

Research Paper: Knowledge and Attitude of Medical Students of Cairo University, Cairo, Egypt About National DNA Database



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ABSTRACT

Background: DNA database is used to identify individuals based on their specific DNA profiles. In Egypt, a definitive law describing and legalizing DNA related issues is absent; however, the Egyptian courts frequently deal with these issues. The legal authorities strongly suggest the impending need for detailed decrees in this regard that guard the safety of the whole Egyptian community. This paper aimed to assess the knowledge and attitude of Medical students about Egyptian National DNA Database (END).

Methods: Data of this study were collected from 272 participants in the Faculty of Medicine, Cairo University using interviewer administered questionnaire.

Results: The participants were 136 males and 136 females with mean (SD) age of 27(9) years. Majority of the participants (89.7%) were aware about national database out of their medical textbooks. Personal identification was the most chosen END benefit and database usefulness was the main motivation for them. About 29% suggested to start END with the detected crime scene stains and forensic doctors should freely access END.

Conclusion: These collective points of views might be useful in preparing some international and common ethical standards for the development of DNA databases framework.

1. Introduction

DNA profiling is decisive in many types of criminal investigations, especially identification of unknown people. DNA databases play a very important role in forensic investigations [1]. Immunohistochemical methods and DNA analysis are usually used for this purpose [2].

The U.S. Federal Bureau of Investigation scans each DNA sample for at least 13 Short Tandem Repeats (STRs), a unique DNA fingerprint, to create a person's DNA profile [3]. The DNA profiles from suspected and convicted criminal offenders as well as biological stain materials of unsolved crime cases were held in many European national databases [4]. The criteria for a forensic DNA profiling and database inclusion, removal, search, storage periods, possibility to keep refer-

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ence samples, role of judges in the process of accessing a database record, and so on can make a very distinct database among different countries [4]. However, the national DNA database criteria in Egypt have not been devised yet [5]. Many legal and ethical problems arise in the construction of a forensic DNA database, and these problems are important in applying the legal regulations on this database [6]. This study was conducted to assess the knowledge and attitude of Medical students and staff about national forensic DNA database.

2. Materials and Methods

The study was approved by the Ethics Committee in School of Medicine, Cairo University. This cross-sectional study was conducted on 272 Medical students. The sample size was estimated by using stratified quota sampling and calculated by sample size calculator with confidence level of 95%, margin of error 5%, and confident interval of 5.23 out of 1200 study population. Informed consent was taken from all participants prior to the study. Non-medical students and those who were below 18 years old were excluded from the study. The study was conducted in School of Medicine, Cairo University.

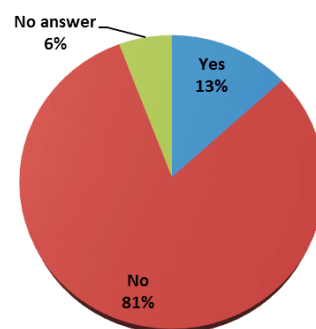
The study was based on two close-ended, structured, interviewer-administered questionnaires consisting of three parts; 1) Sociodemographic criteria of participants, 2) knowledge about DNA and DNA databases, 3) attitude, opinion, and problems in participating in national forensic database with a total of 22 questions. The questionnaire's reliability showed strong internal consistency as measured by Cronbach $\alpha=0.685$. The questionnaire validity was assessed by acceptable level of face validity as reported by expert panel who reviewed the questionnaire before its distribution. Moreover, the Pearson correlation was done between different subscales and revealed acceptable level of correlations; r value ranged between 0.3 and 0.7. Questionnaire was initially tested through a pilot test on 5 students prior to administration. The whole process of questionnaire administration and collection took three weeks. The questionnaires were distributed using quota sampling by research team to the corresponding study group. Based on prior research studies, the expected positive attitude toward national forensic database participation is 46.5% [7]. All statistical analysis was conducted by SPSS 16.0. The descriptive statistics of studied sample were analyzed in terms of mean, standard deviations, median, and interquartile range. Analysis of quantitative data by t test and association of qualitative variables by Chi-square test were conducted. P value less than 0.05 was considered as sta-

tistically significant. Multivariate analysis was adopted according to results from univariate analysis.

3. Results

A total of 272 questionnaires were collected from Medical students and staff. The undergraduate, postgraduate, and post-doctoral subjects represented 61.26%, 20.5%, and 22.4% of total study participants, respectively. Table 1 presents the mean knowledge score of DNA and DNA national forensic database according to the independent variables. The mean (SD) age of overall participants was 27(9) years [136 males (50%) and 136 females (50%)]. There was no significant difference of the knowledge between males and females. The difference in education level had an impact on the level of knowledge; by increasing the level of education, the level of knowledge increased. Regarding source of knowledge, 77% of participants got information from medical textbooks, 9% from the internet, and 7% for both media and friends. National DNA database benefits were shown in Table 2. Most people (57.3%) agreed upon the many benefits of national DNA database. Individually, "identification of unknown," "limitation of the crime," "helping in sexual assault," and "helping in disputed paternity," were respectively favored by 22%, 11.7%, 4.4%, and 1.4% of participants. Figure 1 shows the knowledge about availability of Egyptian national forensic database. About 80.8% of participants believed that Egypt lacked one and they were willing to start and participate in it, 13.2% mentioned that Egypt had one and 5.8% no idea about this issue.

Table 3 presents encouraging and discouraging factors on participants' views about participating in Egyptian National Forensic Database (END). Most participants (80.8%) agreed upon this for 5 reasons; to be useful in criminal and civil issues (25%), to advance legal investigations (23%), to protect Egyptian society (18%), to



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Figure 1. Percentage of participants' opinion regarding having Egyptian National Database

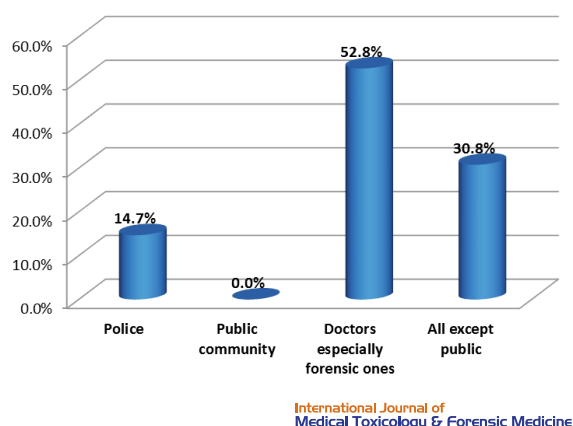


Figure 2. Percentage of participants' opinion regarding their permission to access their DNA profile

start a modern technology (16.8%), and to have better life through research (16.8%). The most common discouraging factor was lack of legal regulation (47.7%) followed by paucity of information (18%), fear of violating individual's privacy e.g. detection of any genetic defects (13.6%), and uncontrollable access and misuse of the database (11.3%). While the least common barrier was its exclusiveness for criminals (9%). Regarding the samples to be included in national forensic database, Table 4 shows that 21.4% of participants had positive response to all samples and 29.4% chose crime scene stains. Furthermore, 16% believed that all crimi-

nals' samples should be included, 13.2% thought that all Egyptians' samples, especially newborns (10.2%) should be included. Lastly, unknown's samples (missed persons or dead bodies) were chosen by 5.8%.

Duration for keeping these samples were shown in Table 4. About 80.8 % of participants agreed to save the taken samples. Of them, 29.3% believed that the samples can be kept for indefinitely (>80 years), 30.8% for no longer be useful, 7.3% for as long as performing DNA profile then discard, 5.8% for 10-20 years, 4.4% till solving the crime, and 4.4% for as long as personal request. Regarding accessibility to DNA database, 52.8% of participants believed that doctors, especially forensic ones should have free access to DNA database; 14.7% suggested that police should access DNA database; while 30.8% selected both doctors and police. All participants refused public community to access the individual's DNA profile (Figure 2). Almost all participants stressed on making clear laws to control Egyptian National Database e.g. access, insertion and deletion of DNA profiles.

4. Discussion

This study was conducted to assess the knowledge, encouraging and discouraging factors, and suggestions for END among Medical student participants in order to increase their interests in using this database. The results

Table 1. Demographic data and knowledge score about organ donation

Variable	No (%)	Mean±SD	P
Age	272	27±9.	
Sex		knowledge Score (Mean±SD)	
Male	136(50)	3.3±1.5	0.067
Female	136(50)	3.7±1.4	
Educational Level			
Under-graduates	168(61.7)	3.1±1.4	0.001
Post-graduates	56(20.5)	3.70±1.58	
Post-doctoral	48(17.6)	4±1.7	
Knowledge Source			
Medical books	209(77)	0.6018±0.48989	
Internet	24(9)	0.2021±0.40191	
Friends	19(7)	0.1700±0.37591	
Media	19(7)	0.1271±0.33335	

No: Number, SD: Standard Deviation

Table 2. General knowledge about forensic national DNA database's benefits

Forensic National DNA Database's Benefits	No (%)
Limitation of crimes	32(11.7)
Identification of unknown	60(22)
Helping in sexual assaults	12(4.4)
Helping in disputed paternity	4(1.4)
All	156(57.3)
No answer	8(2.9)

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showed insignificant difference between male and female knowledge as they were equally aware of the DNA and DNA database. While, the education level among participants showed a statistical significant difference in knowledge between undergraduates and postgraduates. However, in a study conducted in Portugal to determine the knowledge and attitude regarding forensic DNA databases, when 70% of participants were female there was a direct negative correlation between education level and their willingness to participate in DNA database [7].

Regarding the source of knowledge about DNA and DNA databases, our findings revealed that the most effective source of knowledge was medical textbooks (61.7%) while media and friends were the least informative sources (7%). Our findings were consistent with a study done in USA where majority of the professional participants with different professional DNA backgrounds e.g. of-ficers and forensic nurses, became aware through DNA

experts' workshop and on-the-job interactions with experts, while majority of general population participants became aware through media and the internet [8]. The internet and media campaigns can thus significantly influence general population awareness and beliefs, but the specialized members' awareness and beliefs can be influenced by training and workshops presented by well-trained experts as confirmed by Knect and Whitman [8].

Despite the well-established forensic DNA database in many countries, Egypt founded its DNA database in 2004. Seven years later, it contained 1046 individuals' DNA profiles from 869 crime scenes, 20 missing persons plus 1815 unidentified human remains [9]. The current study showed high level of awareness about the DNA database benefits. Around 57.3% of the participants knew that DNA database can control the crime, identify unknowns, and help in disputed paternity and sexual crimes. Our results agree with Maguire et al., [10] who reported that several na-

Table 3. Acceptance factors and barriers influencing the decisions of starting and participating in Egyptian National forensic Database

	Variables	No (%)
Acceptance factors	To be useful in criminal and civil issues (more accurate)	55(25)
	To advance legal investigations	51(23)
	For protection of Egyptian society	40(18)
	Like the idea of starting modern technology	37(16.8)
	To have better life development through researches	37(16.8)
Barriers	Their needs for more legal regulation	21(47.7)
	Lack of information	8(18)
	Fear of violation of individual's privacy	6(13.6)
	Fear of uncontrollable access and misuse of the database.	5(11.3)
	It is not for me it is for criminal only	4(9)

No: Number

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Table 4. chosen samples and its preservation period in Egyptian National forensic Database

Variables		No (%)
Samples to begin Egyptian National Database	Criminals & Suspect of offences	44(16.1)
	Unknown e.g. missed persons and dead bodies	16(5.8)
	New live birth	28(10.2)
	All Egyptian individuals	36(13.2)
	Crime scene stains	80(29.4)
	All	64(21.4)
	No answer	4(1.4)
Preservation periods	Discarded after performing DNA profile	20(7.3)
	5 Years	12(4.4)
	10-20 Years	16(5.8)
	>80 Years	80(29.3)
	When no longer considered useful	84(30.8)
	Kept until solving a crime	4(1.4)
	Upon individual request	4(1.4)

No: Number

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tional DNA databases share similar socio-ethical concerns and comparable aims, such as decreasing crime, aiding in identification of offenders, and crime detection.

Despite the interests of 80.8% of study participants to start and share in DNA database, there were many encouraging and discouraging factors influencing their participation. Gamero et al. [11] found that more than half of study participants in Spain disagreed with Spain's need for a national forensic database. They opposed to include all citizens samples in the database without their consent, and believed that the public authorities had no right to interfere in citizen's private life [12]. Moreover, the main problem of our participants in joining the END was the need for strict legal regulations to protect their privacy and rights.

The great majority of the participants accepted starting DNA database with criminals, citizens, unknown and unknown stains. However, most of Portugal population, in Machado and Silva [7] survey study, refused to include all citizens in DNA database and suggested to include criminals only. Moreover, standard set of European genetic systems recommended that all criminal DNA profiles in European databases be included [4]. Saving samples, over a certain period of time, was accepted by 80.8% of our participants. This finding was consistent with Gamero JJ et al. and Kovacs DW et al. studies [11, 13].

Despite destroying individual's DNA sample after obtaining DNA profile, which protects privacy by preventing the sample's re-analysis (to obtain personal health information), most participants agreed to save samples over

certain period of time as it might be helpful for re-profiling if the data was missing, and it might also be useful in upcoming years with science development to be an access for more information. We were in the same line with Jens and Berlingske [14] who reported that some countries, for example, Scotland keep the DNA samples indefinitely but there are a wide variety of rules for controlling the samples saving and destroying. Disclosure of the individual's genetic profile among public community was completely rejected by all participants; this agrees with GeneWatch [15] as there could not be enough security. More than half of the participants believed that physicians, especially forensic doctors should have free access to DNA profile. This would limit the power of enforcers regarding the collection, analysis, preservation of biological samples and ensure that collected samples would be carried out under appropriate private conditions [16].

Almost all participants stressed on clear regulations to control Egyptian National Database e.g. access to, insertion, and deletion of profiles. In the absence of such clear laws, the society would distrust the nature of the protection afforded by the legal system and would be interpreted as interference in the civil liberties and human rights of the individual [11, 16]. Those who refused to include their DNA profile in the national database considered their unawareness of national database's regulations regarding its uses and access as their main reason [7]. The judiciary's control might resolve existing concerns regarding discrimination and privacy [17]. Although Brazil had no law regulating their DNA database, the first DNA database of biological evidence from

sexual assaults and rapes was established in Brazil by the Forensic DNA Research Institute of Federal District Civil Police to aid in criminal investigations [18]. This indicates that each country should have its own regulating rules to control its national forensic DNA database.

5. Conclusion

There was an increased medical awareness about DNA profiling. DNA profiling is important in civil and criminal fields. Initiation of Egypt national DNA database on well-organized programs is an important step in justice's field progression but it needs regulating laws controlling its access and usage.

By rising incorporation of technology in criminal investigation, new or modified regulations will develop in collection, analysis, and storage of samples and DNA profiles among various countries. In Egypt, there are no specific laws authorizing DNA profile databases. This study showed that it would be wise to prepare some general models and regulations that resolve any doubts in this regard and provide a balance between public security and the individual liberty.

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Conflict of Interest

The authors declared no conflicts of interest.

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