marital status, half of the respondents 75 (50.0%) were married, while 59 (39.3%) were single. Smaller proportions included widowed individuals 14

(9.3%) and divorced participants 2 (1.3%). The highest educational qualification attained by most respondents was tertiary education, recorded among 102 (68.0%), followed by secondary education 32 (21.3%), while a few had only primary education 8 (5.3%) or no formal education 8 (5.3%). Occupational distribution showed that the majority were traders 73 (48.7%), followed by civil servants 48 (32.0%). Students accounted for 20 (13.3%), while smaller groups included doctors 3 (2.0%), pharmacists 3 (2.0%), unemployed 2 (1.3%), and retired persons 1 (0.7%). Religion was predominantly Christian, as 129 (86.0%) identified as Christians, while 17 (11.3%) were Muslims and 4 (2.7%) practiced traditional religion. Ethnic distribution revealed that nearly half of the respondents 71 (47.3%) were Bini, followed by Yoruba 40 (26.7%), Ibo 20 (13.3%), Ijaw 11 (7.3%), and Esan 8 (5.3%). Finally, regarding the duration of residence in Benin City, a slightly higher proportion 81 (54.0%) had lived in the city between 5–20 years, while 69 (46.0%) had resided for over 21 years.

**Table 4.1 Socio-demographic factors of Study Participants**

| | Frequency | Percent | Chi-square | p-value |
|---|---|---|---|---|
| 20.00-40.00 | 124 | 82.6 | 159.76 | .001 |
| 41.00-60.00 | 26 | 17.4 | | |
| **Sex** | | | | |
| Females | 62 | 41.3 | 4.51 | .001 |
| Males | 88 | 58.7 | | |
| **Marital status** | | | | |
| Single | 59 | 39.3 | 98.16 | .001 |
| Married | 75 | 50.0 | | |
| Widowed | 14 | 9.3 | | |
| Divorced | 2 | 1.3 | | |

| | | | | |
|---|---|---|---|---|
| **Education qualification** | | | | |
| Primary | 8 | 5.3 | 158.16 | .001 |
| Secondary | 32 | 21.3 | | |
| Tertiary | 102 | 68.0 | | |
| No formal education | 8 | 5.3 | | |
| **Occupation** | | | | |
| Doctors | 3 | 2.0 | 225.95 | .001 |
| Students | 20 | 13.3 | | |
| Pharmacists | 3 | 2.0 | | |
| Civil servants | 48 | 32.0 | | |
| Traders | 73 | 48.7 | | |
| Unemployed | 2 | 1.3 | | |
| Retired | 1 | .7 | | |
| **Religion** | | | | |
| Christian | 129 | 86.0 | 188.92 | .001 |
| Islamic | 17 | 11.3 | | |
| Traditional | 4 | 2.7 | | |
| **Ethnicity** | | | | |
| Bini | 71 | 47.3 | 90.87 | .001 |
| Yoruba | 40 | 26.7 | | |
| Ibo | 20 | 13.3 | | |
| Ijaw | 11 | 7.3 | | |
| Esan | 8 | 5.3 | | |
| **How long have you lived in Benin city(years)** | | | | |
| 5.00-20.00 | 81 | 54.0 | 140.27 | .001 |
| 21 and above | 69 | 46.0 | | |

Table 4.2 presents respondents' awareness and experiences with DNA testing. The findings indicate that a large majority of respondents, 130 (86.7%), had heard of DNA testing being used to resolve maternity or paternity disputes, while only 20 (13.3%) had not. Despite this high level of awareness, actual involvement was relatively low, as only 52 (34.7%) reported either personal or second-hand experience with DNA testing, compared to 98 (65.3%) who had no such experience. Similarly, most respondents, 125 (83.3%), acknowledged that DNA testing can be used to confirm biological relationships, while 25 (16.7%) lacked such knowledge.

Awareness of facilities in Benin City that provide DNA testing was divided. While 63 (42.0%) of respondents were aware of such facilities, 50 (33.3%) reported none, and 37 (24.7%) were unsure. Concerning the type of tests offered, 67 (44.7%) identified paternity testing, 3 (2.0%) mentioned maternity testing, while the majority, 80 (53.3%), gave no response. Experiences with facility visits for DNA testing were limited, as only 42 (28.0%) of respondents had visited or knew someone who had visited a facility, compared to 108 (72.0%) who had not. Among those who indicated the purpose of visits, 16 (10.7%) reported paternity disputes, 12 (8.0%) cited maternity disputes, and 14 (9.3%) mentioned legal proceedings, while 108 (72.0%) gave no response. In terms of knowledge, 90 (60.0%) correctly identified the meaning of DNA, whereas 60 (40.0%) reported that they did not know.

**Table 4.2 Awareness and Experience of DNA Testing for Resolving Maternity and Paternity Disputes among Respondents**

| | | | | |
|---|---|---|---|---|
| **Have you ever heard of DNA testing being used to resolve maternity or paternity disputes** | | | | |
| | Frequency | Percent | Chi-square | p-value |
| Yes | 130 | 86.7 | 80.67 | .001 |
| No | 20 | 13.3 | | |
| **If yes have you or someone you know been involved in DNA testing for maternity or paternity disputes** | | | | |

| | | | | |
|---|---|---|---|---|
| Yes | 52 | 34.7 | 14.11 | .001 |
| No | 98 | 65.3 | | |
| **Have you ever heard of DNA testing being used to confirm biological relationship** | | | | |
| Yes | 125 | 83.3 | 66.67 | .001 |
| No | 25 | 16.7 | | |
| **Is there any facility in Benin city that you know, that offers DNA testing for dispute resolution** | | | | |
| Yes | 63 | 42.0 | 6.70 | .034 |
| No | 50 | 33.3 | | |
| Not sure | 37 | 24.7 | | |
| **If you know of facilities in Benin city offering DNA testing, what type of tests are offered?** | | | | |
| Maternity disputes | 3 | 2.0 | 67.96 | .001 |
| Paternity disputes | 67 | 44.7 | | |
| No response | 80 | 53.3 | | |
| **Have you visited a facility or know someone who visited a facility for DNA testing related to maternity or paternity disputes** | | | | |
| Yes | 42 | 28.0 | 29.04 | .001 |
| No | 108 | 72.0 | | |
| **If yes, what was the purpose of visit?** | | | | |
| Legal proceedings | 14 | 9.3 | 176.93 | .001 |
| Maternity disputes | 12 | 8.0 | | |
| Paternity disputes | 16 | 10.7 | | |
| No response | 108 | 72.0 | | |
| **What is the full meaning of DNA in the context of genetic testing** | | | | |
| I know | 90 | 60.0 | 6.00 | .014 |
| I don’t know | 60 | 40.0 | | |

Table 4.3 examines respondents' perceptions of the accuracy, reliability, and willingness to learn about DNA testing. A majority of respondents, 107 (71.3%), affirmed that DNA testing can accurately resolve maternity or paternity disputes, while 43 (28.7%) expressed uncertainty. Regarding the common locations for DNA testing, 104 (69.3%) cited hospitals, 45 (30.0%) mentioned specialized laboratories, and only 1 (0.7%) indicated they did not know.

Perceptions of the influence of external factors on DNA test accuracy were mixed. While 59 (39.3%) believed external factors could affect results, the majority 91 (60.7%) did not know. Among those aware, 62 (41.3%) attributed possible inaccuracies to laboratory errors, though 88 (58.7%) provided no response. Furthermore, most respondents, 112 (74.7%), agreed that DNA testing could enhance the resolution of maternity or paternity disputes in Benin City, while 38 (25.3%) were uncertain. With respect to willingness to learn more about DNA testing, 64 (42.7%) expressed they were somewhat willing, 55 (36.7%) were highly willing, and only 31 (20.7%) indicated no willingness.

**Table 4.3 Perceptions of Accuracy, Reliability, and Willingness to Learn about DNA Testing among Respondents**

| | | | | |
|---|---|---|---|---|
| **Can DNA testing accurately resolve maternity or paternity disputes?** | | | | |
| I know | 107 | 71.3 | 27.31 | .001 |
| I don't know | 43 | 28.7 | | |
| **Where are DNA test typically conducted?** | | | | |
| Hospital | 104 | 69.3 | 106.84 | .001 |
| Specialized Laboratory | 45 | 30.0 | | |
| I don't know | 1 | .7 | | |
| **Can the accuracy of DNA testing be affected by external factors?** | | | | |
| I know | 59 | 39.3 | 6.83 | .001 |
| I don't know | 91 | 60.7 | | |
| **If yes, by what means?** | | | | |
| Laboratory errors | 62 | 41.3 | 4.51 | .001 |
| No response | 88 | 58.7 | | |
| **Do you think DNA testing can improve the resolution of maternity or paternity disputes in Benin city?** | | | | |
| Yes | 112 | 74.7 | 36.51 | .001 |
| I don't know | 38 | 25.3 | | |
| **How willing are you to learn more about DNA testing for resolving maternity or paternity disputes** | | | | |
| Highly willing | 55 | 36.7 | 11.64 | .001 |
| Somewhat willing | 64 | 42.7 | | |
| Not willing | 31 | 20.7 | | |

# CHAPTER FIVE

## 5.1 DISCUSSION, CONCLUSSION AND RECOMMENDATION

Deoxyribonucleic acid (DNA) testing has become an essential tool in resolving disputes of biological relationships, particularly maternity and paternity cases, with significant social, legal, and emotional implications. The findings of this study provide valuable insights into the perception and awareness of DNA testing for resolving maternity and paternity disputes among residents of Benin City. The results show that the majority of respondents (86.7%) had heard of DNA testing being used in dispute resolution, which suggests that the concept of DNA technology is well disseminated in the study area. This level of awareness is consistent with global developments in genetic testing since its introduction in the 1980s and its expansion into routine forensic and relationship testing applications (Jeffreys *et al.,* 1985; Jobling and Gill, 2004).

Despite high levels of awareness, actual utilization and experience with DNA testing remain limited. Only 34.7% of respondents reported personal or second-hand involvement in DNA testing, which points to barriers such as cost, accessibility of facilities, cultural stigma, and lack of counseling support. This aligns with the work done in Nigeria indicating that religious beliefs, financial constraints, and concerns about confidentiality strongly influence whether families pursue DNA testing (Iyamu-Ojo and Ehikhameanor, 2017; Adegbite, 2024).

A further dimension of the findings is the knowledge gap regarding the existence of DNA testing facilities. Only 42.0% of respondents knew of facilities in Benin City offering such services, while 33.3% stated that none existed, and 24.7% were unsure. This indicates that, although awareness of DNA technology is high, there is still a lack of concrete knowledge about local

access points. For a technology that is central to resolving family disputes, such uncertainty undermines trust in its accessibility and effectiveness. This is an important contrast to developed countries where DNA testing services are widely advertised and institutionalized (Butler, 2012). The study also revealed that the majority of respondents (83.3%) correctly understood that DNA testing can be used to confirm biological relationships. Similarly, 71.3% agreed that DNA testing could accurately resolve maternity and paternity disputes. These findings demonstrate positive perceptions of the reliability of DNA technology. They are in line with the high scientific accuracy of DNA-based parentage testing, where exclusion probabilities and inclusion probabilities routinely exceed 99.9% (Kayser, 2017). Nevertheless, 28.7% of respondents were uncertain about its accuracy, which highlights an educational gap. This lack of full confidence may stem from technical misconceptions, limited exposure to DNA testing in practice, or distrust arising from societal debates about paternity fraud in Nigeria.

The perception of external influences on the reliability of DNA testing also revealed knowledge gaps. About 39.3% believed external factors could affect accuracy, but a majority (60.7%) did not know. Among those who responded, laboratory error was most frequently mentioned. These views reveal that while respondents acknowledge the existence of DNA testing, their understanding of its technical foundations remains shallow. Given that short tandem repeat analysis and modern PCR-based methods are highly robust and standardized internationally (Butler, 2012), it is important to correct such misconceptions through targeted education.

In terms of service access and practical use, only 28.0% of respondents had visited or knew someone who had visited a DNA testing facility, and of these, visits were primarily motivated by paternity disputes, maternity disputes, or legal proceedings. This reflects a predominantly legal and conflict-driven demand for DNA testing, as seen in previous African studies that link DNA

testing to inheritance disputes, custody cases, and immigration (Thelingwani *et al.,* 2024; Wenk and Shao, 2014). This limited scope of application suggests the need for broader awareness of DNA testing's other roles, such as medical diagnostics and family planning.

Another important finding is that respondents demonstrated a strong willingness to learn more about DNA testing, with 42.7% somewhat willing and 36.7% highly willing. This readiness to acquire knowledge provides a solid basis for the development of community education programs and policies that improve DNA literacy. Such efforts could also help mitigate cultural resistance and prevent misuse of DNA results in ways that exacerbate family tensions. As UNESCO (1997) highlights, respect for human dignity and proper counseling are essential when applying genetic testing in family contexts.

Taken together, the study underscores a dual reality: DNA technology is widely recognized and positively perceived by Benin City residents, yet there remain significant barriers to its full acceptance and use. These include limited knowledge of facilities, gaps in technical understanding, low levels of practical experience, and socio-cultural concerns around family stability. Addressing these barriers requires not only public education but also the integration of ethical safeguards, counseling services, and increased access to affordable facilities. In this way, DNA testing can realize its potential as a reliable, culturally sensitive, and widely accepted tool for resolving disputes.

## 5.2 CONCLUSION

This study concludes that awareness of DNA testing among residents of Benin City is high, and perceptions of its accuracy and usefulness in resolving maternity and paternity disputes are largely positive. However, actual use of DNA testing remains limited, with gaps in knowledge of

local facilities and technical understanding. These findings highlight the importance of making DNA testing more accessible, affordable, and supported by ethical frameworks and counseling to prevent social conflicts.

## 5.3 RECOMMENDATIONS

1. Launch community-wide education and awareness programs to address misconceptions about DNA testing and its accuracy.
2. Expand the availability and affordability of accredited DNA testing facilities in Benin City.
3. Integrate pre- and post-test counseling services to support individuals and families and prevent disputes from escalating.
4. Develop legal and policy frameworks that safeguard privacy, informed consent, and ethical use of DNA test results.
5. Encourage further research into cultural, social, and religious influences on the acceptance and use of DNA testing in Nigeria.

## 5.4 CONTRIBUTION TO BODY OF KNOWLEDGE

This study contributes to knowledge by being among the first to systematically assess awareness and perceptions of DNA testing for dispute resolution in Benin City. It highlights the paradox of high awareness but limited engagement, underscoring the need to bridge informational and accessibility gaps. The findings also reveal persistent uncertainties about accuracy and technical foundations, enriching the literature on DNA literacy in African contexts. Furthermore, the study adds empirical evidence to debates on the ethical and cultural dimensions of DNA testing,

demonstrating the importance of counseling, regulation, and public engagement in its application for family and legal dispute

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