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Roles of DNA Molecules in Identification of Unclaimed or Missing Dead Bodies Presumed Death in Western Kenya Utilizing Comparison Standards

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Abstract

Medico-legal form bench-mark of health determinants and provide integrated services towards criminal justice support in health. Globally, over 44 million cases of unclaimed bodies or missing dead persons (UCBOMDPs) occur annually 88% of these cases are in Sub Saharan Africa. In Kenya and western Kenya rate of UCBOMDPs from road traffic accidents accounts 30% and 10% respectively 80% of these UCBOMDPs are associated with limited access to affordable quality comparison tests for identifications attributed to the increased prevalence of health and occupational hazards in population health. The current investigations aimed at identifying UCBOMDPs from public mortuaries by quantifying demographic data and determining DNA finger print and chemical tests (electrophoresis) using comparison standards. In Exploratory and cross sectional 235 respondents were investigated through purposive and saturated sampling using Finger print forms structured questionnaires focus group discussions (FGDs) observations and key informant interviews (KII) guides to collect data. Analyzed statistical inferences and contents analysis to saturation, results showed, 94% of mortuary service providers in tier 4 were primary and secondary education drop outs of males on contract jobs with limited access to quality services in mortuary science contrarily to females and males counterparts from tiers 5 and 6 mortuary facilities on permanent and trained. Rate of gross infection in public mortuaries and congestion had significant OD (2.2, 0.44). Prevalence of male being admitted as UCBOMDPs was significant due to being family bread winners OD (8.3, 0.12), RR (0.33), 95% CI (1.23, 1.02), significance were associated with male deliberately leaving IDs in houses due to identity. Utilization of Dactylography was significant than electrophoresis method, P value (0.67), OD (4.8, 1.3) due to high costs, procedures, DNA quantifying reagents and next of kin sampling for comparisons. Need for quality service advocacy in Department of Forensic Pathology to develop subsidized functional DNA chemical structures.

Keywords: Medico-legal; Demographic indices; Dactylography; Electrophoresis; Comparisons; Forensic pathology

Materials and Methods

Introduction and background information

Medico-legal approaches enshrine forensic pathology which deals with roles of multidisciplinary teams (Mortuary service providers) and next of kins in synergistic partnership with other integrated professionals to discover and achieve criminal justice support in health and comparison studies to describe manner (natural, accident, suicide, homicide or undetermined) and state the actual cause (disease, injury or abnormality) of death [1,2]. Chronic prevalence of decomposing death bodies is due to ineffective utilization of medico-legal laws on UCBOMDPs [3,4]. Investigations of medico-legal approaches are multifaceted and require expertise of multidisciplinary teams of skilled practitioners from various fields with appropriate I-24/7 communication network that enables investigators to access INTERPOL's range of criminal databases based on their demographic data and underlying causes such as persons missing by design pick pocketing while still in crime of scene or with health problem INTERPOL [5,6]. However utilization of medico-legal approaches by mortuary service providers from public mortuaries in western Kenya based on demographic characteristics and underlying causes remains unclear.

Globally, World Population Data (WPD) sheet indicates a global population clock of crude mortality due to UCBOMDPs in developing countries of 44 million every year 88% of these cases are found in Sub Saharan Africa (SSA) [7]. Global Road Safety Partnership (GRSP) on the other hand demonstrates a mortality of UCBOMDPs of 1.2 million per year majority being attributed to over speeding and reckless driving over which 80% prevalence results to unclaimed death, injuries and disabled from road traffic accidents which are against achievement of Road safety target on Sustainable Development by 2030 [2]. Those who succumb to death mostly become UCBOMDPs in public mortuaries which lead to high prevalence of infectious diseases and other mortuary health hazards thus need accessible and efficient DNA method to help trace their name promptly [8]. The cumulated decomposing death bodies in public mortuaries in western Kenya are associated with limited capacities and inefficient utilization of DNA pathways like locard's method as basic health determinants of health support to reduce disease incidence and other associated mortuary occupational hazards [9,10]. Globally, INTERPOL country members use DNA Gateway to access UCBOMDPs and retain ownership of their profile data and control its submission by country members and allow its destruction in accordance with their national laws and these remains unstated in western Kenya [11].

In Kenya, majority of UCBOMDPs are mainly attributed to road accidents with 3,000 unclaimed bodies in every 10,000 deaths Police these bodies are admitted to public mortuaries and overstay causing a budget strain on the health sector [8,12]. Cumulated UCBOMDPs in

most pubic mortuaries are due to persistent underutilization of medico-legal approaches as basic health determinants which result to over stayed bodies to decompose. Majority of adults victims who die during the accident, lack national identity cards, which could be used as cold hits from national DNA data base in the Central Bureau whereby finger print stain impression by poroscopy in locard's method is matched with a profile of persons on the database who are not suspects once identified it is linked to I-24/7 communication network of INTERPOLs to report on the originality of the UCBOMDPs [13-15]. As such the study intend to use Police finger print forms to take finger prints impression as double blind exposure to identify UCBOMDPs from public mortuaries using national data base from Central Bureau of Statistics, Kenya [15].

The first government DNA database was set up in April 1995 in south Africa adapting from the United Kingdom for fingerprints utilization by authorized users in member countries to view, submit and cross-check fingerprint records using I-24/7 communication network [16]. This was done to secure the global network, by user-friendly automatic fingerprint identification system (AFIS) [11]. The second DNA data base was set up in New Zealand and then France in 1998. By applying finger prints impression, the evidence left at crime scene is linked with serial offenders with rapid exclusion from ambit of investigation of suspects who are already on a database and whose profiles do not match [17]. When using I-24/7 communication network, investigators access INTERPOL's range of criminal databases installed at all 190 National Central Bureaus and beyond to frontline officers such as immigration and customs officials [6]. DNA molecule consist of a Curled ladder of about 3 billion rungs with natural base of chemical: adenine, cytosine, thymine and guanine which provide information contained within human finger print [18]. This information is unique and inherent basing on chemical arrangement [19].

In Kenya, persons above 18 years are legally required to acquire national identity card whose copy of DNA finger prints are kept in national DNA database as combined DNA Index System CODIS for future forensic evidence of citizenship and criminal justice [8,15]. Despite the fact that, both manual and electronic DNA methods of testing are used globally to trace UCBOMDPs convicted offenders and to unsolved crime evidences the utilization of national DNA data base by communities of Western Kenya to identify UCBOMDPs from public mortuaries as a basic health determinant of medico-legal strategy remains unclear.

Specific Objectives

- To Quantify Demographic Characteristics, manner and causes of UCBOMDPs in Public Mortuaries of Western Kenya.
- To Determine Pathways to DNA Fingerprint Tests as Basic Health Determinants in Identification of UCBOMDPs in Public Mortuaries by Mortuary Service Providers.

Demographic characteristics manner and causes of UCBOMDPs in public mortuaries

Unclaimed or missing dead person UCBOMDPs is anyone who is reported unclaimed or missing to police whose whereabouts death are unknown and where there are fears for safety or concern for welfare of their next of kin of that person [11]. Statistic from police and non-police tracing agent's service shows about 30,000 people are reporting missing in Australia each year. Majority (approximately 285,000) are reported to police most reported to police missing, (99.5%) are located within a week 95% within a month while in Kenya like SSA information on rate of identifying missing persons by the police remains undiscovered [2]. Demographic data of (UCBOMDPs) include only age, gender, but there is need to add also country of birth, occupation, marital status and living arrangements [20]. Missing person population reflects multicultural diversity of population [21]. However the information about unclaimed or missing dead persons in SSA, and western Kenya remains undocumented. Men and females are reported missing persons almost equally but more children and young people (55%) are reported missing than adults [11]. However when UCBOMDPs are included in the investigation study their data from public mortuaries is not well documented.

Families and friends of UCBOMDPs suffer significantly in health, work, quality of life, emotional relation, economic and other impacts associated with unclaimed or missing dead person incidence for every case of missing of missing person an average of 100 people are affected in some way either emotionally by health or employment related impact effect on quality life or on relationship or a combination of some or all these therefore while the number of people reported unclaimed or missing dead persons to police per year some of these people their impact remains on going for years and even decades because of limited methods available to trace them completely [1,20,22]. Magnitude of the impact when one goes missing has not been recognized widely by the community as a whole and need to be addressed in partnership between the government and the community [23]. Economic cost of locating UCBOMDPs and the associated estimate in developed countries are 1851 dollars per person by government agent and 2360 dollars for non- police tracing agencies [24]. However, many cost components cannot be accurately estimated example: emotional suffering and relationship impact have cost but not captured as an expenses implication. Socio-economic reason includes resource constraints for burial and families living far from poor backgrounds which are similar cases of public mortuaries in Kenya and its western region at large [24].

Manual DNA fingerprint method in identification of UCBOMDPs from public mortuaries

Using right forensic methods, the sample containing preserved DNA materials is analyzed by poroscopy in locard's method to provide a DNA profile that can be compared against other DNA profiles within a certain range database from central bureau of statistics (Figure 1) [4,25].

These provide evidence on valid hits cold of persons-to-scenes, scenes to scenes or persons-to-persons match, where no previous connection was known. Crime or INTERPOL offices do not keep any nominal data linking a DNA profile to any individual [2]. DNA profiles are simply lists of numbers based on the pattern of an individual's DNA producing a numerical code which can be used to differentiate individuals [23].

This profile does not contain information about a person's physical or psychological characteristics diseases or predisposition for diseases [21]. Member countries that use the DNA Gateway retain ownership of dactylography profile data and control its submission access by other countries and destruction in accordance with their national laws [26].
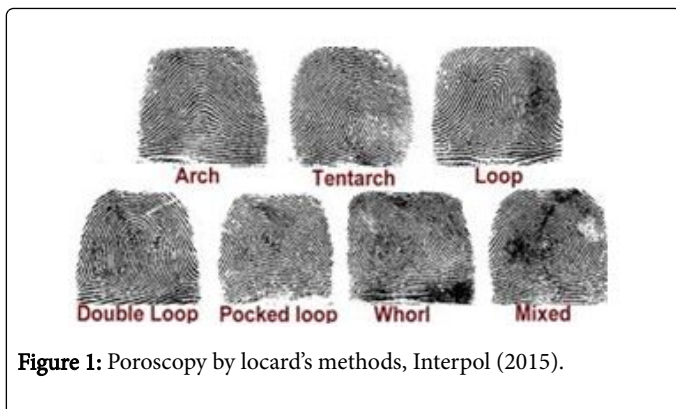
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Figure 1: Poroscopy by locard's methods, Interpol (2015).

Manual DNA dactylography has hastened finger print classification globally and regionally such manual systems include: Roscher, Vucetich and Henry or Lorcards Systems [27]. Roscher system was developed in Germany while Vucetich in Argentina. Henry/locards system of classification was developed in India and adopted by most English-speaking countries like Kenya for the identification of UCBOMDPs using DNA bank from Criminal Investigating Department (CID) and Central Bureau of Statistics (CBS), which are National DNA Data Base Kuhne is also called Combined DNA Index System (CODIS) [9,23]. CODIS provide finger print evidence in authentication, crime justice and forensic audits for the identification of UCBOMDPs [28]. In Kenya, persons above 18 years are legally required to acquire the national identity cards whose DNA finger prints data are stored in CODIS for future identification of citizenship and also in criminal investigation [3,25].

However, implementation of Locards or Henry's manual system of DNA finger print test by poroscopy as a basic health determinant of medico-legal approaches in the Identification of UCBOMDPs from public mortuaries in Western Kenya by mortuary service providers remain underutilized and in accessible [29].

Restriction fragment length polymorphism in identification of UCBOMDPs from public mortuaries

Electrophoresis is a chemical technique used to separate and sometimes purify macromolecules of proteins and nucleic acids that differ in sizes charges or conformations. Agarose electrophoresis separates different DNA molecules according to their sizes. The gel is stained with ethidium bromide to allow visualization of DNA bands as they resolve along the gel [26]. Restriction Fragment Length Polymorphism (RFLP) is an electronic DNA finger print test which analyzes variable lengths of DNA fragments in a sample after digestion by endonuclease enzyme [30]. The product formed possesses specific cuts of DNA sequence pattern called restriction endonuclease recognition sites [25].

The presence or absence of certain recognition sites in a DNA sample generates variable lengths of DNA fragments [29]. These fragments are separated in a gel electrophoresis then hybridized with DNA probes that bind to a complementary DNA sequence in sample [31]. Although (RFLP) is a global technique in research laboratories, there is limited and scarce investigative evidence to show is utilized as basic health determinant of medico-legal concept in the identification of UCBOMDPs from public mortuaries by mortuary service providers in western Kenya.

Polymerase chain reaction analysis in identification of UCBOMDPs from public mortuaries

Polymerase chain reaction (PCR) is a common electronic/chemical DNA method that is used to generate millions of exact copies of DNA from a suspect biological sample [30]. The ability of PCR to amplify such tiny quantities of DNA allows highly degraded samples to be further analyzed by using high-resolution gel electrophoresis [29].

Even though some facilities in Western Kenya are use PCR to screen HIV seropositive population its application as a basic health determinant of medico-legal concept in the identification of UCBOMDPs from public mortuaries in Western Kenya remains unclear and unaffordable [32].

Short tandem repeat analysis in identification of UCBOMDPs from public mortuaries

Short tandem repeat STR is also an electronic/ chemical DNA test which evaluates specific loci within nuclear DNA [33]. The variability in STR loci is applied to distinguish, one DNA profile from another [34]. In America, the FBI uses a standard set of 13 specific STR loci in CODIS software, FBI Department to identify UCBOMDPs, convict offenders and in unsolved crime scene evidence [15,35]. The odds that two individuals will have the same 13-loci DNA profile, is about 1 in every one billion samples, unless they are identical twins or triplets [18,20].

Despite the fact that short tandem repeats software are used to identify UCBOMDPs and resolve unsolved crime offenders globally in Western Kenya there is no documented evidence to show utilization of short tandem repeats as the basic health determinant of medico-legal concept to identify UCBOMDPs from the public mortuaries [32].

As such, the current proposed study will evaluate methods of DNA finger print tests used in public mortuaries in Western Kenya, as basic health determinants of medico-legal approaches in the identification of UCBOMDPs from the public mortuary by mortuary service providers.

Methodology

Study design

Study used cross-sectional and exploratory designs where insights of investigations and exposures of sampled respondents and their outcome are measured at same time respectively to determine levels of basic health determinants of medico-legal approaches in identification UCBOMDPs from public mortuaries in western Kenya. Quantitative data was collected by formal survey using a structured questionnaire on service providers and Police finger print forms were used to take finger prints from UCBOMDPs in cold rooms as double blind test in the national DNA data base. In qualitative survey exploratory design was used to collect data on insights of investigations using a focused group discussion (FGD) guide and Key Informants interviews (KII) with mortuary service providers. In observation 3Ls (look listening and learn) tools were exploited during transect mapping with help of observation checklist to gather medico-legal information.

Study population

Study was purposive to majority of mortuary service providers and health professional attached to provide services into mortuaries besides double blind finger prints testing on UCBOMDPs lying in public

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mortuaries during the survey period. Mortuary service providers and health professions involved in the study were: Death investigators, Police officers, police wardens, and crime scene investigators, liaison managers, coroners/medical examiners, pathologists, forensic technologist, forensic anthropologists, and forensic odontologists, administrators, Community-Owned Resource Persons (CORPs).

Inclusion criteria/target population

All service providers and health professions who have worked for more than three months in a health facility or mortuary and attached to issues affecting medico-legal approaches as basic health determinants in identification of UCBOMDPs from public mortuaries to improve public health in Western Kenya were used as target population. Unclaimed bodies or missing dead persons aged above 18 months were also targeted in the general evaluation and facilities had memorandum of understanding to participate in medico-legal approaches with the structural support from National medico-legal unit.

Exclusion criteria/limitation of study

We do acknowledge certain limitations of this study that our findings and results of this study were based on respondents who provided in any way mortuary services to public mortuaries and finger prints of the 73 UCBOMDPs found lying in public mortuaries in western Kenya during the period of our six months study (July 2016 to February 2017). Service providers and health professions, whose services delivery are not related to medico-legal approaches, like UCBOMDPs found aged below 18 years were not sampled in the double blind study since, they lack a copy national identity card to be traced in National data base bureaus.

There was also possibility of response bias by detective, police warden or morticians during body admission in the morgue or during data collection to provide wrong responses or some data may be missed out during cleaning process. Also recall bias was bound to occur during interviews in the explorative discussions in FGD and KII.

Sampling design

Saturated purposive sampling designs were utilized to select and determine the study subjects basing on specific research question. A sampling frame was developed from mortuary service providers. The facility was evaluated based on opinions of key informants and on the total number of service provider in relation to UCBOMDPs present at that point in time. Questionnaires and police finger print forms were administered, to the pre-trained personnel and corpses respectively. Upon entry into a health facility, mortuary service providers or health profession were asked to draw a list of staff present and those of unclaimed bodies or missing dead persons admitted by detective/ warden Police. Demographic data were recorded and fingerprint stain impression taken using a roller-bad and black ink, then transferred onto a police finger print form. This process was carried out until the required sample size of 73 finger prints was obtained.

For qualitative focus group discussion FGD and key informant interview KII questionnaires guides were administered explored and sub themes were discussed to saturation with all mortuary Service provider's health professional respectively. Transect mapping and observation by listening, learning and looking on other related basic health determinants of medico-legal approaches provided vital

information not captured before, by the chief researcher questionnaires.

Sample size determination

Sample size was determined by Fisher formula and adjusted by finite formula in twenty (20) public health facilities implementing medico-legal concepts to identify UCBOMDPs public mortuaries in the estimated target population of 600 respondents [36].

Fisher's formula states: $n=(Z^2 pq)/d^2$

Where,

n=target population greater than 10,000

Z=degree of confidence (1.96)

p=Population of estimated study/target population (0.50)

q=proportion of the acceptance proportion significance of respondents estimated to be traced. (0 .50)

d=level of statistical test, 0.05

$n=(1.96)^2 (0.5) (.05)/(0.05)^2$

n=9604/25

n=384

Adjustment of the sample size was done using Finite population correction formula because estimated sample size from public health facilities in western Kenya was below 10,000 respondents [36].

Hence corrected sample size: nf=n/(1+(n/N))

Where

nf=desired sample size of respondents was less than 10,000

n=desired sample size of respondents was more than 10,000

N=total estimated study / target population size (600)

Hence:

Nf=384/1+({384}/600)

= 235 respondents

The number of samples, from each facility was purposively saturated based on number of mortuary service providers deployed and UCBOMDPs present in the sampling frame during that period of study.

Procedure of manual DNA fingerprint test

The following procedure was exploited in the study area to obtain finger print impressions from suitable UCBOMDPs, for further investigation from CID Headquarters in (Figure 2).

- Cleaned and disinfected finger prints of UCBOMDPs, with plenty water and then wiped with 70% alcohol to air dry.
- Spread finger print dye on ink pad evenly using a roller.
- Use police finger print form to take prints as guided by the form.
- Went with impressed forms to National bureaus/CID headquarters to trace the finger by comparing with stored standard finger prints using magnifying lens.
- Traced and found finger prints contained individual ID number which send national registration of persons to link and identify,

UCBOMDPs, thus allow subsequent medico legal procedure to be carried out.

Figure 2: Manual procedure for dactylographic analysis.

Comparison procedure for dactylographic analysis

- Comparison analysis was performed by comparing the 73 evidentiary finger print to that of a known subject in the national bureaus/CID headquarters which were captured when taking national Identity Cards.

- If there was no subject to compare the evidentiary print, this print was entered into the Automated Biometric Identification System (ABIS) for search against the friction ridge detail in ABIS which contain the national database.

- Comparisons were reviewed by an additional examiner to assure correctness and the quality of the work produced, thus providing another level of scrutiny to the conclusions made during the examination of latent print evidence before concluded trace and not found.

Procedure of extracting DNA from bones of grossly decomposed or burnt bodies

Electrophoresis is a technique used to separate and sometimes purify macromolecules of proteins and nucleic acids that differ in sizes charges or conformations. Agarose electrophoresis separates different DNA molecules according to their sizes. The gel is stained with ethidium bromide to allow visualization of DNA bands as they resolve along the gel [26].

Tris Borate EDTA (ethlylenediaminetetra acetic acid), (TBE), and Tris Acetate EDTA (TAE), buffers are used to provide ions that carry a current at a relative constant PH value most common buffers for DNA nucleic acid have PH of 8.3 to keep DNA depronated and soluble in water TBE is media of choice because contain Borate that maintain integrity of DNA and inhibitor of enzymes.

Acetate gives improved separation of large DNA fragments. In agarose electrophoresis DNA is added into pre-casted wells in the gel and when current is applied phosphate backbone of DNA and RNA molecules are negatively charged thus making the electric field to be positively charged on the anode. Spiral DNA run faster than open-circular DNA while linear DNA runs the fastest in the gel due to its less frictions of contacts in media.

During our study to extract DNA from bone, we cut detective bones samples of UBOMDPs exhumed or grossly decomposed bodies into small sizes to increase DNA surface area in well labeled containers.

Samples were washed in ascending grades of alcohols to remove traces of fats and rinsed in plenty water bleached in 1% hypochlorite for 1hour then rinsed in plenty running tap water to eliminate excess hypochlorite in tissue. Dried in oven at 55^0C for 2hours then set for grinding in liquid nitrogen at -196^0C

Grinding DNA bone samples in liquid nitrogen at -196^0C

Grinded DNA samples in liquid nitrogen to increased surface area of DNA from 0.05-0.1 mg/ml. In case 0.05 ng sample was harvested it became insufficient for DNA analysis, thus we extracted more from raw bone samples.

If sample mass weight more than 0.1 mg/ml DNA the quantity was reduced to prevent obscuring of final results during analysis. Grinding was done by filing medium and small sizes of DNA bone particles into 4 vails containing iron rods in freezer miller machine (Figure 3). Set transfer line of liquid nitrogen (Figure 4) to fill specimen compartments.

Switch on electronic compartment of the freeze miller for 3hours to grind samples into fine raw DNA powder, which was further used to extract pure DNA using Tris borate EDTA TBE, buffer and decalcifying [26].

Figure 3: Model of liquid nitrogen DNA bone grinding machine.

Figure 4: Model of liquid nitrogen with transfer lines connect to DNA grind miller.

DNA extraction by phenol chloroform iso-amyl alcohol

Prepared Phenol Chloroform Iso-amyl alcohol in ratio of 25:24:1 then mixed with Tris Borate EDTA (TBE) buffer in ratio of (1:1). Aspirated 500 micro liters of buffer added to 1 g of raw DNA material

incubated at 55^0C for 2hours before centrifuged at 13000 rpm for 10 minutes as we discarded supernatants repeatedly three times. We added 500 µl of chloroform into filtrate and centrifuge for 3 minutes discarded supernatants. Added 1000 micro liters of absolute ethanol into filtrate and left for overnight at room temperature. Centrifuged at 13000 rpm for 15 minutes, dislodged supernatant then added 70% ethanol to DNA filtrate centrifuged for 10 minutes discarded supernatant and then air dried pure DNA filtrate for 1 hour before quantification was done with DNA quantifier kit from Boisytems (Figure 5) the kit classified XX and XY sex chromosomes contents of bones exhumed, in line with the study by Mendelian on genetic inheritance in among the family members in the population health [26].
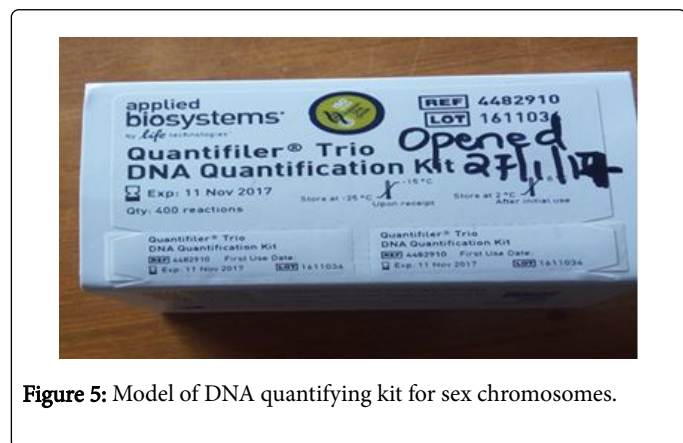

Figure 5: Model of DNA quantifying kit for sex chromosomes.

Principle of gel electrophoresis of DNA samples

When charged protein are placed on an electric-field, molecules will migrate towards one of the electrodes depending on the net charge of molecules, the phosphate backbone of DNA and RNA (nucleic acids) molecules are negatively charged, hence will be attracted to positive anode.

Separation of protein materials are determined by density of the migrating molecules in the supporting matrix which act like a sieve to allow only smaller molecules to migrate faster than larger ones [26].

In our study TBE buffer and 2% agarose was mixed and heated in a microwave to boil then taken out and swirled gently until all agarose was melted. Cooled the flask of agar up to 55^0C and added 2 µl of ethidium bromide which stained DNA under detection. Set the comb in the groove at back end of the gel and made borders using masking tape on the end of gel tray. Poured melted agar into tray up to 1/3 length less than the comb tooth and allowed the gel to cool and added little buffer on the gel work as a lubricant. Removed the comb straight and left it with tiny wells where teeth were.

Removed masking tape without tipping up gel to control slipping off of the gel placed the gel tray between the two posts of electrophoresis box ensure that well of the gel are place on the negative anode. Pour TBE buffer in the box until barely covered by the gel Pipette 5 µl of DNA loading dye and 10 µl of DNA samples into each well in the gel and closed the box with a lining up to electrodes posts and slide the top cover completely.

Confirmed polarity and turned on the power supply and adjusted voltage to 100-200 voltage, the channel switch lets us to read voltage of gel box depending on location of the switch to allow the migrating dye

to occur. When the furthest band of blue color reached ¾ end of the gel the electric power was switched off and readings were taken and viewed under UV trans- illuminator.

Process of DNA extraction from the bones, quantification, sex classification and analysis take more than 2 weeks to provide results.

Results and Findings

During our study in public mortuaries of western Kenya, 235 respondents of were used in exploratory and cross sectional designs of mixed research in purposive and saturated sampling designs to collect data through survey and interview using FGDs, KIIs and observation guides.

Whereby, 70% (162) respondents with a mean of 1.06, with deviation of 0.23 were mortuary service providers and 30% (73) were (UCBOMDPs) finger prints impression (Blueprint for dead bodies sort of an instruction manual that contains genetic information) which were traced in CID headquarters for comparison studies, using magnifying lens comparator machines or Automated Biometric Identification Systems (ABIS) (Table 1).

Diversity of (UCBOMDPs)	Valid case	Percent (%)
Presumed dead while ID pick pocket at crime of scene	62	85
Presumed dead with other associated crimes	11	15

Table 1: Percentage prevalence of UCBOMDPS presumed dead in public mortuaries.

Gender social expression of a person's identity in relation to social role and behavior results indicated that majority 94% (153) of mortuary service providers with mean of 5.33 and STD deviation of 1.47 were males with Spear man correlation value of 0.315.

Males had limited knowledge on basic mortuary science compared to 6% (9) female counterparts' mortuary with good knowledge on standard operating procedures (SOPs) on quality medico-legal approaches (Figures 6 and 7).
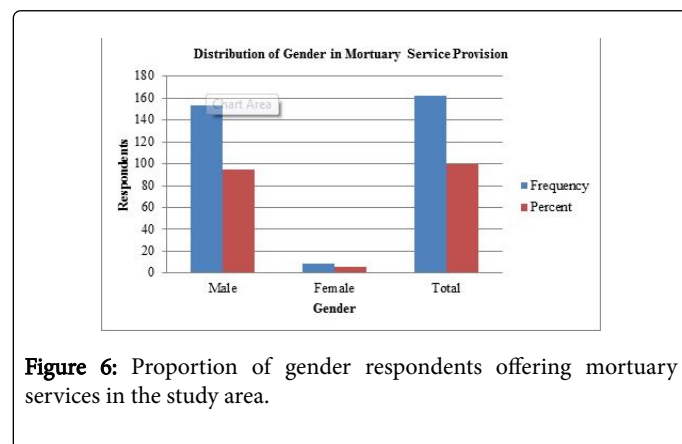

Figure 6: Proportion of gender respondents offering mortuary services in the study area.
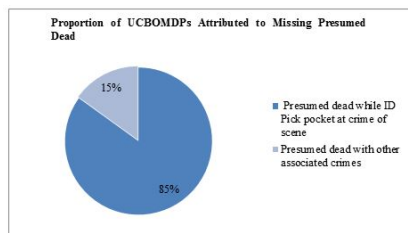
Figure 7: Proportion of UCBOMDPs attributed to missing presumed dead with national ID pick pocket at crime of scene and others associated to missing or unclaimed crimes in the study area.

In our study on determinants of medico-legal approaches to identify UCBOMDPs 73 coded samples of manual finger print impression were taken as part of our target population UCBOMDPs for comparison analysis, with copies from national data base/Bureaus (Figure 8). Manual DNA profile (blueprint for our body's sort of instructions manual that contains genetic information) was compared against with another copy of DNA finger print profiles in the National database located in national registration of persons and finger print units in the CID Headquarters. During the study we found out that manual DNA finger print profile does not contain information about a person's physical or psychological characteristics, diseases or predisposition for diseases but it contain ID number encrypt on the manual DNA finger print copy in national Bureaus.
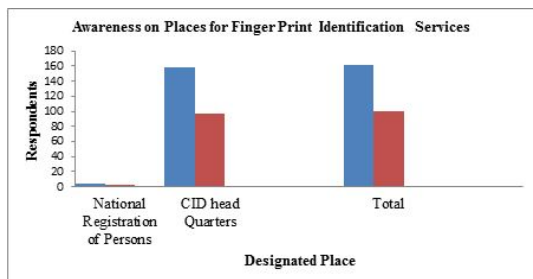

Figure 8: Proportion of the study population on service awareness on designated places to trace UCBOMDPs.

During our comparison analysis, it was revealed that our society use manual finger print of Henry's comparison method to identify UCBOMDPs. Comparison fingerprint impressions are copies of our national identification cards filed in national registration of persons, Bureaus of Coast, Western, Central, Rift valley Nyanza, Eastern and north Eastern Bureau (Table 2).

Parameters	Frequency	Percent	Valid Percent
National registration of persons	4	2.5	2.5
CID headquarters	158	97.5	97.5
Total	162	100	100

Table 2: Designated sites for finger print test identification.

In our study we also realized that grossly decomposed bodies or burnt, obstruct production of quality finger print impressions are done electronically by chemical methods from the government Chemist Laboratories using bones and cartilage samples. But the procedures used are unaffordable and inaccessible.

"Quality finger print is taken on a freshly body before embalming or seven days old in cold room which is not easy for detective police to send signal 7 and 8 promptly in public mortuary. FGD discussion held tier six facility in Eldoret on 23.11.2016"

Our investigation on efficiency uptake of finger print by detective police from UCBOMDPs, in public mortuaries of western Kenya revealed that causes related to dead prisoners were tackled more effectively and efficiently compared to civilian cases which were handled by detective/crime police with estimated risk (1.0, 3.44) indicating there exist delay incidences of civilian UCBOMDPs in comparison to cases involving prisoners and if UCBOMDPs ID is brought in the facility after admission always assumed that is not the exact image of dead person until finger prints are taken for comparison because missing presumed dead person's ID was not found at crime scene as an evidence of medico-legal-approach.

"Prisoners' finger prints are taken promptly by prisoner wardens within seven days of admission in mortuary, while civilian UCBOMDPs once admitted by detective police open file and are left in hands of mortuary staffs waiting for mass disposal in next doesn't come to search for. FGD discussion in Tier five facilities in Kakamega on 17.11.2016"

On Restriction Fragment Length Polymorphism (RFLP) as a method as a medico legal approach in western Kenya we discovered that is rarely used as one of the chemical methods due to the high cost involved and limited appropriate technology available for the population health (Figure 9).
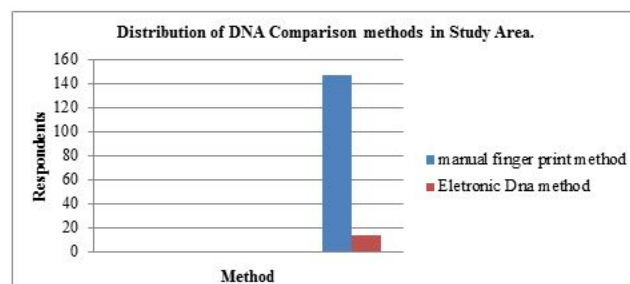

Figure 9: Proportion among the population health; using manual DNA finger print and electronic methods to identify UCBOMDPs during the comparison studies.

Polymerase chain reaction (PCR) is a common chemical/electronic DNA method used to generate millions of exact copies of DNA from suspect biological sample/grossly decomposed bodies. However, the study revealed that facilities in Western Kenya have limited utilization/application of PCR as a basic health determinant of medico-legal approach in the identification of UCBOMDPs from public mortuaries to improve public health and also PCR method remains inaccessible and unaffordable has discussed with senior National registrar of persons during key informant interview:

"We rarely use electronic DNA methods in Kenya because are very costly, and take longer period to provide results though circumstances of grossly decomposed bodies beyond recognition forces us to use KII informant interview held on 30. 11. 2016 with senior National registrar of person in Nairobi."

Short tandem repeat STR is another type of chemical/electronic DNA method in which was demonstrated to have limited uptake in the study area as basic health determinant of medico-legal concept to identify UCBOMDPs from the public mortuaries due to cost implicated and limited resources accessible by public facilities and was emphasis in a KII discussion.

Discussion

In our study on determinants of medico-legal approaches to identify UCBOMDPs, 73 coded samples of manual finger print impression forms were taken as part of our target population on unclaimed or missing dead persons for comparison analysis with copies from national data base/Bureaus. Manual DNA (blueprint for our bodies sort of an instruction manual that contains all the genetic information) profile was compared against with another copy of DNA finger print profiles in the National database located in national registration of persons and finger print units in the CID Headquarters [8]. Results aimed to provide evidence on valid hits cold of persons-to-scenes, scenes-to-scenes or persons-to-persons match. Manual DNA finger print profiles are simply lists of numbers based on patterns of an individual's DNA done during the first enrolment for National Identity cards produced a numerical code which can be used for comparison study like the study in South Africa [16]. This profile does not contain information about a person's physical or psychological characteristics, diseases or predisposition for diseases but it contain ID number encrypt on the manual DNA finger print copy in national Bureau this study is in line with the study by Ashbaugh on importance of friction ridges of skin a comparison of finger prints scrutiny during identification process [33].

Our study also revealed that, success of comparison study in the national data base is determined by quality processing of neat manual DNA finger print in order to provide the blueprint for our bodies sort of an instruction manual that contains all the genetic information. DNA analysis is actually very reliable and probably the most accurate personal identification system that we have. It ranks right up there with fingerprinting; these findings are similar with study with Khune on the origin of classification and uses of finger Prints, an ideal system of identification of missing persons. During our study in public mortuaries in western Kenya we established that all public mortuaries utilize Manual DNA fingerprints similar to Henry Systems in Indian which are found in national registration of persons and CID for identification of UCBOMDPs and Criminal offences as a Combined DNA Index System (CODIS) respectively. CODIS provide finger print evidence in authentication, crime justice, and forensic audits on the identification of the community households which is in line with Fauld study in 1905 and FBI discovery on the outline history of operating techniques of finger print and identification of the missing persons or unclaimed to improve health in the public [21,27,35].

During our comparison analysis study of the manual finger prints, it was revealed that, our society use manual finger print of Henry's comparison method to identify UCBOMDPs. Comparison fingerprint forms are mainly copies our first national identification cards which are filed in national registration of persons Bureaus of Coast, Western,

Central, Rift valley Nyanza, Eastern and north Eastern Bureau, and this study is in line with the studies by Tewari and Ravikumar and Cowger on History and development of forensic in India and friction ridge of skin comparison in finger print [9,19]. In our study we also realized that grossly decomposed bodies obstruct production of quality finger print impressions such cases we opted to outsource electronic methods from South Africa which are costly for public mortuaries in Western Kenya and this study is contrary to study by Jeffrey et al. on importance of utilizing the Hyper variable mini satellite regions in human DNA nature to enhance accessibility and availability of machines to trace the of the finger prints [16,25].

Our investigation on efficiency uptake of finger print by detective police from UCBOMDPs, in public mortuaries of western Kenya it was revealed that causes related to dead prisoners were tackled more effectively and efficiently compared to civilian cases which were handled by detective/crime police with estimated risk (1.0, 3.44) indicating there exist delay incidences of civilian UCBOMDPs in comparison to cases involving prisoners the study is contrary with Interpol study in on role of efficient criminal and intelligent analysis for DNA data confirmation and this is true to our society where by if UCBOMDPs ID is brought in the facility after admission we always assume is not the one until finger print are taken for confirmation because missing presumed dead person's ID was not found at crime scene as an evidence of medico-legal approach [6,35].

Restriction Fragment Length Polymorphism (RFLP), the study discovered that Kenya rarely use (RFLP) electronic method due to cost attached on it and other expenses of technology involved they prefer manual due to its accessibility, affordability and efficiency outcome. The study is contrary to the study by Starrs for investigation incurred on the target population with miscue in fingerprint identification could causes and concerns for further identification and confirmation we needed electronic method to provide the results [17].

On Polymerase chain reaction (PCR), using high-resolution gel electrophoresis. The study discovered that its application as a basic health determinant of medico-legal concept in the identification of UCBOMDPs from public mortuaries, remains inaccessible and un affordable has discussed with senior National registrar of persons during key informant interview which is in line with study by Risinger et al. on cost implications of observer effects in forensic science, hidden problems of the expectation and suggestion when managing public health facilities and diagnostic laboratories in less developed countries [3].

Short tandem repeat STR is another type of chemical DNA test method, which was discovered in western Kenya to remain inaccessible and unaffordable among most facility households as basic health determinant of medico-legal approach to identify UCBOMDPs from the public mortuaries to improve health due to cost implicated and limited resources available in public facilities which is in line with study by Risinger et al. on cost implications of observer effects in forensic science hidden problems of the expectation and suggestion when managing public health facilities and diagnostic laboratories in less developed countries [3].

The incidences and prevalence of males falling into bays of UCBOMDPs, are higher than females with OD (8.3, 0.12), RR (0.33) with estimated risks of 95% CI (1.23, 1.02) significance is intentionally not to walk with national IDs to conceal identity at the scene of crimes and this is similar with the study by Smith and Kaye [8,14]. From our study on utilizations of medico-legal approaches in public facilities we

discovered the headquarters of western Kenya has no any manual DNA linkages (Biometric identification system) with its immediate Counties for purposes of accessibility and affordability of services its households hence contrary to studies by Tewari and Ravikumar and by WHO [9]. Our findings also indicates that utilization of the health determinants of medico-legal approaches by public mortuaries in western Kenya are limited due to existing constant decline in the interlinks of manual DNA finger prints (Biometric Identification System) between the National governments and County governments with the National bureau data base thus long delays or may miss to identify UCBOMDPs

The study revealed that due to prevailing inaccessible, scarcity and unaffordable of medical training institutions to train on quality medico-legal approaches to mortuary service providers have led the health sector to employ unqualified primary and secondary dropouts to work in public mortuaries as morticians on contract terms which is majorly associated with the increased occupational health hazards, marked gross infection in facility utilities and premises besides contributing to recurrent foul and health nuisance to population health. For grossly decomposed or burnt corpses we discovered that the chemical method used to identify UCBOMDPs is very costly (process bones and cartilage samples) to extract DNA then further processed and matched in comparison study at national bureaus or CID headquarters.

Conclusion

Our findings indicates that application of DNA molecules in identification of unclaimed or missing dead bodies presumed death in western Kenya remains limited, inaccessible and unaffordable to our society due to existing limited resources constant decline in the interlinks of manual DNA dactylographic (Biometric Identification System) between the National governments and County governments with the National bureau data base. For grossly decomposed or burnt corpses we discovered that the chemical procedures and processes (electrophoresis) used are very costly and takes longer period to provide results (process bones and extracting DNA and quantifying) to extract DNA then further processed in comparison studies with next of kins sample to provide results.

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