
The impact of forensic genetics on the management of sexual assault victims: A multicentre GE.F.I project

Sarah Gino^{a,1,*}, Marco Bo^b, Rossana Ricciardelli^{a,2}, Milena Alù^c, Iliaria Boschi^d,
Eugenia Carnevali^e, Matteo Fabbri^f, Paolo Fattorini^g, Andrea Piccinini^h, Carlo Previderèⁱ,
Andrea Verzeletti^j, Pamela Tozzo^k, Luciana Caenazzo^j

^a Laboratory of Criminalistic Sciences "Carlo Torre", Department of Public Health and Pediatrics, University of Turin, Corso Galileo Galilei, 22, 10126 Turin, Italy

^b Legal Medicine Unit, Local Health Trust TO5, piazza Silvio Pellico 1, 10023 Chieri TO, Italy

^c Department of Biomedical, Metabolic and Neural Sciences, Laboratory of Forensic Genetics, University of Modena and Reggio Emilia, Policlinico di Modena, Via del Pozzo 71, 41124 Modena, Italy

^d Laboratorio di Genetica Forense, UOC Medicina Legale-Direzione Strategica, Fondazione Policlinico Universitario Agostino Gemelli, Largo Francesco Vito 1, 00168 Roma, Italy

^e Laboratorio di Genetica Forense, Struttura Complessa Universitaria Medicina Legale, Azienda Ospedaliera Santa Maria, viale Tristano di Joannuccio, 05100 Terni TR, Italy

^f Laboratory of Immunology and Forensic Genetics, U.O.L. of Legal Medicine, Section of Public Health Medicine, Department of Medical Sciences, University of Ferrara, via Fossato di Mortara 64, 44121 Ferrara, Italy

^g Unità Clinica Operativa di Medicina Legale e delle Assicurazioni, Department of Medicine, Surgery and Health Sciences, University of Trieste, Ospedale di Cattinara, Strada di Fiume 447, 34149 Trieste, Italy

^h Forensic Genetics Laboratory, Department of Biomedical Sciences for Health, University of Milan, Via Luigi Mangiagalli 37, 20133 Milan, Italy

ⁱ Laboratorio di Genetica Forense, Unità di Medicina Legale e Scienze Forensi "Antonio Fornari", Dipartimento di Sanità Pubblica, Medicina Sperimentale e Forense, University of Pavia, via Forlanini 12, 27100 Pavia, Italy

^j Legal Medicine Service, Department of Medical and Surgical Specialties, Radiological Sciences and Public Health, University of Brescia, Piazzale Spedali Civili 1, 24123 Brescia, Italy

^k Department of Molecular Medicine, Laboratory of Forensic Genetics, University of Padova, Via Falloppio 50, 35121 Padova, Italy

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ABSTRACT

We conducted a retrospective study to analyse the ways in which sexual abuse was handled by the Italian forensic geneticists in order to delineate common strategies in the management of the collected biological samples.

In particular, the results of laboratory analyses were compared with the patients' reports and the outcome of their medical examination, as recorded on standard evidence collection documents. The purpose of this study is identifying which factors could influence the congruence between what was reported and the typing of male genetic profiles.

The project was proposed at the Italian Society of Forensic Genetics and 10 laboratories have joined the study filling in a questionnaire. We analysed 102 cases that occurred between 2006 and 2017. The analysis of the data here presented highlights that the ability to ascertain the presence of male biological material in the collected evidence is not a technical problem for forensic genetics laboratories but it seems to be influenced by other factors, such as how much time elapsed before being taken into care, actions or other relevant events that have occurred between the assault and the medical examination, and the characterisation of the evidence.

1. Introduction

The phenomenon of "gender violence" has its roots in the mists of

time, although it has been perceived as a problem only in relatively recent times.

Violence against women is a violation of human rights, crossing all

* Corresponding author at: Department of Health Sciences, University of Piemonte Orientale, via Solaroli 17, 28100 Novara, Italy.

E-mail address: sarah.gino@uniupo.it (S. Gino).

¹ Permanent address: Department of Health Sciences, University of Piemonte Orientale, via Solaroli 17, 28100 Novara, Italy.

² Present address: Settore Medico Legale, Direzione Generale, Azienda Ospedaliero-Universitaria, via Gramsci 14, 43126 Parma, Italy.

cultures, classes, levels of education, earnings, ethnic and age groups. It has an important impact, not only on the justice and economy of every country in the world, but above all on women's health.

The competence of personnel who come into contact with the abused person in conducting the examination and collecting evidence is of fundamental importance. For these reasons the World Health Organization has drawn up guidelines for the clinical and medico-legal treatment of victims of violence [1]. Despite this, the methods of taking care of women victims of sexual violence remain diverse in Italy. If in some places there are Hospital Trusts equipped with centres dedicated to the rescue of victims of violence, in most cases women turn to the Emergency Department hospitals or to family counselling centres, where care paths (diagnostic-therapeutic-assistance path, P.D.T.A.) or formal protocols are not always available.

We conducted a retrospective study to analyse the ways in which sexual abuse was handled by the Italian forensic geneticists in order to delineate common strategies in the management of the collected biological samples. In particular, the results of laboratory analyses were compared with the patients' reports and the outcome of their medical examination, as recorded on standard evidence collection documents. The purpose of this study is identifying which factors could influence the congruence between what was reported and the typing of male genetic profiles.

2. Materials and methods

The project was proposed at the XVI Congress of the Italian Society of Forensic Genetics. Ten forensic genetic laboratories joined the study. Each laboratory was asked to send data on cases of sexual violence against women, in which the analysis was ordered by Courts, filling in a questionnaire. The questionnaire was divided into three sections: one section was about the characteristics of the centre that assisted the woman. A second part was relative to demographic characteristics of women, features of assault, relationship between women and attackers, time elapsed before the taking in care, behaviour of the woman after the assault and before the medical examination, and injuries reported by the victim. The third one was about the characteristics of the collected biological evidence and the type of forensic genetic analysis carried out.

3. Results

In this paper we present the data deriving from the analysis of some of the information contained in the second and third part of the questionnaire.

We analysed 102 cases that occurred between 2006 and 2017, fifty-nine questionnaires (57.8%) related to episodes of violence suffered by Italian women and 43 (42.2%) by foreign women. The women in the analysed sample had a mean age of 26 (IQR 22–35).

Forty-five women (44.1%) were examined in hospitals where there was a dedicated centre (Sexual Violence Aid Centre –SVS- in Turin and Sexual and Domestic Violence Aid Centre - SVSeD in Milan) or in which there was a PDTA for the taking care of women victims of sexual violence.

3.1. Before the forensic geneticist's activity

For 71 women (69.6%) the collection of biological material occurred within the first 24 h after the violence, for 12 women (11.8%) between 24 and 48 h and for 2 women (1.9%) between 3 and 7 days.

At the time of the medical examination, 91 women (89.2%) were able to reconstruct the assault at least partially. Women said they did not know their assailant in 51 cases (52.1%), seventy-eight women (76.5%) said they had suffered violence from a single individual, while in 14 cases (13.7%) women said they were raped by more than one individual and in 10 cases (9.8%) the data was not available.

Nineteen women (18.6%) had washed themselves and / or changed their clothes before undergoing medical examination.

In 82 cases (80.4%) women were subjected to a vaginal swab, in 39 cases (38.2%) to a rectal swab, in 41 cases (40.2%) to an oral swab, while in 40 cases (39.2%) other biological material was also collected (i.e. subungual scraping). Underwear and/or other clothes were taken in custody in 99 cases (97.1%). The probability of being subjected to the collection of biological material different from a vaginal swab was significantly greater in women who turned to a dedicated centre (SVS and SVSeD) or to a healthcare facility equipped with a PDTA, rather than to other facilities: 60% and 22.8%, respectively ($p = 0.000$).

In 95 cases (93.1%) the task of analysing the collected material was given to the forensic geneticist within six months from the clinical evaluation.

3.2. The forensic geneticist's activity

3.2.1. Characterization of the collected evidence

Cytological examination to find spermatozoa was carried out in 27 cases (26.5%), while the characterization of the origin of evidence was performed, independently from the outcome of the cytological examination, in 89 cases (87.3%). In particular presumptive tests to highlight semen is carried out in 55 cases (61.8%).

3.2.2. Typing of human genetic profiles

In 59 cases (57.8%) the forensic genetic laboratories employed the latest generation methods of extraction (ion exchange columns or magnetic beads), in 14 cases (13.7%) Chelex resin and Phenol-chloroform in 16 cases (15.7%). The differential lysis was performed in 50 cases (49.0%). DNA quantification was carried out in 48 cases (47.1%), using Real-Time-PCR in 19 cases (18.6%).

As regards the kind of markers employed, in 12 cases (11.7%) the forensic geneticist amplified autosomal short tandem repeats (STR), in 8 cases (7.8%) Y-STR markers and in the remaining 82 cases (80.4%) both kind of markers, without significant differences in relation to the nature of the samples.

3.3. Concordance between the story provided by the woman and the results provided by the genetic profile typing

In 74 cases (72.5%) forensic genetic investigations led to the identification of a genetic profile matching the genetic profile of the individual described or identified by the victim as the perpetrator. On univariate analysis the probability of obtaining a genetic profile matching the genetic profile of the assailant was significantly greater when the woman reported she was raped by a single individual (OR 3.8; IC95% 1.0–14.6; $p = 0.036$), in cases where the woman had not taken care of personal hygiene or change of clothes (OR 2.9; IC95% 0.9–9.5; $p = 0.070$), in cases where the woman had been examined in a hospital that developed a protocol for taking care of victims of sexual violence (OR 3.9; IC95% 1.2–12.9; $p = 0.018$) or that had a PDTA for taking care of women (OR 3.1; IC95% 0.9–10.8; $p = 0.055$), and in cases where the forensic geneticist had performed a characterisation of the evidence (OR 4.3; IC95% 1.1–17.0; $p = 0.023$).

4. Discussion and conclusion

Regarding the possibility of identifying male genetic profiles from the evidence collected during the visit, the study shows that this does not depend on the methods of analysis used in the laboratories, which turned out to be almost the same. Instead the possibility to identify genetic profiles useful in the identification of the perpetrator seems to be influenced by other factors, such as how much time elapsed between the event and the sampling, the actual availability of biological material of the aggressor on the body and on the woman's clothes and the characterisation of the evidence.

It is useful to keep in mind that unsolved sexual assault investigations of today may well become the cold-case investigations of the future. This suggests that healthcare personnel must be able to collect and store biological material in an appropriate manner to ensure the possibility of carrying out laboratory investigations to identify the perpetrator as soon as possible [2,3].

Declaration of Competing Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

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