Can DNA Data be used to establish a Cut-Off Time for Juvenile Sexual Assault Exams?

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ABSTRACT

Sexual offenses are recognized to be one of the most critical crimes throughout the world. Therefore, a Sexual Assault Kit is collected and processed to determine if a DNA profile foreign to the victim is present. To have optimal effect, the Sexual Assault Exam should be performed as quickly as possible after the alleged assault. While this is common knowledge, there is often a time lapse between the sexual assault of a juvenile and the Sexual Assault Exam. In turn, the lapse may have adverse affects on DNA quantification results and downstream STR success, decreasing the likelihood of developing a profile while inflicting unnecessary trauma on the juvenile.

An extensive review of more than 1,000 outsourced sexual assault cases involving juveniles is being performed to determine the optimal time interval between assault and collection, and downstream STR success. The initial results presented here are from the review of 246 cases and indicate there is insufficient information to develop a strict cut-off time for collection post-incident.

INTRODUCTION

Juveniles and adolescents are populations known to be most vulnerable to sexual assault [1]. The term “sexual assault” is any sexual contact that occurs without the consent of the recipient [1,2]. In many cases, victims and offenders are not strangers and therefore, sexual assaults are not reported [2]. In cases where the alleged assault is reported, a Sexual Assault Nurse Examiner (SANE) collects evidence from the victim as part of a comprehensive exam [3]. The Sexual Assault Kit is then processed to determine if a DNA foreign to the victim is present. Nevertheless, it is critical to balance the information’s value with the victim’s trauma. To maximize effectiveness, the Sexual Assault Exam should be performed as quickly as possible after the alleged assault [4]. A substantial time lapse between the sexual assault of a juvenile and the Sexual Assault Exam often occurs. This may be due to a delayed outcry, or because parents were unaware of the assault.

Sexual assault exams may cause secondary trauma to the victim, coupled with the significant initial trauma caused by the sexual assault. Previous publications have suggested that the Sexual Assault Exam be conducted within 24 hours in prepubescent children and within 72 hours in adolescents [5]. Therefore, it is possible that the trauma caused by the Sexual Assault Exam may not yield any evidence when collected outside of these published guidelines.

This study aims to determine the optimal time interval for the collection of a Sexual Assault Kit based on the success of obtaining the DNA profile of the possible offender. In addition, this data may be used to develop a cut-off time for collection of evidence post incident. This would allow SANEs to decline a sexual assault examination on juvenile victims based on the premise that the risk of inflicting further trauma may outweigh the likelihood of gaining a useable DNA profile.

RESULTS

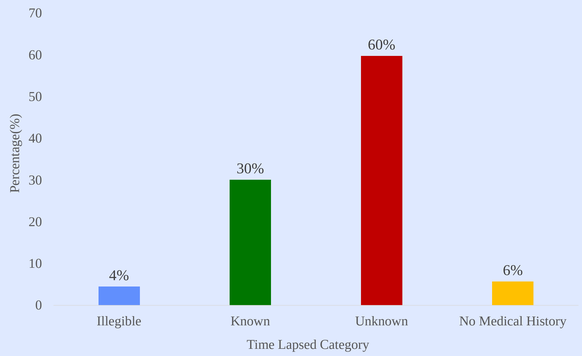

Figure 1: The proportion of unknown time intervals, illegible reports, no medical report provided and known time lapses between the alleged sexual assault and the sexual assault exam (N = 246).

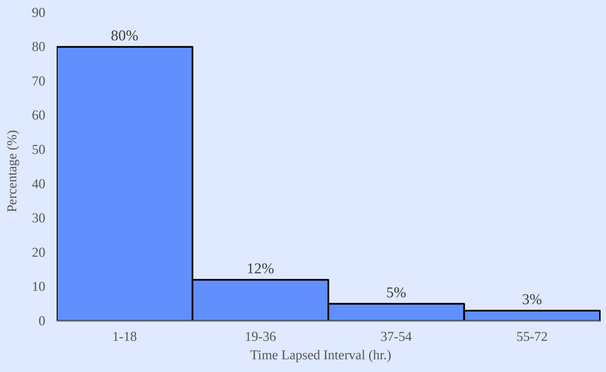

Figure 2: The proportion of sexual assault exams collected within known time intervals between the alleged sexual assault and the sexual assault exam (N = 74).

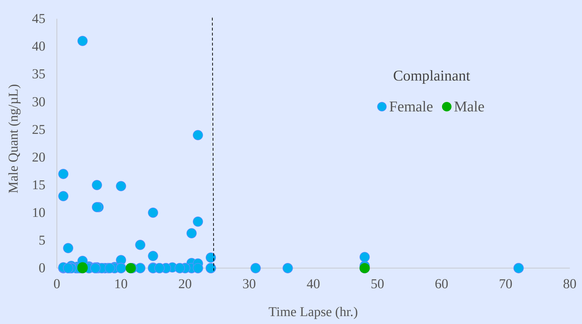

Figure 3: The relationship between male DNA quantity (ng/µL) and known time lapses between the alleged sexual assault and the sexual assault exam. The dotted line indicates the 24hr time period.

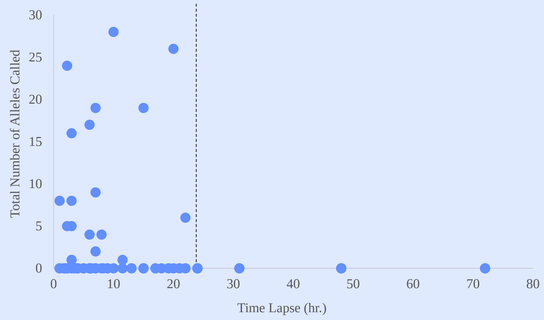

Figure 4: The relationship between the total number of alleles called and known time lapses between the alleged sexual assault and the sexual assault exam. The dotted line indicates the 24hr time period.

DISCUSSION & CONCLUSIONS

- Of the 246 cases examined, only 30% of cases included a known time interval between the alleged incident and the sexual assault exam (Fig. 1).
- In the 74 cases when the time interval between the alleged assault and the sexual assault exam was known, the majority of cases (80%) were collected within 18hrs post incident (Fig. 2).
- Although samples collected within the first 24hrs yielded variable results in terms of DNA quantity (Fig. 3) and STR success (Fig. 4), no samples collected after 24hrs post-incident resulted in useable DNA results.
- When Sexual Assault Exams are performed within 24 hours of the alleged assault, data suggests that it is more likely to develop a profile that is CODIS eligible (Fig. 4). However, without testing more cases, a 24hr time threshold for the collection of evidence is not warranted.
- The results of this study suggest that with limited information provided by the juvenile Sexual Assault Exam in relation to the time lapsed between the sexual assault and the sexual assault exam, a cut-off time post incident cannot be determined (Fig. 1 & 3).
- SANE examinations which include the time lapsed post-incident have contributed to the success of the Sexual Assault Exams and can be useful to predict downstream DNA success.

Concluding Remarks

Overall, the value of the Sexual Assault Exams for any investigation extends beyond the DNA collection, as medical history, physical examination, child and guardian accounts are also recorded during the exam. These exams can provide investigative leads and reduce the likelihood of repeated offenses by the same offender. However, a standardization for the data collection in Sexual Assault Exams plays a key role in the information provided to crime laboratories and aids in determining whether a cut- off time to allow SANEs to decline a sexual assault examination on a juvenile victim could be applied to avoid inflicting secondary trauma, which may outweigh the likelihood of generating a DNA profile foreign to the victim.

MATERIALS AND METHODS

An extensive review of more than 1,000 outsourced sexual assault cases involving juveniles is being performed by the Houston Forensic Science Center. Sorenson Forensics, LLC and Bode Cellmark Forensics were the outsourcing laboratories within this study. The review focused on the information provided by the SANEs, DNA quantification data, the ratio between the amount of autosomal and male DNA detected and the success of retrieving a useable DNA profile foreign to the victim.

Sorenson Forensics, LLC

DNA screening was performed using the Chelex® 100 Resin. DNA extract was quantified using Plexor® HY (Promega) on the ABI® 7500 Real-Time PCR System (ThermoFisher Scientific). If samples tested positive for male DNA, a full portion of the sample was extracted manually and quantified. Samples with male DNA were amplified using AmpFISTR® Identifiler Plus PCR Amplification Kit (ThermoFisher Scientific) on the ABI GeneAmp® PCR System 9700 (ThermoFisher Scientific). Separation and detection of amplified products was performed on ABI Prism® 3130 Genetic Analyzer (ThermoFisher Scientific).

Bode Cellmark Forensics

DNA extraction was performed using the QiaSymphony® DNA Investigator Kit (Qiagen). DNA extract was then quantified using Plexor® HY (Promega) on the ABI® 7500 Real-Time PCR System (ThermoFisher Scientific). Samples with male DNA were amplified using AmpFISTR® Identifiler Plus PCR Amplification Kit (ThermoFisher Scientific) on the ABI GeneAmp® PCR System 9700 (ThermoFisher Scientific). Separation and detection of amplified products was performed on ABI Prism® 3130 Genetic Analyzer (ThermoFisher Scientific).

REFERENCES

1. Muram D, Hostetler BR, Jones CE, Speck PM. Adolescent victims of sexual assault. J Adolesc Health 1995;17(6):372-5.
2. Chahine EF. Child Abuse and its Relation to Quality of Life of Male and Female Children. Procedia - Soc Behav Sci 2014;159:161-8.
3. Sievers V, Murphy S, Miller JJ. Sexual assault evidence collection more accurate when completed by sexual assault nurse examiners: Colorado's experience. J Emerg Nurs 2003;29(6):511-4.
4. Gökdoğan MR, Bafra J. Development of a sexual assault evidence collection kit – The need for standardization in Turkey. Nurs Edu Today 2010;30(4):285-90.
5. Adams JA, Kaplan RA, Starling SP, Mehta NH, Finkel MA, Botash AS, et al. Guidelines for Medical Care of Children Who May Have Been Sexually Abused. J Pediatr Adolesc Gynecol 2007;20(3):163-72.

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