

# Frequency of Injuries to Women after Sexual Offense – Relevance of a Gynecology Examination

## Häufigkeit von Verletzungen bei Frauen nach Sexualdelikten – Relevanz der gynäkologischen Untersuchung



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### Key words

sexual offense, gynecology examination, genital injuries, injury pattern, forensic medicine

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### ABSTRACT

**Introduction** Up to a third of women worldwide report having experienced an act of sexual violence during their lifetime. The emergency gynecology department is often the first port of call for affected individuals. The aim of the current study was to evaluate the importance of gynecology examinations for women after a sexual offense and to evaluate the pattern of injuries sustained.

**Methods** This study is a retrospective single center analysis of the gynecology and forensic examination reports of all women examined for a suspected sexual offense in the central emergency department of a university hospital between 2013 and 2017 (n = 692). We evaluated genital and extragenital injury patterns, age, offender profile, time of offense, and substance use, as well as the administration of post-coital contraception and post-exposure prophylaxis for HIV.

**Results** The affected individuals had a mean age of 26 (12–91 years). Almost 75% of affected individuals presented within 24 hours of the reported sexual offense. Extragenital injuries were detected in 78.6% of patients and genital injuries in 28.5%. Overall, 20.1% of the women reported complete memory loss and 18.7% partial memory loss of the actual event. Risk factors for memory lapse were the consumption of alcohol and/or the (possibly non-consensual) administration of other substances acting on the central nervous system. A history of alcohol consumption by the victim (hazard ratio [HR] 1.95; 95% confidence interval [CI] 1.21–3.12, p = 0.006) and younger victims aged between 25–49 years (HR 1.75; 95% CI 1.07–2.85, p = 0.025) were associated with the occurrence of extragenital injuries. However, if the perpetrator was someone who was known to the affected individual, fewer extragenital injuries were sustained (HR 0.60; 95% CI 0.36–0.99, p = 0.046). Reports of genital injuries, associated with an older age of affected individuals and indications of anal penetra-

tion, resulted in more frequent administration of post-exposure prophylaxis (29.1% vs. 19.5%,  $p < 0.012$ ) and hepatitis B (active) vaccination (40% vs. 28.5%,  $p < 0.028$ ).

**Conclusion** Emergency gynecology examinations form a fundamental component of the medical care and the assessment of affected women after a sexual offense, since almost a third of victims sustain injuries to the genital region. In addition to a detailed complete physical examination and expert forensic documentation of physical and genital injuries, victims should also be offered psychological support which is easy for them to access.

## ZUSAMMENFASSUNG

**Einleitung** Bis zu einem Drittel der Frauen weltweit geben an, in ihrem Leben sexuelle Gewalt erfahren zu haben. Häufig ist die gynäkologische Notaufnahme die erste Anlaufstelle dieser Betroffenen. Ziel der vorliegenden Untersuchung war die Evaluation des Stellenwerts der gynäkologischen Untersuchung von Frauen nach Sexualdelikten sowie die Evaluation des Verletzungsmusters.

**Methode** Retrospektive unizentrische Analyse der gynäkologischen und rechtsmedizinischen Untersuchungsbefunde aller Frauen, die in den Jahren 2013–2017 wegen eines mutmaßlichen Sexualdelikts in der zentralen Notaufnahme eines Universitätsklinikums untersucht wurden ( $n = 692$ ). Genitale und extragenitale Verletzungsmuster, Alter, Täterprofil, Tatzeitpunkt, Substanzkonsum sowie die Durchführung einer postkoitalen Kontrazeption und HIV-Postexpositionsprophylaxe wurden ausgewertet.

**Ergebnisse** Die Betroffenen waren im Mittel 26 Jahre alt (12–91 Jahre). Fast 75% der Betroffenen stellten sich innerhalb von

24 Stunden nach dem angegebenen Sexualdelikt vor. Bei 78,6% der Patientinnen konnten extragenitale und bei 28,5% genitale Verletzungen festgestellt werden. Insgesamt gaben 20,1% der Frauen einen vollständigen und 18,7% einen teilweisen Erinnerungsverlust an die konkrete Tathandlung an. Risikofaktoren für eine Erinnerungslücke waren der Konsum von Alkohol und/oder die (ggf. unfreiwillige) Verabreichung anderer, auf das Zentralnervensystem wirkender Substanzen. Ein stattgehabter Alkoholkonsum des Opfers (Hazard Ratio [HR] 1,95; 95%-Konfidenzintervall [KI] 1,21–3,12,  $p = 0,006$ ) und ein jüngeres Alter des Opfers zwischen 25–49 Jahren (HR 1,75; 95%-KI 1,07–2,85,  $p = 0,025$ ) waren mit der Entstehung extragenitaler Verletzungen assoziiert, wohingegen ein dem Opfer bekannter Täter mit weniger extragenitalen Verletzungen vergesellschaftet war (HR 0,60; 95%-KI 0,36–0,99,  $p = 0,046$ ). Das Auftreten genitaler Verletzungen, welches mit höherem Alter der Betroffenen und Angaben einer analen Penetration verbunden war, führte zu einer häufigeren Durchführung der Postexpositionsprophylaxe (29,1% vs. 19,5%,  $p < 0,012$ ) und einer (aktiven) Hepatitis-B-Impfung (40% vs. 28,5%,  $p < 0,028$ ).

**Schlussfolgerung** Die gynäkologische (Notfall-)Untersuchung stellt einen elementaren Bestandteil in der medizinischen Versorgung und Begutachtung von betroffenen Frauen nach Sexualdelikten dar, da fast ein Drittel der Opfer Verletzungen im Genitalbereich aufwies. Neben einer ausführlichen Ganzkörperuntersuchung und fachgerechten gerichtsverwertbaren Dokumentation von Verletzungen am Körper und im Genitalbereich, sollte auch eine psychologische Betreuung der Opfer angeboten und niedrigschwellig ermöglicht werden.

## Introduction

Up to a third of women worldwide are affected by sexual or physical violence during the course of their lives [1]. Overall, the steady increase in reports over the last few years, and also after the tightening of the Sexual Offences Act in 2016, highlights the growing significance of sexualized violence in our society [2,3]. In Germany, a total of 81 630 crimes against sexual self-determination were registered in 2020 [3]. Data from a 2003 study by the German Federal Ministry for Families, Senior Citizens, Women and Youth indicate that 13% of all women surveyed in Germany had already been affected by sexual violence at some point in their lives. The information in these types of surveys is given on a voluntary basis and only provides an estimate. It may nevertheless be assumed that, in addition to the reported cases, there is a high number of unreported cases. In many cases, women who have suffered a sexual offense do seek a medical examination. There are different care options available in different countries. After a sexual offense, a large proportion of women present at hospital emergency departments where they are examined by either specifically trained nurses or medical personnel [4]. In many countries, examining women after a sexual offense forms a central part of the gynecologists' work.

In Germany, however, there are no published national guidelines on the management or care of women after sexual offenses; instead, local recommendations for action and SOPs (Standard Operating Procedures) are used.

There is some limited data which shows that evidence of genital and/or extragenital trauma may have medicolegal consequences in terms of educating and convicting offenders [5–7].

The objectives of the current analysis were, therefore, to systematically record women's injury patterns after sexual offenses as determined by a full physical examination, and to evaluate the importance of the gynecology examination.

## Materials and Methods

### Patient cohort

Retrospective data was collected from the patient records of all 692 women who presented at the emergency department of the University Medical Center Hamburg-Eppendorf (UKE), Germany, which is considered the city's central point of contact for victims of sexual offenses, due to a reported sexual offense that occurred within the 5-year period from 1 January 2013 to 31 December 2017.

## Definitions

This study presents findings from the joint examination of women after sexual offenses which is routinely performed by physicians from gynecology and forensic medicine as part of a long-established model of interdisciplinary cooperation. Affected individuals either undergo a joint gynecology and forensic examination straight away, or, depending on the particular circumstances, the forensic medical examination may take place the following day in the forensic medicine outpatient clinic. The gynecology examination is performed using a speculum by regularly trained junior doctors or specialists in the gynecology department, under the supervision of the senior physician. Women also have low-threshold access to a forensic examination without making a police report (this is referred to as securing of confidential evidence). For the analysis, we created a database (Microsoft Excel 2007) containing 46 defined, independent variables for each case. Injury sites were classified as either genital or extragenital. Genital injury patterns pertaining to the external genitalia (mons pubis, labia majora and minora, introitus, posterior fourchette, and navicular fossa), internal genitalia (hymen, vaginal wall), and anal region were classified as abrasions, tears, ecchymosis, or redness according to the TEARS system. The TEARS classification (tear, ecchymosis, abrasion, redness, swelling) was established to improve the accuracy of interpretation and documentation of genital injuries [8, 9]. For extragenital injuries (head, neck, trunk, upper and lower extremities), a distinction was made between abrasions, redness, ecchymosis, and scratch and bite injuries (multiple responses were possible; other injuries were also noted).

## Statistical analysis

The statistical analysis was performed using SPSS (IBM SPSS Statistics Version 23). It included a descriptive analysis of individual variables, as well as a comparison of several categorical variables for potentially significant differences using the  $\chi^2$  test and Fisher's exact test. Logistic regression with backward selection was used to evaluate the factors influencing the occurrence of genital and extragenital injuries. The descriptive analysis of the frequencies of the individual variables was performed with a confidence interval of 95%. A  $p$ -value  $< 5\%$  was considered statistically significant.

## Data protection

The data were analyzed in anonymized form in accordance with the data protection guidelines of the Medical Faculty of the University of Hamburg and in compliance with the requirements of good scientific practice.

## Results

### Patient characteristics

The mean age of the 692 affected individuals was 26.3 (age range: 12–91 years). Nearly 75% of affected individuals presented to the emergency department within 24 hours of the reported sexual offense (49.9% within 12 hrs, 24.3% within 12–23 hrs, 21.3% within 24–71 hrs, 3.6% within 72–119 hrs, and 0.3% after 5 days). In most cases, the reported sexual offense was penile-vaginal penetration (88.3%), which occurred in the early morning

hours between 3:00–5:00 am (17%) or the late evening hours between 8:00–11:00 pm (8%). In 53.9% of cases, the perpetrator (always male) was someone who was known to the affected individual. Where there was repeated abuse (10.4% of cases), it was committed by the same perpetrator in 57.4% of cases.

Overall, a forensic medical examination was performed for 95.2% of the presumed victims and a gynecology examination for 87.5%; 84.9% of affected individuals were examined by both disciplines. In 64.2% of cases, the presumed victims were initially brought to the emergency department for an examination by police or officers of the State Office of Criminal Investigations, which means that securing of confidential evidence took place for 35.8% of the presumed victims. Overall, 83% of affected individuals filed a police report. Additional characteristics are shown in ► **Table 1**.

### Injury pattern

The forensic medical examination revealed extragenital injuries in 78.6% of patients. This is in contrast to the gynecology examination which detected genital injuries in 28.5% of cases (► **Table 2**). Overall, 15.7% of women ( $n = 100$ ) did not sustain any injuries. Of the women who sustained genital injuries (28.5%), 63.4% involved the external genitalia, 38.2% the internal genitalia, and 20.4% the anal region (► **Table 2**). Among injuries to the external genitalia, 53.4% involved abrasions, 39.9% tears, 37.3% redness of the skin, and 32.4% ecchymosis (hematomas). The types of injuries to the internal genitalia exhibited similar frequency distributions. Conversely, tears were most frequently located in the anal region (55.3%). Of all patients with genital and extragenital injuries, four patients required surgical treatment (1× orbital floor fracture, 1× retrobulbar hematoma, 1× sphincter injury with anal hematoma, 1× deep vaginal tear), and one patient sustained a fracture of the pubic bone (penile-anal penetration).

Extragenital injuries mostly involved multiple sites at the same time (71.2%). Among these, most injuries involved the lower extremities (71.6%), upper extremities (64.3%), or trunk (50.3%). Patients also suffered injuries to the head (26.9%) or neck (23.4%), albeit less frequently.

Among extragenital injuries, 83.9% involved ecchymosis (hematomas), abrasion injuries (56.8%), and redness of the skin (41.1%). Scratch injuries (6.1%) and bite injuries (6.1%) were less common (► **Table 2**). However, overall, 1.2% ( $n = 8$ ) of the women suffered a fracture as a result of the violence, mostly involving the bones of the facial skull, and 0.6% ( $n = 4$ ) of the victims suffered a traumatic brain injury.

### Injury risk factors

Affected individuals with a history of alcohol consumption (hazard ratio [HR] 1.95; 95% confidence interval [CI] 1.21–3.12,  $p = 0.006$ ) and of a younger age, between 25–49 years (HR 1.75; 95% CI 1.07–2.85,  $p = 0.025$ ), were associated with the occurrence of extragenital injuries. If the perpetrator was someone who was known to the affected individual, extragenital injuries occurred significantly less frequently (HR 0.60; 95% CI 0.36–0.99,  $p = 0.046$ ). There was no statistically significant association between the time of examination and the detection of extragenital injuries ( $p = 0.173$ ). Anal penetration (HR 1.89; 95% CI 1.08–3.29,  $p = 0.025$ ) and an older age of the affected individuals, ranging

**► Table 1** Characteristics of women who sustained a sexual offense.

	Number	Percentage
Age in years		
▪ > 12–24 years	395	57.4%
▪ 25–49	258	37.5%
▪ 50–74	31	4.5%
▪ ≥ 75	4	0.6%
Time of offense		
▪ 06:00 am–09:59 pm	220	41.7%
▪ 10:00 pm–05:59 am	308	58.3%
Perpetrator		
▪ not known to the victim	315	46.1%
▪ known to the victim	368	53.9%
Previous assault		
▪ first assault	588	89.6%
▪ repeat assault by the same perpetrator	39	5.9%
▪ repeat assault by different perpetrators	29	4.4%
Time elapsed since the offense		
▪ < 12 hrs	342	49.9%
▪ ≥ 12 hrs	167	24.3%
▪ ≥ 24 hrs	146	21.3%
▪ ≥ 72 hrs	25	3.6%
▪ ≥ 120 hrs	6	0.9%
Substance use		
▪ Alcohol consumption reported	394	59.4%
▪ Drug use reported	50	7.5%
▪ Positive toxicology with non-consensual consumption reported	14	2.3%
Retrograde amnesia		
▪ complete	136	20.1%
▪ partial	126	18.7%
▪ complete ability to recall	413	61.2%
HIV post-exposure prophylaxis (PEP)		
▪ initiated	135	21.3%
Post-coital contraception		
▪ recommended	352	53.4%
Hepatitis B vaccination (active)		
▪ administered	20	3.9%

from 50 to 74 (HR 3.00; 95% CI 1.02–8.87,  $p = 0.046$ ), were identified as risk factors for the occurrence of genital injuries (► **Table 3**).

### Retrograde amnesia and substance use

Only 61.2% of patients reported being able to fully recall the assault. 20.1% reported complete memory loss and 18.7% incomplete memory of the reported crime and its specific circumstances. A history of voluntary consumption of alcohol (59.8%) and a history of covert administration of narcotics by the offender

**► Table 2** List of the types of genital and extragenital injuries and injury patterns (as a percentage of all genital and extragenital injuries, multiple responses possible).

	Number	Percentage
Type of injury		
Type of genital injury		
▪ abrasion	88	47.3%
▪ tear	75	40.3%
▪ redness	60	32.2%
▪ ecchymosis	40	21.5%
Type of extragenital injury		
▪ ecchymosis	437	83.9%
▪ abrasion	296	56.8%
▪ redness	214	41.1%
▪ scratch	165	31.7%
▪ bite	32	6.1%
Location of injury		
Location of genital injury		
▪ external genitalia	118	63.4%
▪ internal genitalia	71	38.2%
▪ anal region	38	20.4%
Location of extragenital injury		
▪ upper extremities	374	71.8%
▪ lower extremities	335	64.3%
▪ trunk	262	50.3%
▪ head	140	26.9%
▪ neck	122	23.4%

(toxicology evidence in 2.3% of cases) (knockout drops, drugs, alcohol) were identified as risk factors for memory lapse ( $p < 0.001$ ).

### Administration of post-coital contraception and post-exposure prophylaxis for HIV

During the consultation and after taking the medical history, post-coital contraception was recommended by the treating gynecologist in 53.4% of cases and then handed out to the patients. In contrast, post-exposure prophylaxis to protect against HIV infection (HIV-PEP) was prescribed in only 21.3% of cases, and 3.9% of patients received a hepatitis B (active) vaccination (► **Table 1**). PEP was more frequently prescribed when genital injuries were present (29.1%,  $n = 50$ ) as opposed to no injuries (19.5%,  $n = 84$ ,  $p < 0.012$ ). Hepatitis B vaccination occurred more frequently when genital injuries were present (40%,  $n = 8$ ) vs. no injuries (28.5%,  $n = 167$ ,  $p < 0.028$ ).

### Psychiatric disorders

A medical history of borderline personality disorder and/or the affected patient previously self-harming were reported in 13.4% of cases.

► **Table 3** Risk factors for genital and extragenital injuries. Statistically significant comparisons are shown in bold.

	Genital injury				Extragenital injury			
	n	HR	95% CI	p-value	n	HR	95% CI	p-value
Age in years								
▪ <25 (reference)	214				266			
▪ 25–49	143	0.649	0.40–1.06	0.084	170	1.75	1.07–2.85	0.025
▪ 50–74	15	3.004	1.02–8.87	0.046	18	2.86	0.63–13.02	0.174
▪ ≥ 75	1	–	–	–	2	–	–	–
History of alcohol consumption								
▪ none reported (reference)	183				199			
▪ reported	190	1.01	0.61–1.67	0.981	257	1.95	1.21–3.12	0.006
Time of offense								
▪ 10:00 pm–05:59 am (reference)	204				258			
▪ 06:00 am – 09:59 pm	169	0.85	0.51–1.42	0.537	198	0.71	0.44–1.16	0.173
Perpetrator								
▪ perpetrator is a stranger (reference)	123				184			
▪ known to the victim	250	0.73	0.45–1.20	0.215	272	0.6	0.36–0.99	0.046

## Discussion

This study of women having sustained a sexual offense shows that a combined gynecology and forensic medical examination was able to detect injuries in the majority of patients, and that the medical reports pertaining to these injuries were consistent with the reported offense.

Based on this interdisciplinary examination of the affected individuals as well as the extensive number of cases evaluated, it appears that the distribution of genital and extragenital injury patterns is meaningful and can be transferred to other settings.

The high percentage of genital injuries observed in our study, at 28.5%, reinforces the importance of the gynecology examination. In the literature, evidence of genital injuries after sexual offenses ranges from 6% [10] to 87% [11]. This may be attributed to differences in the patient inclusion criteria used in the different studies, the definition of genital injuries, and the delay in seeking medical assistance, as well as the study method [12–14]. Transient evidence (skin redness, swelling) is not systematically recorded [12, 15], and may be missed if there is a prolonged delay since the time of the offense. In contrast to studies showing that significantly more genital injuries were detected in women examined within 72 hours of a sexual offense [16–18], we were unable to confirm this in our cohort. Given that most of the gynecology examinations in our cohort were performed close to the time of the offense, and because intimate injuries were documented based on the TEARS system, it appears unlikely that there is a relevant underestimation of genital injuries in our study.

The absence of genital injuries does not generally preclude a sexual offense [12]. Conversely, the presence of genital injuries does not prove that a sexual offense took place, since injuries may also occur after consensual sexual intercourse [17]. Sexually active women may find it difficult to attribute the provenance of diagnostic findings to a specific event. However, from a morpho-

logical perspective, evidence from injuries is well suited for the assessment and evaluation of alleged penetration mechanisms and the details of the offense that have been communicated.

For the same reason, and due to the high percentage of extragenital injuries, amounting to 78.6%, an additional complete physical examination appears necessary for the appropriate care of women after a sexual offense.

We identified anal penetration and older age as risk factors for the occurrence of genital injuries. Postmenopausal vaginal mucosal atrophy associated with older age may favor injury [19]. An increase in the incidence of genital injuries with increasing age was also observed in an American study of 819 patients (20% genital injuries) [20] and a Danish study of 249 patients (32% genital injuries) [21], as well as an Australian study of 1266 patients (24.5% genital injuries) [18]. Non-consensual anal penetration is also associated with an increased probability of injury. The type of penetration or objects used, narcotic use, and the victim's relationship with the offender are also considered to increase the risk of injury. According to Sugar et al. (2004), extragenital injuries occurred more frequently when the perpetrator was someone who was not known to the affected individual [20]. Our study also confirms that women sustained more extragenital injuries when the perpetrator was a stranger (HR 0.60; 95% CI 0.36–0.99,  $p=0.046$ ). It may be speculated that a greater level of physical violence is inflicted in this type of perpetrator-victim context. Zilkens et al. (2017) found an association between victims being administered sedatives and a lower occurrence of genital injuries [18], and concluded that intoxicated and sleepy patients presented less resistance and were therefore at lower risk of injury [21]. Although our study showed an association between a complete or partial memory gap and alcohol consumption, this did not affect the genital injury patterns observed. We were, however, able to show that individuals from our cohort who reported having consumed alcohol sustained more extragenital injuries (HR 1.95;



95% CI 1.21–3.12,  $p = 0.006$ ) [16]. This is consistent with the Maquire et al. (2009) study. It is important to qualify that our study collated alcohol and/or drug use from the medical history, and not from routine toxicology screening results. In our cohort, toxicology reports were exclusively performed at the request of the investigating authorities. In our study, knockout drops could only be detected in 2.3% of the cases ( $n = 14$ ) in which a memory gap was reported in relation to the offense.

Preventive measures were able to be implemented as part of the gynecology examination, particularly for young women, by informing them about the potential consequences of excessive voluntary alcohol consumption. Gynecologists perform a key preventive function in this context.

The primary care of victims should also focus on providing psychological support for patients as well as facilitating access to low-threshold contact services. This is illustrated by the high proportion of patients in our cohort with a psychiatric history. A medical history of borderline personality disorder and/or self-harm were reported in 13.4% of the cases in our study. This compares to an overall incidence in the general German population of only 2.7% [22]. International studies have also shown that a high proportion of affected individuals, ranging from 25.8–39.7%, have a prior history of psychiatric disorders [18,20]. Timely psychological support for affected women can at least address several of the more typical consequences of sexual violence, such as depression, post-traumatic stress disorder (PTSD), and anxiety disorders [23]. However, psychological support is difficult to implement in the context of an emergency department consultation.

The risk of an unwanted pregnancy as a result of rape varies, depending on patient age and concurrent contraception use, and is approximately 5% [24]. The risk of an HIV infection ranges from 0.001–0.03% depending on whether vaginal, oral, or anal intercourse occurred [25,26]. Our results show that post-coital contraception was prescribed within 120 hours of the offense in more than half of the cases, whereas PEP was indicated and implemented in only 21.3% of cases. Counseling by gynecologists about unwanted pregnancies and infections is, therefore, another important component of primary care. The presence of genital injuries increased indications for HIV PEP and also for hepatitis B vaccination. There are no German federal standard recommendations for HIV PEP after a sexual offense. Strict recommendations only apply to perpetrators with an established positive HIV status.

The current study has several limitations, most notably the retrospective nature of the data collection which introduces a potential selection bias. This may, for instance, account for the high proportion of prior psychiatric disorders in our cohort. It is also important to note that data about the offense, such as the time of the offense, substance use, and prior psychiatric disorders were based only on the medical history and were not confirmed by results from the criminal investigation (recall bias). It is well established in practice that some of the medical history data relating to details about the offense, e.g., specifically the consensual status, cannot be subsequently confirmed, particularly in the case of patients with a prior history of psychiatric disorders.

Whether or not patients sought or consulted support services after the initial care could not be evaluated in our study. Furthermore, the spectrum of injuries evaluated is only relevant to our

current study cohort and cannot be extrapolated to child or adolescent individuals affected by the same type of offenses.

## Conclusion

A combined gynecology examination and forensic complete physical examination of women after a reported sexual offense provides expert documentation and an assessment of the injuries incurred which may be used in court.

The gynecology examination is a fundamental component and cornerstone of the medical care of women after a sexual offense, as 28.5% of affected women sustained injuries in the genital region. The gynecologists also prescribed post-coital contraception to more than half of the women in this study. Our results indicate that young age, consumption of alcohol, administration of narcotics, and the presence of psychiatric disorders appear to be risk factors for the occurrence of sexual offenses and associated injuries. The interdisciplinary care provided to female victims of a sexual offense may serve as a model for formulating national German guidelines.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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