



(RESEARCH ARTICLE)



## Assessment of public awareness and willingness for establishment/storage of DNA profile in a national DNA database in Nigeria

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### Abstract

One prominent aspect of forensic deoxyribonucleic acid testing is the establishment and expansion of centralized national forensic DNA databases and body of evidence have continued to emerge, demonstrating the extensive efficiency and effectiveness of the DNA database in assisting criminal investigation globally. Therefore, the present study aimed to examine public awareness on Forensic DNA Database and the willingness for storage of DNA profiles. The design used in this study is the survey research design and the sample size of this study was a total number of five hundred University of Benin students drawn from our population for empirical investigation. The study adopted descriptive statistics which involves the use of frequency and percentage. The result of this study revealed that majority of the respondent demonstrated an adequate level of awareness and knowledge (71.2%), showed good knowledge on the function of a national forensic DNA database (54.4%), demonstrated increased level of awareness and knowledge on the benefit of a national forensic DNA database (44.8%), and revealed that 422 (84.4%) were willing for the storage of their profiles in the national forensic DNA database. The study also observed that a vast proportion of the respondents indicated that fear of violation of individual's privacy was the only barrier they considered for the storage of DNA profiles in the National Database and our observations provides a good a basis for reviewing and implementing policies that find a reasonable balance based on the creation of moral and ethical spectrum involving professionals in the area of forensics, law enforcement and the public, in particular, social groups which are less involved in genetics.

**Keywords:** Forensic DNA Database; DNA; DNA Profiling; National DNA Database in Nigeria

### 1. Introduction

Forensic DNA testing has become a significant resource for criminal investigation and prosecution activities in the criminal justice systems globally [1, 2]. Forensic DNA testing can be conducted in several ways: first, by comparing the DNA profiles from criminal suspects to DNA evidence, so as to assess the likelihood of their involvement in a crime [3]. The second kind of use is related to searching for a link between the biological material collected from a crime scene to a DNA profile stored in a criminal DNA database, and the final form of forensic DNA testing is related to procedures to search for criminal suspects through their connection with biological relatives [3, 4]. Logically and theoretically, the higher the number of citizens whose DNA has been profiled and recorded in a database, the better the chances of identifying a criminal [5, 6].

One prominent aspect of forensic DNA testing is the establishment and expansion of centralized national forensic DNA databases [7, 8]. These databases involve the collection, storage, comparison, and use of DNA profiles from nominated

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suspects, convicted offenders, victims, volunteers, and other persons of interest to criminal investigation work [9, 10]. The primary function of a criminal DNA database is to produce matches between individual profiles and crime scene stains, which requires a constant input of both [3, 11]. Forensic DNA databases are considered as tools for improving efforts to detect crime and identify suspects, and the end result is expected to be a reduction in crime rates, and greater public safety and security [12, 13, 14]. Additionally, forensic DNA databases have proved to be an indispensable tool in preventing miscarriages of justice and deterring offenders from further criminal activity [15, 16, 10], and the use of DNA to trace crime suspects has been a prominent improvement in policing, and when DNA databases are efficiently put to use, it overwhelmingly aids the conviction of culprits and exoneration of the innocent [17, 2].

Although the value of forensic DNA databases is recognized widely by criminal justice policymakers and legislators, there are academic, legal, and civil society groups that have reacted critically to the expansion of databanks holding genetic material for criminal investigation purposes and as such different views on the capabilities, benefits, and risks of forensic DNA profiling and forensic DNA database circulate within modern societies [3, 15, 18]. Supporters of the expansion of forensic DNA testing in the criminal justice system invoke its capacity to serve as a valuable law enforcement tool, namely by improving efficiency in fighting crime, helping in the prevention of miscarriages of justice and deterrence of criminal activity, which is, in turn, expected to reduce crime and increase public safety and security [19, 5]. Critics argue, however, that operating forensic DNA databases carries potential threats to the protection of a range of human rights, particularly as concerns our freedom, autonomy, privacy, moral and physical integrity, and the presumption of our innocence; and the expansion of DNA databases might be perceived by the general population as an excessive form of state control [5, 20, 21]. Thus, a responsible forensic DNA database policy needs to find a reasonable balance between these two positions, based on the creation of a moral and ethical spectrum involving both professionals in the area of forensics and law enforcement [22] and the public, in particular, social groups which are less involved in genetics [15, 23, 24].

Knowledge about existing research on public views on forensic DNA profiling and forensic DNA database is thus essential to inform ethically sustainable governance models [3]. Also, there is a paucity of scientific report about the level of public awareness concerning forensic DNA database and the willingness for possible inclusion of DNA profiles in the National Forensic DNA Database in Africa particularly Nigeria. Hence our interest in assessing a sample of Nigerian adults on their knowledge and acceptance of a national forensic DNA database to support criminal investigation as conducted by other groups of researchers around the world in support of a responsible forensic DNA database policy [25, 3, 15, 5, 21].

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## 2. Material and methods

### 2.1. Population and Sample size

This study was based on a questionnaire developed by the research team. The sample population of the present study was five hundred (500). The sample population was drawn from two categories using the stratified random sampling technique, the categories include members of staff and students of a public university in Nigeria. A total of 500 questionnaires were completed, with participants aged from 18 years. This study examined the responses of the 500 participants and the result was distributed as follows: female 279 (55.8%) and male 221 (44.2%); the dominant population of participants was found to be within the age of 18-25, 310 (62%); and a vast proportion of the participants were undergraduate with frequency distribution of 383 and percentage distribution of 76.6%.

### 2.2. Research Instrument

For this research work, the research instrument adopted was a formal standardized questionnaire. A total of 500 questionnaires were distributed to members of staff and students of a public university in Nigeria between the periods of September 2021 to November 2021. The questionnaire comprised of three main categories:

- Socio-demographic characteristics, including the following: Gender, Age, and Educational level.
- Awareness on the function of a national forensic DNA database: Have you heard about forensic DNA database, what is the function of a national forensic DNA database, what is the benefit of a national forensic DNA database, and is there a national forensic DNA database in Nigeria
- Willingness to allow for storage of DNA profile in the forensic national DNA database: What institution should protect and maintain confidentiality of the DNA profile stored in the national DNA database, would you be willing to have your DNA profile stored in a national forensic DNA database, what should be the preservation period of DNA profile in the database, and what do you consider as a barrier for storage of DNA profiles in the national DNA database.

### 2.3. Ethical consideration

#### 2.3.1. Voluntary participation

Respondents were informed of the purpose of the study. They were informed that their participation in the study was voluntary and not paid for. They were also informed that the information provided was strictly for academic research purposes, and were requested to kindly provide honest responses to ensure the credibility of the study.

#### 2.3.2. Anonymity and confidentiality

The respondents were informed that their identity was confidential and as such their detail of names and picture were not collected.

## 3. Results

**Table 1** Participants awareness level on national forensic DNA database

	Frequency (n=500)	Percentage (100%)
<b>Have you heard about forensic DNA database?</b>		
Yes	356	71.2
No	36	7.2
Not Sure	108	21.6
<b>What is the function of a national forensic DNA database?</b>		
Storage of DNA profiles	17	3.4
Comparison of DNA profiles for possible hit	67	13.4
All of the above	272	54.4
Not sure	144	28.8
<b>What is the benefit of a national forensic DNA database?</b>		
Reduction of crime	108	21.6
To have a more efficient legal system		
To identify criminals	50	10
To keep criminals under control	34	6.8
All options except 'Not Sure'	224	44.8
Not sure	84	16.8
<b>Is there a national forensic DNA database in Nigeria?</b>		
Yes	30	6
No	196	39.2
Not Sure	274	54.8

Responses of participant's awareness level on national forensic DNA database were collected and analyzed. The result as presented in table 1 revealed that from a pool of 500 participants, majority of the respondent demonstrated high level of knowledge and awareness on forensic DNA database by reporting a "Yes" with a frequency distribution of 356 and percentage distribution of 71.2%. while 108 respondents from the entire population were not sure and 36 had poor knowledge and awareness with percentage distribution of 21.6% and 7.2% respectively. As well a greater proportion of the study population 272 (54.4%) showed good knowledge on the function of a national DNA database by reporting "all options except not sure" implying that it is used for storage of DNA profiles as well as comparison of DNA profiles for possible hit. while a few 144 (28.8%) of the respondents demonstrated inadequate level of awareness and

knowledge by responding with “Not Sure”. In response to the question, what is the benefit of a national forensic DNA database?, it was also observed that a vast proportion of the participants 224 (44.8%) demonstrated significant level of awareness and knowledge by reporting the more appropriate option “all options except not sure” covering the following; to keep criminals under control, to identify criminals, reduction of crime, and to have a more efficient legal system. Conversely, 84 (16.8%) of the respondent showed inadequate awareness level and knowledge by reporting with “Not Sure”. Finally, the participant’s responses to the question, is there a national forensic DNA database in Nigeria? was analyzed and the result revealed that 274 (54.8%) reported “Not Sure”, 196 (39.2%) reported appropriately with a “No” and 30(6%) reported wrongly with a “Yes”.

**Table 2** Participants views on establishment of a forensic national DNA database

	Frequency (n=500)	Percentage (100%)
<b>Is there a need for establishment of a forensic DNA database</b>		
Yes	387	77.4
No	26	5.2
Not Sure	87	17.4
<b>What institution should protect and maintain confidentiality of the DNA profile stored in the national DNA database?</b>		
The Nigerian Police	60	12
Ministry of Justice	58	11.6
University	30	6
The council of forensic practitioners with the judicial backing	239	47.8
All options except ‘Not Sure’	65	13
Not sure	48	9.6
<b>What should be the preservation period of DNA profile in the database?</b>		
<5 years	48	9.6
5 years	36	7.2
10-20 years	30	6
When no longer considered useful	280	56
upon individual request	52	10.4
kept until solving a crime	54	10.8
<b>What do you consider as a barrier for storage of DNA profiles in the national DNA database?</b>		
Fear of violation of individual’s privacy	198	38.6
Fear of uncontrollable access and misuse of the database	76	15.2
It is not for me it is for criminal only	-	-
All options except ‘Not Sure’	183	36.6
Not Sure	48	9.6

Participants views and espousals for an appropriate establishment and operation of a forensic national DNA database were collected, analyzed and data presented in table 2. The result on the participant’s responses on what institution should protect and maintain confidentiality of the DNA profile stored in the national DNA database revealed that a greater population of the participants 239 (47.8%) of the total study population of 500 preferred the council of forensic practitioners with the judicial backing. In response to the question what should be the preservation period of DNA profile in the database?, it was observed that majority of the participants 280 (56%) preferred that the DNA profiles be

preserved until when no longer considered useful. Finally, responses to what do you consider as a barrier for the storage of DNA profiles in the national DNA database was analyzed and the result revealed that a vast proportion of the respondent 183 (36.6%) reported all options except not sure which includes; fear of uncontrollable access and misuse of the database and fear of violation of individual privacy. Specifically, it was also observed that a greater number of the participants 193 (38.6%) reported that they consider the option “fear of violation of individual’s privacy” as a barrier for the storage of DNA profile in the national DNA database. On the other hand, 48 (9.6%) of the respondent were undecided by reporting “Not Sure”.

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#### 4. Discussion

Forensic DNA profiling have extensively been reported and demonstrated to be a huge resource for investigation of crime and providing an irrefutable evidence for an efficient prosecution of offenders and exoneration of the innocent in the criminal justice system globally [11, 3, 2]. One prominent aspect of forensic DNA profiling is the establishment and expansion of centralized national forensic DNA databases [7, 8]. The use of a national DNA databases for advancement of efficient criminal investigation in modern society remains a commendable endeavour, and its benefits and efficiency have extensively been demonstrated [26, 27, 28]. Therefore, the first section of this study assessed the level of awareness on national forensic DNA database. Analysis of the responses gathered from the respondent revealed a growing level of knowledge and awareness on forensic DNA database which negates the result of our previous study conducted in 2020 showing a dearth in knowledge and inadequate awareness [17]. However, our observation on growing knowledge corroborate the recent finding of Orhue et al. [29] and Omorogbe et al. [30]. This is an indication that perhaps the general public have become alarmed at the growing insecurity within the society and are now adept and knowledgeable about proven and modern approach for efficient criminal investigation. Additionally, the study also assessed the awareness level on the functions, and benefits of a national DNA database. Similar with the earlier observation, there was a significant level of awareness which validates the increasing level of awareness in Nigeria on forensic DNA database and may imply a public preparedness for the establishment of a national DNA database for improvement of criminal investigation. In support to our observation, forensic DNA databases are considered as tools for improving efforts to detect crime and identification of suspects, and the end result is expected to be a reduction in crime rates, greater public safety and security and the use of DNA to trace crime suspects has been a prominent improvement in policing [13, 14, 15, 10]. The final aspect of the first section examined the participant strength of awareness to know if Nigeria operates a national DNA database. It was observed that a vast proportion of the respondent agreed to the non-existence of national DNA database in Nigeria. It has been established that Nigeria do not operate a national DNA database for criminal investigation [17, 29]. However, they are existing biometric databases operated by various agencies for other purposes but for criminal investigation. Although progress have been made in recent times towards establishing a DNA database for criminal investigation with the passage of the legislative provision for the establishment of a forensic DNA database sponsored by Senator Theodore A. Orji “The Senate Bills: SB: 78 Deoxyribonucleic Acid (DNA) Bill, 2015” [31, 11].

The second section of this study assessed the participant’s views on the establishment of a forensic national DNA database. Forensic DNA databases have largely been documented and shown to be a vital technology in preventing miscarriages of justice and deterring offenders from further criminal activity [15, 16, 10], and when DNA databases are efficiently put to use, it overwhelmingly aids the conviction of culprits and exoneration of the innocent [17, 2]. With the popularity, increased establishment and growing number of stored DNA profile in the DNA database around the world, is have been suggested by a great number of authors and legislators that further research should be conducted with the objective of evaluating and monitoring the performance and safety including assessment of public view [32, 27, 33, 3]. In an attempt to meet this suggestion, the present study assessed individual perception on the establishment of a forensic DNA database for criminal investigation, as well as other factors including the duration for storage of DNA profile and what was considered as a barrier for storage of DNA profiles in the national DNA database. As per the perception on the need for establishment of a forensic DNA database, the analysis of the response gathered revealed from a pool of five hundred participants, a vast proportion of the respondents agreed that there is a huge need for the establishment of a national DNA database for advancement of criminal investigation in Nigeria. As per the institution that should protect and maintain the confidentiality of the DNA profile stored in the national DNA database, the analysis of the result revealed that a greater population of the participants 239 (47.8%) preferred the council of forensic practitioners with the judicial backing. The perception of the respondents was not unfounded, as report around the world in countries operating a functional DNA database revealed that society or forensic organisation regulates the operation of forensic DNA databases; European Network of Forensic Science Institutes (ENFSI) for European countries, the United Kingdom Forensic Science Service (FSS) for UK, South African Academy of Forensic Sciences (SAAFS) for South Africa, and American Academy of Forensic Sciences (AAFS) for the US [34, 35, 36, 37, 38]. Owing to this, the existing bodies of forensics in Nigeria needs to synergize to form an equitable body with the judiciary backing that would

propagate and catalyse the establishment of a functional DNA database and harmonise the proposed bills for regulation and protection of the use and storage of DNA profile.

Although the value of forensic DNA databases is recognized widely by criminal justice policymakers and legislators, but there are academic, legal, and civil society groups that have reacted critically to the establishment and expansion of databanks holding genetic material for criminal investigation purposes and as such different views on the capabilities, benefits, and risks of forensic DNA profiling and forensic DNA database circulate within modern societies [3, 15, 18]. In view of the position of opponents on the establishment and expansion of a forensic DNA database who argue that operation of forensic DNA databases carries potential threats to the protection of a range of human rights, particularly as concerns our freedom, autonomy, privacy, moral and physical integrity, and the presumption of our innocence [5, 20, 21], the study also examined what the respondents considers as a barrier for storage of DNA profiles in the national DNA database and it was observed that a greater number of the respondents indicated that they consider the option “fear of violation of individual’s privacy” as a barrier for the storage of DNA profile in the national DNA database. The observations made in this study provides a good a basis for reviewing and implementing policies that find a reasonable balance based on the creation of a moral and ethical spectrum involving professionals in the area of forensics, law enforcement and the public, in particular, social groups which are less involved in genetics as suggested in the report of [15, 23, 24, 22].

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## 5. Conclusion

The intricacy of public views about forensic DNA databases points towards the need for more research examining the necessity and requirements for the establishment of forensic DNA database and willingness for inclusion of DNA profile exploring the ethical issues surrounding the technology. In conclusion, our results demonstrated that, there is an adequate level of awareness on the function of Forensic DNA database in criminal investigation and majority of the respondents were willing to allow for the storage of DNA profile in the forensic national DNA database. The study also observed that a vast proportion of the respondents indicated that fear of violation of individual’s privacy was the only barrier they considered for the storage of DNA profiles in the National Database and our observations provides a good a basis for reviewing and implementing policies that find a reasonable balance based on the creation of a moral and ethical spectrum involving professionals in the area of forensics, law enforcement and the public, in particular, social groups which are less involved in genetics.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

The authors declare no conflict of interest.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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