

Sexual assault of postmenopausal women: a retrospective review

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Objective To determine whether postmenopausal women have a greater susceptibility to genital and extragenital injuries as a result of sexual assault.

Design Retrospective review of patient notes.

Setting The Havens sexual assault referral centres, Camberwell and Paddington, London, UK.

Population A total of 122 postmenopausal and 130 premenopausal women.

Methods Eligible women were identified. Standardised Haven forms completed during forensic examination were retrieved for each participant, and relevant information was extrapolated to study forms.

Main outcome measures Demographic and assault-related characteristics, prevalence of genital and extragenital injury, type, size and location of injury, and logistic regression predicting study group.

Results 37% of postmenopausal women and 17% of premenopausal women sustained genital injury (multivariate analysis OR 3.31, 95% CI 1.39–7.91), and 71% of postmenopausal women and 69% of premenopausal women were found to have extragenital injury (univariate analysis OR 1.35, 95% CI 0.79–2.32, not significant). Of those with extragenital injury, 41.4% of postmenopausal women and 20.9% of premenopausal women sustained large bruises ($P < 0.01$).

Conclusions When controlling for the effects of demographic and assault-related characteristics, postmenopausal women were more than three times more likely to sustain genital injury than premenopausal women following a sexual assault. No significant difference between the two groups was found for extragenital injuries; however, of those who sustained an extragenital injury, postmenopausal women were significantly more likely to have large bruises than premenopausal women.

Keywords Injury, postmenopausal, rape, sexual assault.

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Introduction

The term 'sexual assault' is primarily a legal definition, and the question of consent is resolved by the courts rather than by the doctor who examines the victim. The Sexual Offences Act (2003) provides definitions of rape and sexual assault as follows: rape is defined as penetration by the penis of somebody's vagina, anus or mouth, without their consent; assault by penetration is the offence of penetrating the anus or vagina of someone else with any part of the body or with an object if the penetration is sexual and if the person does not consent; sexual assault is any kind of intentional sexual touching of somebody else without their consent.¹

The Havens sexual assault referral centres

The Havens are London-based sexual assault referral centres that were set up as a joint initiative between the

Metropolitan Police Service and the UK's National Health Service (NHS). Three Havens provide a 24-hour/7-days service to any adult or child, male or female, in greater London who has been sexually assaulted. The first Haven opened in Camberwell in 2000, followed by the Havens in Paddington and Whitechapel in 2004. The Havens provide comprehensive services: clients can receive a forensic examination, emergency contraception and drugs to prevent infections, including HIV, and follow-up care including sexual health screening, psychosocial support and practical advice. There is also the opportunity for them to meet a specially trained police officer who will obtain more information about the assault, and help the client to make a decision about whether to formally report the incident to the police. The Havens see people of any age and accept police referrals, self-referrals or third-party referrals.

Why study sexual assault, injuries and postmenopausal women?

There are two primary aims of a forensic medical examination following sexual assault: to provide appropriate health care and to collect evidence to assist in the investigation of the incident, including the documentation of any injuries. The importance of understanding the nature of injury sustained during sexual assault cannot be overstated: research has shown that injury plays a significant role at multiple decision-making points during criminal justice proceedings,² including the decision to report, file, prosecute and convict, and injuries have been shown to be significantly associated with successful prosecution.^{3,4}

The sexual assault of women over the age of fifty is rarely reported in the literature, and the notion of older women as victims of sexual assault is relatively new.⁵ This is partly because of the misconception that older women are not sexually desirable and are therefore not capable of becoming victims of sexual assault. As a consequence, little research has been performed in this population, and as the overall population is becoming older, this gap in knowledge must be addressed. From the research that does exist, it appears that the sexual assault of older women may have distinct characteristics.^{5,6} Compared with younger women, women over 55 years of age were more likely to be assaulted in their own home or care facility by a service provider or a stranger, and were less likely to have been assaulted with a weapon. The older population were more likely to report higher rates of vulnerabilities, such as psychiatric and cognitive disabilities, than younger women, and were more likely to be admitted to hospital after the assault.

Further investigation with this population will improve our understanding of the vulnerabilities, exposure patterns, and physical and emotional responses that are unique to older victims. This in turn will help with the development of prevention and treatment strategies, and will inform those who care for sexual assault victims of all ages.

Ageing and the menopause

The ageing process affects the body's ability to respond to injury and contributes to a slower rate of recovery from even minor injuries. Furthermore, certain illnesses can impact on sexual arousal: for example, cardiovascular disease and diabetes mellitus can cause blood flow to diminish, which can lead to vaginal dryness. In addition, many prescription medications have been linked to sexual dysfunction, including antihypertensive medications, antidepressants and antipsychotics.⁷

The menopause is defined by hormonal changes, specifically by lower levels of estrogen. As women age, the vagina gets narrower and shorter, the walls become thin and less

elastic, and vaginal glands produce fewer secretions. External genitalia also change as the labia lose fat and elastic tissue, and the vulva thins and flattens as a result of reduced thickness of the keratin and epithelial layers. Furthermore, the epidermal growth rate decreases and collagen content and thickness diminish with age.⁸

Theoretically, all of the above changes may contribute to an increased risk of injury to postmenopausal women following sexual intercourse, regardless of whether it is consensual or not. We have not been able to identify any research into injuries in postmenopausal women following consensual sexual intercourse.

Postmenopausal women and injury from sexual assault

There have been mixed outcomes from previous research into injuries in postmenopausal women following sexual assault. Some studies suggest older women sustain a higher prevalence of genital injury following rape than younger women,⁹⁻¹³ whereas other studies have not found any age-related increase in the prevalence of genital injury.^{14,15} Most studies show a similar prevalence of non-genital injury in younger and older groups;^{9,11,15} however, two studies found that older women were more likely to sustain non-genital injuries than younger women,^{13,14} and another study found that younger women were more likely to sustain non-genital injuries than older women.¹⁰

There are a number of possible reasons for the variations in findings among previous studies. A review of the literature showed a large variation in research objectives, study populations, sample sizes, methodology, injury definition, examiner training and experience, and examination technique. Previous studies have generally involved relatively small numbers of postmenopausal women, ranging from 10 to 40,^{9,15} and all but one used age as a proxy for menopause;¹³ thus, it is likely that a number of women who were not postmenopausal were included in the study group. Furthermore, the age chosen varies across the studies, thereby limiting the possibility of comparison. Cartwright, Ramin *et al.*, Sugar *et al.*, Jones *et al.* and Sommers *et al.* defined menopause as age 50 years and over.^{9,10,12,13,15} Tintinalli & Hoelzer¹⁴ defined menopause as over 50 years in age, Muram *et al.*¹¹ defined menopause as aged 55 years and over, and Cartwright & Moore¹⁶ defined menopause as aged 60 years and over.

It has been suggested that any observed elevated rates of injury in postmenopausal women following rape could be the result of higher levels of violence rather than simply the result of postmenopausal status (e.g. Groth).¹⁷ There is some evidence that perpetrators of crimes against older women express more hostility and power, and inflict more pain and degradation, than those who assault younger women (e.g. Fazel *et al.*).¹⁸

Other factors related to injury

In addition to increasing age and postmenopausal status, there are a number of other factors that have been found to be related to higher rates of injury following sexual assault. These include: violence, including the use of a weapon, being hit or kicked, and attempted strangulation;^{12,19} type of assault, specifically oral or anal penetration and assault by more than one assailant;^{12,19} assailant type, namely a stranger or a current partner;^{12,19} the time between the assault and the forensic examination (injury rates were higher in those examined within 24 hours);¹² skin colour;¹⁵ pre-existing psychiatric diagnosis (schizophrenia, schizoaffective disorder, bipolar disorder or psychosis);¹² and recent substance use.^{12,19} All studies have shown relationships between factors other than age and prevalence of injury (e.g. level of violence, type of assault), yet only Sommers et al.¹⁵ adjusted for these factors in their analyses. It is unlikely to be as straightforward as simply an age-related increase in injury prevalence.

Defining patterns of injury

Sommers²⁰ suggests that there is a need for a common definition of genital injury pattern to guide research methods so that all researchers are measuring genital injury within the same parameters. Previous studies have defined injury pattern as simply prevalence and location; however, Sommers suggests that the definition be broadened, to include genital injury prevalence, frequency, location, severity and type. She defines these terms as follows: prevalence, the proportion of women with an occurrence of injury; frequency, the number of injuries counted by the examiner; location, the anatomic site of the injury; severity, the area and degree of injury; and type, tears, ecchymoses, abrasions, redness and swelling.

The main aim of this study was to determine whether postmenopausal women have a greater susceptibility to genital and extragenital injuries as a result of a sexual assault. Methodology from previous research is taken further with the use of a larger sample and a clearer definition of menopause, and by controlling statistically for demographic and assault-related characteristics.

Methods

This was a retrospective review of patient notes. Participants were drawn from the Haven Camberwell from its opening in May 2000 until April 2009, and from the Haven Paddington from its opening in June 2004 until June 2009.

Participants

Women were categorised as either postmenopausal or premenopausal. During the time between the opening of the Havens (Camberwell in 2000, Paddington in 2004) and the time of data collection (Camberwell, April 2009; Padding-

ton, June 2009), 9953 clients were seen. Of these, 174 were women aged 50 years and above (1.75% of all clients seen).

Postmenopausal women were identified by selecting all women aged 48 and above at the time of their forensic examination at the Haven. These women were then classed as postmenopausal if they were either aged 48 or 49 years and had not menstruated for at least 2 years, or were aged 50 years and over and had not menstruated for at least 1 year. In total, 122 women met these criteria and were thus defined as postmenopausal. A comparison group of 130 premenopausal women was then identified using a random number generator to select a group from all Haven clients. Premenopausal women were defined as those aged 18–47 years at the time of their forensic examination and who had menstruated within the last month.

All participants had come to the Haven following an alleged sexual assault within the previous 7 days and had a forensic examination by a doctor. When a client comes to the Haven, they are asked to sign a consent form before their forensic examination. Everything that is about to happen to them is explained in detail, including the issue of using their anonymised information for medical research. They are given the option to cross out anything on the list that they are not happy with before they sign. For the present study, anyone who did not give their signed consent to their information being used for research was not included. In both groups, women were also excluded if they had had a hysterectomy, because it was not possible to determine whether they were still producing estrogen, and therefore whether they were postmenopausal or premenopausal.

Procedure

As this study involved a retrospective review of existing patient notes, all notes for eligible postmenopausal Haven clients, and notes for a random sample of premenopausal women, were retrieved. The information collected fell into the following categories: client information (age at the time of Haven forensic examination, ethnicity, body mass index, number of vaginal deliveries and whether the participant had had consensual sexual intercourse within the previous 10 days), nature of the alleged assault (type of assault, relationship to the assailant, time between assault and Haven examination, violence, weapon present and weapon used), genital injuries (bruises, abrasions, lacerations, and number, size and location of each) and extragenital injuries (bruises, linear abrasions, non-linear abrasions, lacerations, and number, size and location of each).

Study protocol

Haven forensic sexual assault examination

The purpose of the Haven forensic sexual assault examination is to collect evidence of what happened during the

assault and about the assailant(s). Swabs and samples are taken from the client for DNA testing and to provide other evidence of contact, and any injuries are documented. All Haven sexual offences examiners (SOEs) are highly trained, and examine clients and record information in a standardised way. SOEs first obtain a full medical history and details of the alleged assault from the client. They then carry out the forensic examination, which involves a top-to-toe physical examination, including the genital area. The entire process takes around 3 hours. Any injuries are established through visual inspection, and the type, size and location of each injury are recorded on body diagrams. Swabs are taken from the skin and areas involved in the assault, such as the vagina, anus or mouth, and blood and urine samples are also taken. Treatment of any injuries and other medical care is provided at the initial visit. Clients are offered a follow-up appointment 10–14 days later where they can access further services, such as counselling, and have tests for sexually transmitted infections.

Defining injury

Information about genital and extragenital injuries was collated in line with Sommers' (2007) model of describing injury, where prevalence is the number of participants with an injury, frequency is the mean number of injuries, location is the anatomic site of injury, type is bruise, abrasion or laceration, and size is small, medium and large injuries (the definitions of small, medium and large differ depending on the type and location of injury; details are given in the results section).

The original model proposed by Sommers defines injury types as 'tears, ecchymoses, abrasions, redness and swelling' (p. 276).¹⁵ For the present study, injury was defined as any tissue trauma visible on inspection, including bruises, and linear and nonlinear abrasions and lacerations. Bruises were defined as skin discolouration resulting from damage to small blood vessels so that blood leaks into perivascular tissue. Abrasions were defined as superficial injuries to the outer layers of skin that do not penetrate the full thickness of the epidermis. Linear abrasions were abrasions that were considerably longer than they were wide. Lacerations were defined as the splitting of the full thickness of the skin. They are often ragged wounds caused by crushing and tearing of tissue; they tend to gape open and have bruised and abraded margins.

Data collection and analysis

All information collected for the study was taken from the standardised Haven forensic proforma, a detailed form that is completed by SOEs at the time of the client's appointment. For the present study, data were extracted from each client's proforma by two of the investigators

(LM and AD): a research fellow and a sexual offences examiner.

The main outcome was the prevalence of genital and extragenital injuries in postmenopausal and premenopausal women following a sexual assault. Secondary outcomes included any differences in frequency, location, type and size of injury, and any differences in demographics and assault-related characteristics between the two groups. Data were entered into spss v16.0 (SPSS Inc., Chicago, IL, USA) and descriptive statistics were used to illustrate the areas of interest. A Student's *t* test and a chi-square test were used to compare means and proportions, respectively. Multivariate logistic regression analysis was carried out to examine factors associated with being pre- or postmenopausal. In multivariate analysis all variables with $P < 0.05$ were included in the model.

Results

Demographic and assault-related characteristics

Demographic and assault-related characteristics are shown in Table 1. The mean age for the postmenopausal group was 60.52 years (SD 11.8 years), and the mean age for the premenopausal group was 27.36 years (SD 7.89 years). In total, 83.6% of the postmenopausal group were white, compared with 51.5% of the premenopausal group ($P < 0.0001$). There were no statistically significant differences in each of the BMI categories ($P > 0.05$).

Postmenopausal women had had a mean of 2.02 vaginal deliveries, whereas premenopausal women had a mean of 0.81 vaginal deliveries ($P < 0.0001$). Premenopausal women were significantly more likely to have had consensual sexual intercourse within the 10 days prior to the forensic examination than postmenopausal women ($P < 0.0001$). Premenopausal women were also more likely to have drunk alcohol or taken illicit drugs around the time of the assault than postmenopausal women ($P < 0.05$). Twenty-nine per cent of the whole study population reported that they had experienced mental health problems at some time in their lives: 38.5% of postmenopausal women and 20.0% of premenopausal women ($P < 0.05$).

In both groups vaginal rape was the most prevalent type of assault; however, this was reported by significantly more premenopausal than postmenopausal women ($P < 0.01$). There were no statistically significant differences in assailant type between the two groups, although stranger-1 assaults (assaults by complete strangers) were slightly higher in the postmenopausal group ($P = 0.09$) and multiple-assailant assaults were slightly higher in the premenopausal group ($P = 0.06$). Significantly more postmenopausal than premenopausal women reported verbal threats made by the assailant during the assault ($P < 0.05$). The presence and use of a weapon during the assault were reported more

Table 1. Demographic and assault-related characteristics

	Postmenopausal women		Premenopausal women	
	<i>n</i> = 122	%	<i>n</i> = 130	%
Demographics				
Age (mean, years)	60.52	SD 11.8	27.36	7.89
Ethnicity				
White**	102	83.6	67	51.5
Body mass index				
Underweight (<18.5)	12	9.8	11	8.5
Normal weight (18.5–24.9)	35	28.7	35	26.9
Overweight (25–29.9)	29	23.8	28	21.5
Obese (>29.9)	18	14.8	14	10.8
Other participant details				
Alcohol consumed around the time of the assault*	60/120	50.0	85/130	65.4
Illicit drugs used around the time of the assault*	12/120	10.0	28/130	21.5
Mental health problems (in lifetime)**	47/121	38.8	26/130	29.1
Mean vaginal deliveries (max.)**	2.02 (9)	–	0.81 (8)	–
Sexual intercourse within 10 days prior to forensic exam**	24	19.7	58	44.6
Assault details				
Nature of assault***				
No recollection	21	17.2	21	16.2
Vaginal rape**	74/101	73.3	87/99	87.9
Anal rape	14/101	13.9	17/99	17.2
Oral rape	22/101	21.8	24/99	24.2
Object penetration vaginal	5/101	5.0	3/99	3.03
Object penetration anal	0	0	0	0
Object penetration oral	0	0	0	0
Digital penetration vaginal	26/101	25.7	18/99	18.2
Digital penetration anal	4/101	4.0	4/99	4.0
Digital penetration oral	1/101	1.0	0	0
Attempted vaginal rape	11/101	10.9	8/99	8.1
Attempted anal rape	5/101	5.0	9/99	9.1
Attempted oral rape	2/101	2.0	4/99	4.0
Assailant				
No recollection	6	4.9	11	8.5
Stranger 1 (no prior relationship)	31/116	26.7	21/119	17.6
Stranger 2 or acquaintance (known casually)	56/116	48.3	49/119	41.2
Domestic violence (current/previous partner, family member)	21/116	18.1	32/119	26.9
Multiple assailants (more than one assailant)	8/116	6.9	17/119	14.3
Violence				
No recollection	21	17.2	31	23.8
Any violence during assault (yes)	73/101	72.3	79/99	79.8
Weapon present	20/101	19.8	12/99	12.1
Weapon used	16/101	15.8	9/99	9.1
Verbal threats*	35/101	34.7	24/99	24.2
Time between assault and forensic examination				
Within 48 hours of assault	105	86.1	105	80.8
3–7 days after assault	15	12.3	25	19.2

P* < 0.05.*P* < 0.01.

***The percentages in this category add to more than 100% as a number of women reported more than one type of assault.

often by postmenopausal women; however, this did not reach significance (*P* = 0.06 and *P* = 0.07, respectively). The time between the assault and the forensic examination was

similar for both groups, with the majority of women being examined within 48 hours of the assault (88% of postmenopausal women and 81% of premenopausal women).

Hormone use: hormone replacement therapy and contraception

Information was collected on the use of hormone replacement therapy (HRT) among postmenopausal women. Just five out of 119 (4%) were using HRT, and thus it was not possible to include this variable in further analyses. Just one postmenopausal woman was currently using a form of contraception (condoms). Sixty-six of the 130 premenopausal women (51%) were currently using contraception, including condoms (18.5%) and combined oral contraceptives (14.6%).

Injuries

Genital injury

One hundred and seven postmenopausal and 124 premenopausal women consented to a genital examination. Table 2 summarises the prevalence, frequency, location, type and

size of the genital injuries. The prevalence of genital injury was 26% for the whole study population: 37% of postmenopausal women and 17% of premenopausal women ($P < 0.001$). Of those who sustained a genital injury, the mean number of injuries was higher in the postmenopausal group (2.49) than in the premenopausal group (1.69), although this difference did not reach significance ($t = 1.66$, $df = 60$, $P = 0.05$, one-tailed Student's t test).

Owing to the very small numbers in some categories, the significance tests should be interpreted with caution. Postmenopausal women were significantly more likely to sustain an injury to the vestibule ($P < 0.05$) and to sustain genital bruising ($P < 0.01$) than premenopausal women. They were also more likely to sustain large abrasions than premenopausal women, but this did not reach statistical significance ($P = 0.05$). There was some variability in the recording of bruise sizes in the forensic notes, and thus it was not possible to present size of bruises here. However,

Table 2. Genital injuries following sexual assault

	Postmenopausal women				Premenopausal women			
Prevalence**	40/107		37%		21/124		17%	
Frequency	<i>n</i>	Mean	SD	Max	<i>n</i>	Mean	SD	Max
	35	2.49	1.38	6	17	1.69	0.95	4
Location	<i>n</i> = 35		%		<i>n</i> = 17		%	
Pubic area	0		0		0		0	
Labia majora	5		14.3		1		5.9	
Labia minora	9		25.7		4		23.5	
Fourchette	17		48.6		9		52.9	
Fossa navicularis	8		22.9		3		17.7	
Vestibule*	18		51.4		3		17.7	
Hymen	4		11.4		0		0	
Vagina	6		17.1		1		5.9	
Cervix	0		0		0		0	
Natal cleft	0		0		0		0	
Perianus	3		8.6		2		11.8	
Anal margin	1		2.9		1		5.9	
Internal anal injury	1		2.9		1		5.9	
Type								
Bruises**	11		31.4		0		0	
Abrasions	30		85.7		16		94.1	
Lacerations	4		11.4		1		5.9	
Size								
Abrasions								
Small <0.6 cm	20		57.1		10		58.8	
Medium 0.6–1 cm	12		34.3		7		41.2	
Large >1 cm*	7		20.0		0		0	
Lacerations								
Small <0.6 cm	1		2.9		0		0	
Medium 0.6–1 cm	1		2.9		1		5.9	
Large >1 cm	2		5.7		0		0	

* $P < 0.05$.

** $P < 0.01$.

of the women who had bruises to the genital area, all 11 were postmenopausal, and no premenopausal women sustained genital bruising. Bruises were most commonly found in the vestibule (seven women) and the labia minora (four women). Two women had bruises in the labia majora, and two had bruises in the fossa navicularis. One had bruising to the fourchette and no women had bruising in the pubic area.

Extragenital injury

Table 3 summarises injury prevalence, frequency, location, type and size of extragenital injuries. The prevalence was 69% for the whole study population, and was slightly higher in the postmenopausal group (71%) compared with the premenopausal group (66%; $P = 0.17$). Of those who had an extragenital injury, the mean number of injuries was higher in the postmenopausal group (11.34) than in

the premenopausal group (8.63), although this difference did not reach significance ($t = 1.52$, $df = 147$, $P = 0.07$, one-tailed Student's t test). Postmenopausal women who sustained an injury were found to be significantly more likely to sustain large bruises (greater than 16 cm²) compared with premenopausal women ($P < 0.01$). Postmenopausal women had a slightly higher rate of head injury than premenopausal women, although this difference was not significant ($P = 0.09$).

Using injury prevalence and demographic and assault-related characteristics to predict study group

It is clear that there are a number of demographic, assault-related and injury-prevalence differences between the postmenopausal and premenopausal women in the present study. With this in mind, a logistic regression was carried

Table 3. Extragenital injuries following sexual assault

	Postmenopausal women				Premenopausal women			
Prevalence	87/122		71%		86/130		66%	
Frequency	<i>n</i>	Mean	SD	Max	<i>n</i>	Mean	SD	Max
	87	11.34	13.96	72	86	8.63	9.01	49
Location	<i>n = 87</i>		%		<i>n = 86</i>		%	
Head	34		39.1		26		30.2	
Neck	12		13.8		21		24.4	
Upper limb	65		74.7		59		68.6	
Trunk	52		59.8		45		52.3	
Lower limb	60		69.0		52		60.5	
Type								
Bruise	82		94.3		80		93.0	
Linear abrasion	34		39.1		37		43.0	
Nonlinear abrasion	34		39.1		30		34.9	
Laceration	9		10.3		4		4.7	
Size								
Bruise								
Small ≤ 2 cm ²	63		72.4		62		72.1	
Medium 2.1–16 cm ²	58		66.7		58		67.4	
Large >16 cm ^{2*}	36		41.4		18		20.9	
Linear abrasions								
Small <1 cm	8		9.3		16		18.6	
Medium 1–5 cm	27		31.0		31		36.0	
Large >5 cm	11		12.6		9		10.5	
Nonlinear abrasions								
Small <2 cm ²	28		32.2		27		31.4	
Medium 2–9 cm ²	14		16.1		11		12.8	
Large >9 cm ²	5		5.7		4		4.7	
Lacerations								
Small <1 cm	0		0		1		1.2	
Medium 1–5 cm	8		9.2		3		3.5	
Large >5 cm	2		2.3		0		0	

* $P < 0.01$.

out to adjust for the influence of some of these factors, with study group (postmenopausal or premenopausal) as the dependent variable (coded 1 and 0, respectively).

For the purposes of this analysis, the nature of the sexual assault was recoded, as a number of women reported more than one type of assault. In order that each participant belonged to only one category, the data was recoded as follows: no recollection of the assault (17.2% of postmenopausal and 23.8% of premenopausal women); vaginal, anal or oral rape (i.e. rape at one site only; 55.4% of postmenopausal and 60.6% of premenopausal women); rape at more than one site (two or three of vaginal rape, anal rape and oral rape; 24.8% of postmenopausal and 30.3% of

premenopausal women); or other sexual assault, which includes the participants who reported no rape (penile penetration), but who reported one or more of object penetration to the vagina, anus or mouth, digital penetration to the vagina, anus or mouth, and attempted vaginal, anal or oral rape (19.8% of postmenopausal and 9.1% of premenopausal women).

In the univariate analysis (Table 4), study group was predicted by body mass index (the trend as a whole, rather than each level), ethnicity, verbal threats, consensual sexual intercourse within 10 days of the forensic examination and genital injuries. Study group was not predicted by assailant type, time between assault and forensic examination,

Table 4. Summary of logistic regression analyses predicting study group (postmenopausal or premenopausal)

Variable	Crude			Adjusted		
	OR (95% CI)	P	P for trend	OR (95% CI)	P	P for trend
Body mass index						
Normal weight	1		0.041	1		0.010
Underweight	0.46 (0.18–1.15)	0.095		0.30 (0.09–0.92)	0.036	
Overweight	0.95 (0.36–2.50)	0.916		1.28 (0.36–4.52)	0.697	
Obese	1.18 (0.40–3.46)	0.765		1.00 (0.22–4.59)	1.00	
Ethnicity						
White	1			1		
Non-white	0.21 (0.11–0.42)	<0.001		0.14 (0.05–0.40)	<0.001	
Assailant						
Stranger 2/acquaintance	1		0.073	Excluded		
Stranger 1	0.80 (0.41–1.57)	0.518				
Domestic violence	0.46 (0.21–1.01)	0.052				
Multiple assailants	0.33 (0.12–0.90)	0.031				
Unknown	0.38 (0.12–1.19)	0.098				
Time to exam						
Within 48 hours	1			Excluded		
Days 3–7	0.61 (0.30–1.21)	0.158				
Assault type						
Rape single site	1		0.099	Excluded		
Rape multiple sites	0.86 (0.45–1.64)	0.641				
Other sexual assault	2.38 (1.00–5.67)	0.050				
No recollection	0.73 (0.37–1.41)	0.343				
Violence						
Yes	0.99 (0.54–1.81)	0.974		Excluded		
Weapon present						
Yes	2.09 (0.88–4.97)	0.095		Excluded		
Weapon used						
Yes	2.09 (0.88–4.97)	0.095		Excluded		
Verbal threats						
Yes	1.89 (1.02–3.49)	0.042		1.63 (0.67–3.97)	0.285	
Sex in last 10 days						
Yes	0.31 (0.18–0.55)	<0.001		0.50 (0.22–1.13)	0.095	
Extragenital injuries						
Yes	1.35 (0.79–2.32)	0.278		Excluded		
Genital injuries						
Yes	2.93 (1.59–5.40)	0.001		3.31 (1.39–7.91)	0.007	

assault type, violence, weapon present, weapon used or extragenital injuries. In the multivariate logistic regression model, the presence of genital injuries was still associated with the study group: specifically, postmenopausal women were more than three times more likely to sustain a genital injury than premenopausal women (OR 3.31, 95% CI 1.39–7.91). Other factors that remained significantly associated with study group were body mass index (premenopausal women were more likely to be underweight than postmenopausal women; OR 0.30, 95% CI 0.09–0.92) and ethnicity (premenopausal women were more likely to class themselves as non-white than postmenopausal women; OR 0.14, 95% CI 0.05–0.40).

Discussion

The present study took place at the Havens sexual assault referral centres in Camberwell and Paddington, London, and compared injuries in postmenopausal and premenopausal women following sexual assault. There were some notable demographic and assault-related similarities and differences between the two study groups. Significantly more postmenopausal women were white (84%) than premenopausal women (52%; $P < 0.001$), a finding that is similar to those of Cartwright, Ramin et al. and Cartwright & Moore.^{9,10,16} It is unclear whether this finding reflects natural variations in the population, differences in the frequency of sexual assault or a bias in the reporting of sexual assault among ethnic groups.

Postmenopausal women were significantly less likely to have drunk alcohol (50%) or taken illicit drugs (10%) around the time of the assault than premenopausal women (65 and 22%, respectively; $P < 0.05$), which is in line with the findings of other studies (e.g. Ramin et al.).¹⁰ It was not possible to include alcohol and drug use in further analysis in the present study, as participants reported their consumption of each in variable ways (e.g. 'I drank a few glasses of wine', 'I had some cocaine'). Findings from previous research are contradictory with regards to the relationship between alcohol/drug consumption and injury following sexual assault. Coker et al.¹⁹ found a relationship between alcohol/drugs and extragenital injury; however, Jones et al.¹³ found that although premenopausal women were more likely than postmenopausal women to have consumed alcohol or drugs around the time of the assault, there was no statistical association between alcohol/drugs and injury following assault. The exact nature of the relationship between drugs and alcohol and sexual assault remains unclear, and requires further study; however, this was beyond the scope of the present research.

The majority of women in both groups had experienced vaginal rape, although significantly more premenopausal women reported this than postmenopausal women (88 and

73%, respectively; $P < 0.01$). The majority of women in both groups were assaulted by someone they knew casually; however, more than a quarter of postmenopausal women were assaulted by someone that they had never met before, compared with 18% of premenopausal women. This difference was not significant ($P = 0.09$), but the trend is in line with previous research (e.g. Jones et al.)¹³ suggesting that older women are more likely to be assaulted by a man who has broken into their place of residence. Assaults by more than one assailant were more often reported by premenopausal women. Again, this was not a significant difference ($P = 0.06$), but the trend is consistent with previous rape research (e.g. Horvath & Kelly).²¹

The present study found significantly higher rates of verbal threats in assaults against postmenopausal women (35%) compared with premenopausal women (24%; $P < 0.05$). The presence and use of a weapon was reported more often by postmenopausal women (20 and 16%, respectively) than by premenopausal women (12 and 9% respectively), and although these differences did not reach significance level ($P = 0.06$ and 0.07), the findings are consistent with researchers who have found that assaults against older women tend to be more violent.^{17,18} However, the present study does not support the claim that higher levels of violence against older women is sufficient to account for the higher rates of injury: only the odds of verbal threats were higher in the univariate analysis, and when this effect was taken into account, genital injuries were still more than three times more likely to occur in postmenopausal women than in premenopausal women.

Genital injury

Thirty-seven percent of postmenopausal women sustained a genital injury following a sexual assault, a lower prevalence than that reported by previous studies (51% in Sommers et al.; 51% in Muram et al.; 43% in Ramin et al.).^{10,11,15} Seventeen percent of premenopausal women were found to have a genital injury. This difference was significant in univariate analysis ($P < 0.001$), and when controlling for the effects of various demographic and assault-related characteristics. Logistic regression showed that postmenopausal women were more than three times more likely to sustain a genital injury than premenopausal women (OR 3.31, $P < 0.01$). The only other study to date that has attempted to control for the effects of possible confounding variables is that of Sommers et al.;¹⁵ however, they did not find any relationship between postmenopausal status and increased risk of genital injury. A possible explanation for the differences in the findings of the present study and past research is that age has been used as a proxy for menopause, and thus previous research may have included women in their postmenopausal category who were not strictly postmenopausal. There were also

differences in the way injury was defined: previous research categorised redness and swelling as injury, which can be subjective, and may have led to more women being classed as having an injury in previous research than in our study.

In the present study, the mean number of genital injuries was higher in postmenopausal women than in premenopausal women; however, this difference did not reach significance ($P = 0.05$). Of those who sustained an injury, almost a third of postmenopausal women had genital bruising compared with no premenopausal women ($P < 0.01$). Significantly more postmenopausal (51%) compared with premenopausal women (18%) sustained an injury to the vestibule ($P < 0.05$). The most common sites of injury in both study groups were the fourchette, vestibule, labia minora and fossa navicularis, in line with research that found injuries in these areas following both consensual and non-consensual penile penetration,²² suggesting that the major cause of genital trauma occurs as an entry injury, with insertion or attempts at insertion, whatever the age of the woman. It should be noted, however, that in the present study rates of injury in postmenopausal women to the vestibule and fossa navicularis were substantially higher than in premenopausal women, suggesting that there may be some age-related differences here that require further exploration.

Extragenital injury

Seventy-one per cent of postmenopausal women sustained an extragenital injury following a sexual assault. This figure is very high when compared with the 54% found by Sommers et al., the 49% found by Ramin et al. and the 45% found by Muram et al.^{10,11,15} Again, this difference may result from the way previous researchers have defined menopause, or it could be that the women in the present study were more likely to report a sexual assault if they had sustained an injury. Sixty-six per cent of premenopausal women sustained an extragenital injury. The odds of postmenopausal women compared with premenopausal women sustaining an extragenital injury were not statistically significant, which is similar to the findings of some past research.^{9,11,15} In the present study, high levels of violence were reported by both groups, which may explain both the high levels of body injury and the similar prevalence of injury in post- and premenopausal women. Although prevalence of injury to the body was not different between the two groups, there were some interesting differences. Of the women who sustained an injury, the mean number of injuries was higher in the postmenopausal group (11.34) than in the premenopausal group (8.63), although this did not reach significance ($P = 0.07$). Postmenopausal women who sustained an injury were significantly more likely to have large bruises than premenopausal women (41.4 and 20.9%, respectively; $P < 0.01$), and had a slightly higher rate of

head injury than premenopausal women (39 and 30%, respectively; $P = 0.09$, NS).

Clinical and practical implications

Haven clients are offered a variety of services and care, including: a forensic examination; emergency contraception and drugs to prevent infections, including HIV; and follow-up care, including sexual health screening, psychosocial support and practical advice. The care each client receives is tailored to the needs of the individual, thus research like the present study is needed to help us understand as much as possible about the clients seen, particularly in light of the UK government's plan to make a sexual assault referral centre (SARC) available to every police force area by 2011.²³ Furthermore, the development of a broader knowledge base is useful when interpreting clinical findings for judicial processes. Studies suggest that only 15% of rape allegations against people aged 16 years and over are reported to the police, and of the total reported, fewer than 6% result in an offender being convicted.²³ As forensic evidence documenting injuries following sexual assault can be used as part of a larger body of evidence to inform judicial processes, advancing our understanding of the nature and consequences of sexual assault is vital, and contributes to a more robust evidence base.

Although postmenopausal women make up a small percentage of Haven clients, they are by no means an insignificant group, and as has been shown here may present with different problems and needs than younger clients. They clearly represent a more vulnerable part of society, and the level of injury sustained by the postmenopausal women in the present study raises concerns around possible psychological problems that may develop as a result. The relatively small proportion of women aged over 50 years that are seen at the Havens raises the issue of possible under-reporting of sexual assault by older women. This is of concern if women of this age group sustain injuries that are not being treated, and it would be useful to develop ways to increase the number of older women reporting an assault.

Limitations

There are several limitations to the present study, including its design as a retrospective case-note analysis: data that is collected for clinical and legal practice introduces a certain level of error. Also, running a large number of univariate significance tests increases the likelihood of type-1 errors, that is that some of the significant differences found are in fact false. Furthermore, 51 different forensic examiners recorded information on the Haven clients included in this study, and although all had a similar high level of training and complete a standardised proforma for each client, there will be a certain degree of variability in examination and

recording practices. It is not clear exactly how this would impact on the way information is recorded for each client, as we were only able to find one research paper that looks at this,²⁴ where it was found that the less experienced examiners documented significantly more genital trauma. Further research is needed in this area.

More research is also needed into the type and size of injury. The postmenopausal women who sustained an extragenital injury were found to have more, and larger, bruises than premenopausal women. However, because of the low frequency of some injury events it is hard to draw any firm conclusions from this and other types of injury.

This study, like all studies of people who have been sexually assaulted, is open to sample bias in that it is only possible to include people who have reported an assault. People may be more likely to report an assault if they have physical signs of injury, thus our rates of injury may be over-inflated and not generalisable to all cases of sexual assault.

In spite of these limitations, valid conclusions can still be drawn from the research. The present study showed that more than a third of postmenopausal women sustained a genital injury. Postmenopausal women had a higher mean and maximum number of body injuries, and were twice as likely to have large bruises as premenopausal women. If age differences exist in the likelihood of injury, it is important that clinicians understand any typical injury patterns that are attributable to age.

Conclusions

After controlling for the effects of certain demographic and assault-related characteristics, postmenopausal women were more than three times more likely to sustain a genital injury than premenopausal women. The prevalence of extragenital injury was not significantly different between the two groups; however, of the women who sustained an extragenital injury, postmenopausal women were significantly more likely to have larger bruises than premenopausal women.

Disclosure of interests

None.

Contribution to authorship

LM defined the research question, developed the study protocol, collected and analysed the data and is the corresponding author. AD defined the research question and collected the data. JW defined the research question, revised all versions of the paper and gave final approval.

Details of ethics approval

This was a retrospective review of clients' case notes. Advice was sought from a local research ethics committee, which confirmed that no ethics approval was needed.

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