

Research Paper

Identifying the prevalence of genital injuries amongst patients attending Saint Mary's sexual assault referral centre following an allegation of digital penetration

Rabiya Majeed-Ariss^{a,b,*}, Glen P. Martin^c, Catherine White^{a,b,d}

^a Saint Mary's Sexual Assault Referral Centre, Manchester University Hospitals NHS Foundation Trust, Manchester, UK

^b University of Manchester, Manchester, UK

^c Division of Informatics, Imaging and Data Science, Faculty of Biology, Medicine and Health, University of Manchester, Manchester Academic Health Science Centre, Manchester, UK

^d Institute for Addressing Strangulation Sexual Offences, Manchester, UK



ARTICLE INFO

Handling Editor: Wilma Duijst

ABSTRACT

This study aimed to (1) add to the limited evidence base regarding genital injury associated with digital vaginal penetration and (2) identify predisposing or protective factors to the identification of a genital injury. Data collection was performed retrospectively on the paper case files of 120 female adult (>18 years) patients alleging digital vaginal penetration with no penile vaginal penetration that had an acute FME at Saint Mary's Sexual Assault Referral Centre (SARC) Manchester. Descriptive statistics were used to investigate differences in the demographics of those reporting digital penetration, with and without injuries. Overall, 18% had genital injuries noted at the time of the FME. Posterior fourchette was the most common location of genital injury and abrasion was the most common injury type. It is worth further noting that all 22 patients where an injury was noted were of white ethnicity, only 12 patients in the sample were not white so caution is needed in interpreting this finding of a non-significant difference. Future research should consider injury and ethnicity more specifically. The findings from this study add to the existing evidence base and should prove useful to expert witnesses when called upon to interpret examination findings of sexual assault complainants as they relate to an allegation of digital penetration.

1. Introduction

Sexual Assault Referral Centre's in the UK are designated places to perform forensic medical examinations, according to the standards set by The Faculty of Forensic and Legal Medicine (FFLM). Saint Mary's in Manchester, UK was the first Sexual Assault Referral Centre (SARC) to be established in the UK, in 1986 as a direct response to the then deficiencies in the medico-legal response to rape. There are now 47 Sexual Assault Referral Centres in England, based on this model (NHS England, 2022). Saint Mary's SARC remains the busiest site providing a 24/7 service and seeing over 1100 patients (females and males, children and adults) from the Greater Manchester and Cheshire region in 2022 for a forensic medical examination (FME) alone. In addition to this, Saint Mary's SARC provides a comprehensive and coordinated Independent Sexual Violence Adviser (ISVA) and counselling service. 90% of those

attending for a FME are adults (aged 18 years and over), and in the main have been referred to the service by the police.

In forensic medicine, expert witnesses may be called upon to interpret examination findings of sexual assault complainants as they relate to an allegation.¹ Oftentimes, it is brought under question whether or not the presence or absence of an injury at the time of examination is consistent with the accounts given by the defence and/or prosecution.

The frequency with which genital injury is present at the time of forensic medical examination (FME) following penile vaginal penetration is well noted in the literature.²⁻⁴ Factors that might increase or decrease the prevalence of genital injury on examination, such as alcohol and drug consumption have also been explored.⁴⁻⁶ While there is some disparity on rates of genital injury reported in the literature, studies largely agree that vaginal injury does not necessarily imply lack of consent or vice versa.^{2,4} Nevertheless, juries are more likely to convict

* Corresponding author. Saint Mary's Sexual Assault Referral Centre, York Place, Oxford Road, Manchester, M13 9WL, UK.

E-mail address: rabiya.majeed@mft.nhs.uk (R. Majeed-Ariss).

<https://doi.org/10.1016/j.jflm.2024.102656>

Received 3 August 2023; Received in revised form 6 February 2024; Accepted 10 February 2024

Available online 13 February 2024

1752-928X/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

when an injury is present at the time of examination.^{7,8} A robust evidence base to put examination findings in context and support expert witnesses asked to provide their opinion during court proceedings is essential.

Sexual assault by penetration is a crime in England and Wales, classified under the Sexual Offences Act (2003). It occurs when someone sexually penetrates the vagina or anus of another person without the reasonable belief that the other person consents to the act. Sexual assault by penetration can take place by use of a body part (other than the penis) or by an object. The offence of rape, also a crime classified under the Sexual Offences Act (2003), is distinct in that this act of penetration is with a penis.

Unlike penile vaginal penetration injuries where there is a significant body of evidence,^{2–6} and even anal vaginal penetration injuries where there is a growing body of evidence,^{9–11} a dedicated evidence base regarding injury rates associated with digital vaginal penetration is only emerging more recently.

Rossman et al. (2004) first interrogated the question of prevalence of genital injuries when digital penetration was the only reported assault, in the US context. Case files of 941 patients aged 13 years and over, attending over a three-year period were reviewed, of these 53 patients (6%) reported only digital–vaginal assault. Genital injuries were documented in 81% of these 53 patients. The most common injury sites were the fossa navicularis (17%) and the labia minora (16%). The most common injury types were erythema (34%), lacerations (29%) and abrasions (21%) Colposcopy with nuclear staining was reported as useful in detecting these injuries.

More recently Volpellier et al. (2021) undertook a retrospective review of forensic notes at one UK SARC, Haven Paddington, to determine the prevalence of genital injuries following alleged sexual assault by digital penetration of the vagina in the absence of penile penetration of the vagina or anus. Over a 29-month period, 1428 FMEs were carried out at the SARC. Of these, 109 females (7.6% of attenders) aged 16 years and over alleged digital penetration only and their case files were reviewed. The patients mean age was 27.2 years. 77/109 (67%) were examined within 24 h of the assault and 86/93 (92.5%) reported prior vaginal penetration unrelated to the alleged assault. Most patients, 96/109 (88.1%), sustained no genital injuries. Of the 13 (11.9%) who did sustain injuries, the most common injury site was the labia minora (46.2%) and the most common injury type was abrasions (84.6%). This UK SARC performed forensic examinations by gross visualisation (naked eye) only.

The present study will add to the growing body of UK evidence with its aims to report on the prevalence of vaginal injury following digital penetration, as well as provide detail regarding the injury site and injury type. The present study also aims to identify predisposing or protective factors such as: whether vaginal penetration was reported within the preceding 10 days of the assault, the time between the assault and the FME, the assailant gender, whether drugs or alcohol were related to the assault, whether the patient was pre- or post-menopausal and whether the assault included single or multiple alleged perpetrators.

2. Methods

2.1. Study population

Participants included in this analysis were female adult (>18 years) patients who had alleged digital penetration with no penile penetration and underwent an acute FME at Saint Mary's Sexual Assault Referral Centre (SARC) Manchester, during the three-year study period of 1st July 2017 to 30th June 2020. We excluded patients that declined an injury exam as part of the FME, or where information on the examination was missing.

All study data was unidentifiable, collected during routine clinical care and which has been used to evaluate the service provision. The Health Research Authority have advised that projects of this nature are

exempt from ethical approval requirements and are considered to be service evaluation, since non-generalisable data collected as part of routine care is reviewed retrospectively.

2.2. Data collection

Data collection was performed retrospectively from the paper case files recorded at the time of each service user's attendance at Saint Mary's SARC for an FME. FMEs are arranged in accordance with the forensic and medical needs of the service user. As the service is 24/7 there is the capacity to see service user soon (usually within an hour or two) after a referral is made to the Centre. The FME typically lasts between 3 and 4 h and includes an in-depth history including demographics, medical, psycho-social history followed by a top-to-toe examination which includes an ano-genital examination.

As per standard practice, all FME case files are reviewed the next working day within a multi-disciplinary team meeting. Any case with a history of digital penetration were identified at this meeting and the FME notes would be reviewed by the then Saint Mary's SARC Clinical Director (CW) who retrospectively extracted the data for this study. The data includes demographic and baseline characteristics of the patient, the alleged perpetrator and the context of the reported or suspected assault. The data also includes information regarding any genital injuries that were noted during the FME at Saint Mary's SARC.

The categories of injuries were bruises, abrasions and lacerations. Subjective injury types such as redness, swelling and tenderness were not included in this study.

2.3. Statistical analysis

Descriptive statistics were used to investigate differences in the demographics of those reporting digital penetration, with and without injuries. Continuous data were summarised using the mean and standard deviation, while categorical data were summarised using frequency of occurrence. Comparisons between groups were made using the Wilcoxon rank sum test for continuous variables, and either Fisher's exact test or chi-squared test for categorical variables.

We specifically examined the proportion of those with injuries (including the site and type of any injury) according to the following characteristics: whether vaginal penetration was reported within the preceding 10 days of the assault, the time between the alleged assault and the FME, the suspect's gender, whether drugs or alcohol were related to the assault, whether the patient was pre- or post-menopausal and whether the alleged assault included single or multiple alleged perpetrators.

All analyses were performed using R version 4.1.1 (2023), along with the tidyverse suite of packages.¹²

3. Results

A total of 145 patients met the inclusion criteria of reporting digital penetration (without penile penetration), during the data collection period of 1st July 2017 to 30th June 2020. Of these 145 patients, 25 patients were excluded because they declined a genital examination or information on the genital examination was missing. Thus, a total of 120 patients reporting digital penetration were included in the analysis. For context, over the same study period, Saint Mary's SARC Manchester conducted a total of 2136 adult FMEs.

A summary of the characteristics of the included patients are given in [Table 1](#). The mean age was 29.24 years (SD 11.19 years), with the patients being predominately white ethnicity. Overall, 22 (18.33%) had genital injuries noted at the time of the FME ([Table 1](#)); of these, the median number of injuries per person was 1, with this ranging from 1 to 4 injuries per person. [Fig. 1A](#) depicts the frequency of the locations of genital injuries. Posterior fourchette was the most common location of genital injuries (8/22, 36.36%), followed by labia minora (6/22,

Table 1

Characteristics of the baseline information about the included patients that reported digital vaginal penetration.

Characteristic	N = 120 ^a
Age, years, mean (SD) [min-max]	29 (11) [18–71]
Sexuality	
Bisexual	4 (5.7%)
Heterosexual	60 (86%)
Lesbian/Gay	6 (8.6%)
Unrecorded	50
Ethnicity	
Asian	2 (1.7%)
Pakistani	3 (2.5%)
White	108 (90%)
Mixed	4 (3.3%)
Black	2 (1.7%)
Other ethnic group	1 (0.8%)
Learning Disability Screening Questionnaire, %, mean (SD) [min-max]	87 (22) [0–100]
Unrecorded	5
Alleged perpetrator	
Acquaintance <24 h	16 (13%)
Acquaintance >24 h	26 (22%)
Authority Figure	5 (4.2%)
Family: First degree	1 (0.8%)
Partner/Ex partner	20 (17%)
Friend/Family Friend	19 (16%)
Family: Second degree	4 (3.3%)
Stranger	20 (17%)
Other	7 (5.8%)
Family: non-biological	1 (0.8%)
Unclear	1 (0.8%)
Sex of alleged perpetrator	
Female	6 (5.0%)
Male	114 (95%)
Number of alleged perpetrators	
Multiple alleged perpetrators	8 (6.7%)
Single alleged perpetrator	112 (93%)
Object Penetration	4 (3.3%)
Oral Rape	17 (14%)
Other Assault Type	24 (20%)
Menstrual Status	
Menopausal	3 (2.5%)
Post-menopausal	4 (3.3%)
Post-pubertal	112 (93%)
Unrecorded	1
History of giving birth by Vaginal Delivery	
Yes	42 (36%)
No	76 (63%)
Unrecorded	2 (1%)
Previously Sexually Active	111 (93%)
Unrecorded	1
Consensual vaginal penetration <10 days prior to alleged assault	
No	77 (69%)
Penile vaginal	34 (30%)
Digital vaginal	1 (0.9%)
Unrecorded	8
Anal Penetration during Assault	
Digital anal	11 (9.2%)
No	107 (89%)
Penile anal	1 (0.8%)
Object anal	1 (0.8%)
Time Interval to forensic medical examination, hours, mean (SD) [min-max]	35 (47) [4–432]
Drug use related to alleged assault	
No	96 (83%)
Suspected DFSA	6 (5.2%)
Yes	13 (11%)
Unrecorded	5
Alcohol use related to alleged assault	76 (64%)
Unrecorded	1
Other Violence in Assault	38 (32%)
Unrecorded	1
Colposcope used during FME	111 (93%)
Unrecorded	1
Genital Injury Noted During Examination	
No Injuries Noted	98 (82%)
Injuries Noted	22 (18%)

^a Mean (SD) [Minimum-Maximum]; n (%).

27.27%) and hymen (6/22, 27.27%). Across the injury locations, the most common injury type was an abrasion (Fig. 1B). For example, within the posterior fourchette injuries, the injury type was an abrasion (4/8 cases), laceration (3/8) and bruising (1/8).

3.1. Ethnicity

Table 2 shows the number of genital injuries noted during the FME by ethnic group. All 22 patients where an injury was noted occurred in patients of white ethnicity. However, we only observed 12 patients where the ethnicity was not white, so some caution is needed in interpreting these results, which was a non-significant difference (Table 2). Moreover, it is important to note that ethnicity does not simply correlate with skin colour and as such this SARC is now recording skin colour in patient notes using the Fitzpatrick scale.¹³

3.2. Menstrual status

Out of the 22 patients that had genital injuries noted, 21 were post-pubertal (95.5%) and the remaining individual (4.5%) was post-menopausal. There was no evidence within the data that the proportion of patients with genital injuries at the FME differed by menstrual status (Table 3).

3.3. Time since assault

The mean time between the assault and the examination was 35.01 h (min: 4, max: 432), with the mean time being 30 h in those with genital injuries at the examination and 36.13 h in those without genital injuries noted at the examination. There appeared to be an inverse-U-shaped association between the time interval between the assault and the examination with the proportion of genital injuries noted (Fig. 2). Specifically, within the group of 33 patients that were examined within 12 h of the assault, 5 (15.2%) had genital injuries noted during the examination. In contrast, 22 patients were examined between 24 and 48 h from assault where six (27.3%) had genital injuries noted during the examination; this decreased to one (9.1%) with injuries in those patients seen more than 72 h after the assault (n = 11). However, this was not significant (p = 0.758).

3.4. Previous sexual activity

Of the 120 patients included in this analysis, 111 (92.5%) reported being previously sexually active (Table 1). Within those reporting being previously sexually active, 21 (18.9%) had genital injuries noted during the FME. This compares with one (12.5%) patient that had injuries within the 9 patients that either reported not being previously sexually active or where previous sexual activity was missing (Table 4).

Table 1 shows the number of patients that reported consensual vaginal penetration within 10 days of the assault. Collectively, 35 patients reported consensual vaginal penetration within 10 days of the assault, and of these 5 (14.29%) had genital injuries noted during the FME. In contrast, 77 patients reported no vaginal penetration within 10 days of the assault, of which 13 (16.88%) had genital injuries noted during the FME (p = 0.945). In 8 patients, previous consensual vaginal penetration data was missing.

3.5. Alcohol and drug consumption

Alcohol consumption related to the alleged assault was reported in 76 of the 120 patients included in this analysis (63.33%). Of those who reported consuming alcohol related to the alleged assault, 13 (17.11%) had genital injuries noted during the FME. This compares to 9 (20.93%)

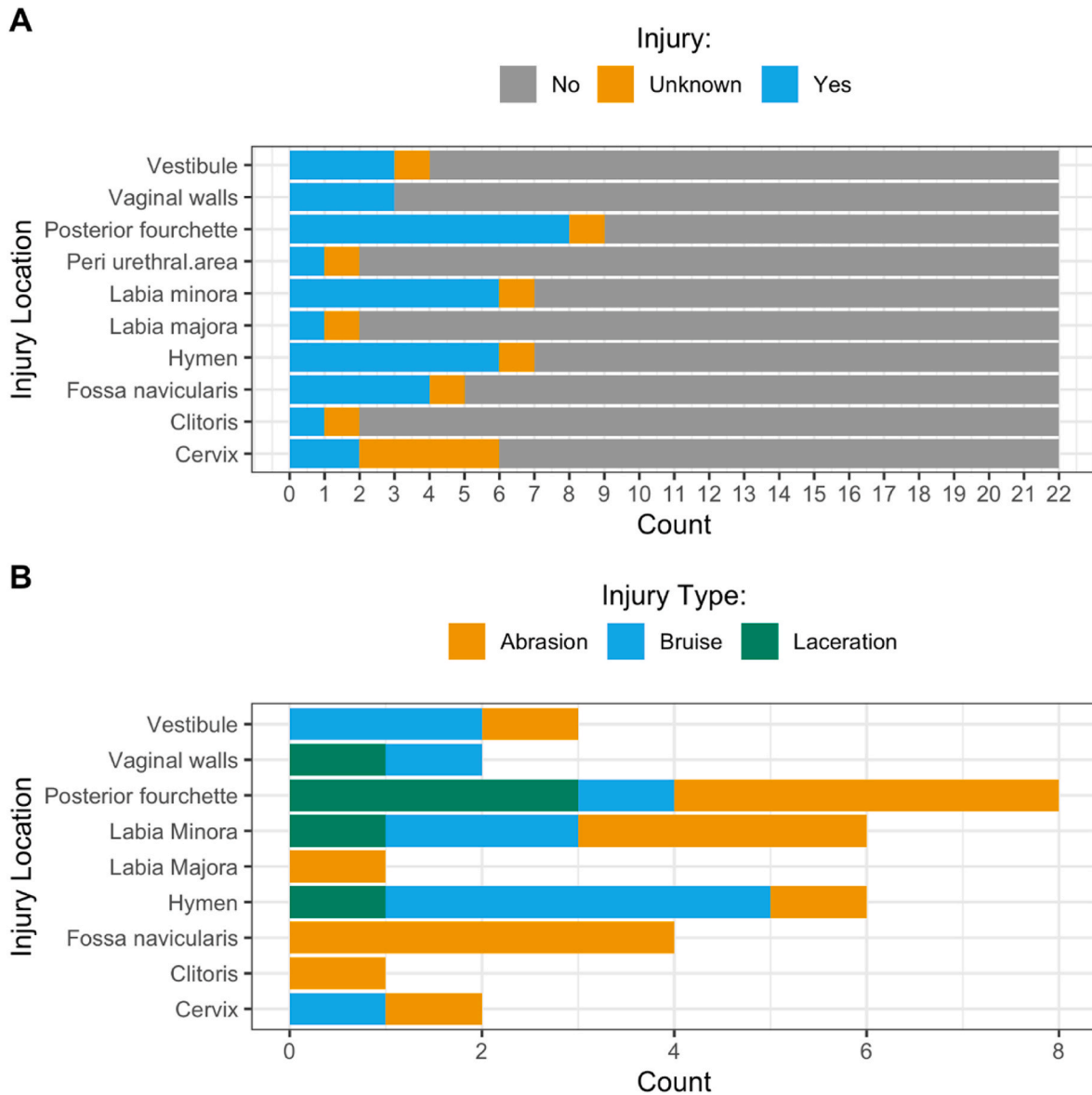


Fig. 1. (A) Location of injuries in those with genital injuries noted at the FME; (B) breakdown of the injury types per location.

Table 2
Genital injuries noted during the examination by ethnicity of the patient.

Characteristic	Overall, N = 120 ^a	Non-White, N = 12 ^a	White, N = 108 ^a	p-value ^b
Genital Injury Noted During Examination				0.12
No Injuries Noted	98 (82%)	12 (100%)	86 (80%)	
Injuries Noted	22 (18%)	0 (0%)	22 (20%)	

^a n (%).

^b Fisher's exact test.

Table 3
Genital injuries noted during the examination by menstrual status of the patient.

Characteristic	Overall, N = 120 ^a	Menopausal, N = 3 ^a	Post-menopausal, N = 4 ^a	Post-pubertal, N = 112 ^a	(Missing), N = 1 ^a	p-value ^b
Genital Injury Noted During Examination						0.8
No Injuries Noted	98 (82%)	3 (100%)	3 (75%)	91 (81%)	1 (100%)	
Injuries Noted	22 (18%)	0 (0%)	1 (25%)	21 (19%)	0 (0%)	

^a n (%).

^b Fisher's exact test.

injuries that were noted within the group of patients reporting not consuming alcohol (Table 5).

In terms of drug use, of the 120 patients of digital penetration explored in this analysis, six had suspected drug-facilitated sexual assault (DFSA), while 13 reported drug use related to the alleged assault (Table 6). There was no evidence that the proportion of genital injuries differed across those taking/not taking drugs.

3.6. Type of assault

There were four patients who reported object penetration alongside

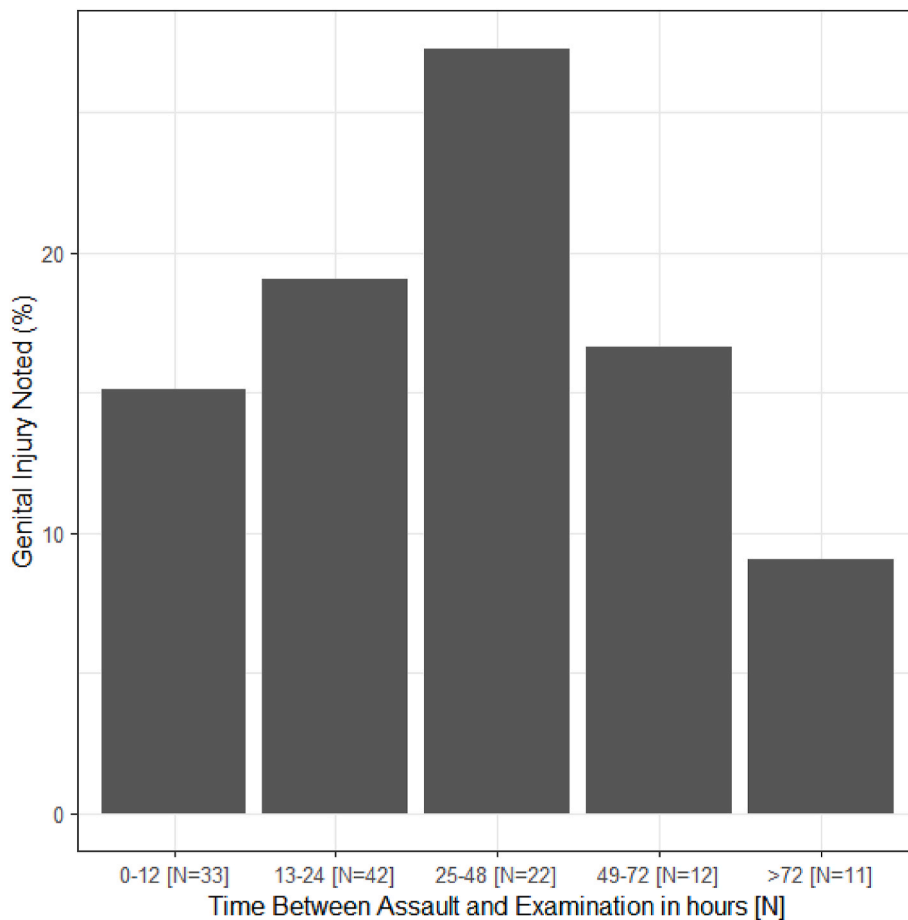


Fig. 2. Proportion of patients where genital injuries were noted by groups of time between assault and examination.

Table 4

Genital injuries noted during the examination across those who reported being/not being previously sexually active.

Characteristic	Overall, N = 120 ^a	Not Previously Sexually Active, N = 8 ^a	Previously Sexually Active, N = 111 ^a	(Missing), N = 1 ^a	p-value ^b
Genital Injury Noted During Examination					>0.9
No Injuries Noted	98 (82%)	7 (88%)	90 (81%)	1 (100%)	
Injuries Noted	22 (18%)	1 (12%)	21 (19%)	0 (0%)	

^a n (%).

^b Fisher's exact test.

Table 5

Genital injuries noted during the examination across those who reported if alcohol use was related to the assault.

Characteristic	Overall, N = 120 ^a	No Reported Alcohol Use Reported Related to the Alleged Assault, N = 43 ^a	Reported Alcohol Use Reported Related to the Alleged Assault, N = 76 ^a	(Missing), N = 1 ^a	p-value ^b
Genital Injury Noted During Examination					0.7
No Injuries Noted	98 (82%)	34 (79%)	63 (83%)	1 (100%)	
Injuries Noted	22 (18%)	9 (21%)	13 (17%)	0 (0%)	

^a n (%).

^b Fisher's exact test.

the digital penetration, three (75%) of which had injuries noted at the time of the FME. Where available, one individual reported the object being a bottle, and another reported the object being a plastic knife. In contrast, 19 (16.38%) of the 116 patients that did not report object penetration had an injury noted at the FME. Indeed, there was a significant difference in the proportion of patients with genital injuries noted according to whether object penetration was reported alongside

the digital penetration (p = 0.02).

In addition to the digital penetration, 38 patients reported oral rape, other assault types (but not penile penetration), or both. Of these, 9 had injuries noted during the FME. In the majority of patients, there was a single alleged perpetrator (112, 93.33%), while eight patients reported digital penetration with multiple alleged perpetrators.

Table 6

Genital injuries noted during the examination across those who reported if drug use was related to the assault.

Characteristic	Overall, N = 120 ^a	No Drugs, N = 96 ^a	Suspected DFSA, N = 6 ^a	Drugs Reported, N = 13 ^a	(Missing), N = 5 ^a	p-value ^b
Genital Injury Noted During Examination						0.8
No Injuries Noted	98 (82%)	77 (80%)	5 (83%)	12 (92%)	4 (80%)	
Injuries Noted	22 (18%)	19 (20%)	1 (17%)	1 (7.7%)	1 (20%)	

^a n (%).^b Fisher's exact test.

3.7. Alleged perpetrator

The alleged perpetrator was reported to be male by the majority (95%) of the patients, with only six (5%) alleged female perpetrators (Table 1). The proportion of genital injuries was significantly higher in patients reporting alleged female perpetrators, than alleged male perpetrators ($p = 0.01$). Specifically, within the six patients alleging a female perpetrator, four (66.67%) patients had genital injuries noted during the FME (Table 7). In contrast, within the 114 patients reporting alleged male perpetrators, 18 (15.79%) had genital injuries noted during the FME. However, there were only a small number of alleged female perpetrators, so some caution is needed in interpreting these findings. One of the six cases of female alleged perpetrator used an object.

4. Discussion

This study reports an 18% prevalence of genital injury following digital penetration in patients attending Saint Mary's SARC. The genital injury rate of 18% reported in this study is higher than the 12% reported recently by Volpellier et al. (2021), yet far lower than the 81% reported by Rossman et al. (2004). A likely reason for some of this discrepancy is that Rossman et al. include erythema as an injury and indeed they report this to be the most common injury type, whereas the UK sites, both Haven Paddington (Volpellier et al., 2021) and Saint Mary's Manchester (this study), do not classify erythema as an injury. In both the UK sites, abrasions are reported as the most common injury type. Another reason for this discrepancy in genital injury rates following digital penetration may be that Rossman et al. (2004) use nuclear staining to identify injuries, Volpellier et al. (2021) perform examinations by naked eye only whereas Saint Mary's Manchester use a colposcope for light and magnification in all cases, provided there is consent.

While caution is advised in interpretation of these findings due to small numbers, the present study reports two significant predisposing factors to vaginal injury, these are (1) where object penetration is reported alongside the digital penetration and (2) when the alleged perpetrator is female. Rossman et al. (2004) reported no correlation between the number of genital injuries and the age of the victim, victim's alcohol or drug use or relationship to assailant. Volpellier et al. (2021) did not report on predisposing factors to genital injury, instead they used a penile penetration group as a comparator and reported on differences in incidence and types of injury between the two groups.

Another interesting finding in this study, was that there appeared to be an inverse-U-shaped association in the time interval between the assault and the examination with the proportion of genital injuries noted (Fig. 2). The highest frequencies of genital injuries noted were among patients examined between 24 and 48 h from assault. Rossman et al. (2004) reported no correlation between the number of genital injuries and the time interval to examination. While Volpellier et al. (2021) reported on number of examinations done within and outside of 24 h, they do not state if this had any impact on presence of injuries.

A limitation of this study is that since the sample is relatively small and has all been recruited from a single SARC there is limited generalisability. Another limitation is that the forensic medical examinations were undertaken by different forensic physicians, although they had similar training there was a range of experience within the team. Due to methodological differences, such as routine use of speculums and

Table 7

Genital injuries noted during the examination by gender of the alleged perpetrator.

Characteristic	Overall, N = 120 ^a	Female, N = 6 ^a	Male, N = 114 ^a	p-value ^b
Genital Injury Noted During Examination				0.010
No Injuries Noted	98 (82%)	2 (33%)	96 (84%)	
Injuries Noted	22 (18%)	4 (67%)	18 (16%)	

^a n (%).^b Fisher's exact test.

colposcopes, direct comparisons cannot be made with other UK SARC data that has recently been published (Volpellier, 2021).

Moreover, comparatively little is still known about the incidence and prevalence of injuries following non-consensual digital vaginal penetration, when compared to non-consensual penile vaginal penetration. To the authors knowledge, at time of publication, there was no injury data available following consensual digital penetration. Nevertheless, the findings from this study add to the existing evidence base regarding the prevalence of genital injuries in patients reporting non-consensual digital vaginal penetration who undergo a forensic medical examination. This enhanced understanding should prove useful to expert witnesses when called upon to interpret examination findings of sexual assault complainants as they relate to an allegation of digital penetration.

Declaration of competing interest

None.

References

- Milroy CM. Medical experts and the criminal courts. *BMJ*. 2003;326(7384): 294–295. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1125168/>.
- Bowyer L, Dalton ME. Female victims of rape and their genital injuries. *Int J Obstet Gynaecol*. 1997;104(5):617–620. <https://obgyn.onlinelibrary.wiley.com/doi/full/10.1111/j.1471-0528.1997.tb11543.x>.
- Sommers MS. Defining patterns of genital injury from sexual assault. *Trauma Violence Abuse*. 2007;8(3):270–280. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3142744/>.
- McLean I, Roberts SA, White C, Paul S. Female genital injuries resulting from consensual and non-consensual vaginal intercourse. *Forensic Sci Int*. 2011;204(1–3): 27–33. <https://www.sciencedirect.com/science/article/pii/S0379073810002288>.
- Jones JS, Rossman L, Diegel R, Van Order P, Wynn B. Sexual assault in postmenopausal women: epidemiology and patterns of genital injury. *Am J Emerg Med*. 2009;27(8):922–929. S0735675708005329. Legislation UK. Sexual Offences Act, 2003 <https://www.legislation.gov.uk/ukpga/2003/42/section/2>. Accessed April 14, 2023.
- Busch-Armendariz NB, DiNitto DM, Bell H, Bohman T. Sexual assault perpetrators' alcohol and drug use: the likelihood of concurrent violence and post-sexual assault outcomes for women victims. *J Psychoact Drugs*. 2010;42(3):393–399. <https://pubmed.ncbi.nlm.nih.gov/21053762/>.
- Edgardh K, Von Krogh G, Ormstad K. Adolescent girls investigated for sexual abuse: history, physical findings and legal outcome. *Forensic Sci Int*. 1999;104(1):1–15. <https://www.sciencedirect.com/science/article/abs/pii/S0379073899000936>.
- McGregor MJ, Du Mont J, Myhr TL. Sexual assault forensic medical examination: is evidence related to successful prosecution? *Ann Emerg Med*. 2022;39(6):639–647. https://www.researchgate.net/publication/11347834_Sexual_assault_forensic_medical_examination_Is_evidence_related_to_successful_prosecution.
- Sugar NF, Fine DN, Eckert LO. Physical injury after sexual assault: findings of a large case series. *Am J Obstet Gynaecol*. 2004;190(1):71–76. [https://www.ajog.org/article/S0002-9378\(03\)00912-8/fulltext](https://www.ajog.org/article/S0002-9378(03)00912-8/fulltext).

10. Hilden M, Schei B, Sidenius K. Genitoanal injury in adult female victims of sexual assault. *Forensic Sci Int*. 2005;154(2-3):200–205. <https://www.sciencedirect.com/science/article/pii/S0379073804007066>.
11. Buswell H, Majeed-Ariss R, Rajai A, White C, Mills H. Identifying the prevalence of genito-anal injuries amongst clients attending St Mary's Sexual Assault Referral Centre following an allegation of anal penetration. *J For Legal Med*. 2022;90, 102392. <https://doi.org/10.1016/j.jflm.2022.102392>.
12. Wickham H, Averick M, Bryan J, et al. Welcome to the tidyverse. *J Open Source Softw*. 2019;4(43):1686. <https://doi.org/10.21105/joss.01686>, 10.21105/joss.01686.
13. Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. *Arch Dermatol*. 1988;124(6):869–871. <https://doi.org/10.1001/archderm.1988.01670060015008>.