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DORIS

The DORIS study: Domestic violence in ORthopaedIcS, an observational study of 1,366 female patients

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ABSTRACT

Background

Domestic violence (DV) is a major problem which despite many efforts persists globally. Victims of DV can present with various injuries, whereof musculoskeletal presentation is common. Injury severity may escalate as DV continues, thus making early identification and intervention, within a healthcare setting, an important strategy in the work against DV.

Objectives

The DORIS study aimed to establish the year prevalence of DV at an orthopaedic emergency department (ED) in Sweden. The prevalence of injuries due to DV and current experience of any type of DV was surveyed.

Design

Female adult patients with orthopaedic injuries seeking treatment at a tertiary orthopaedic centre received forms containing validated questions for DV between September 2021–2022 during their ED visit. Furthermore, all cases of DV identified by staff at the ED were reported. Affected patients were offered to see a counsellor within the project.

Results

During the study period, 4,192 female patient were provided with study forms and 1,366 responded (32.5%). One in 14 had experience of current DV (n=100, 7.5%) and one in 65 (n=21, 1.5%) had an injury due to DV. Of patients injured due to DV, 50 % had previously sought medical attention. Formal documentation of DV was missing in 50 % of the cases, and these cases had been identified thanks to screening.

Conclusions

The prevalence of DV found in the current study is comparable to international findings and adds to the growing body of evidence that it needs to be considered in clinical practice. It is

important to raise awareness of DV, and frame strategies, as health caregivers have a unique position to identify and offer intervention to DV victims.

ARTICLE SUMMARY

Strengths and limitations of this study

- This is a prospective observational study investigating the year prevalence of domestic violence (DV) in female orthopaedic patients using questionnaires containing validated questions for DV.
- Study participants were approached individually without the presence of company and great discretion was taken to ascertain the safety of DV victims.
- The study was designed to screen all female patients consecutively, and although difficulties in the practical implementation of the screening program impeded the desired inclusion rate, a large volume of patients were included.
- Study participants could not chose to be anonymous which may have deterred some patients from filling out the study questionnaires.

Keywords: orthopaedics, domestic violence, trauma

Introduction

Domestic violence (DV) is a serious public health problem estimated to affect as many as 27% of women in partner relationships during their lifetime.[1] It is an insidious process, starting off with phases of systematic psychological abuse often leading to physical abuse.[2] Aside its societal and individual economic consequences,[3] it is one of the most common causes for physical injuries in women and victims are at great risk for mental health issues, suicide and homicide.[4] 20–50% of female homicides, are caused by a former or current intimate partner,[5, 6] and in Sweden, the death toll due to known DV was 13 in 2020.[7]

Musculoskeletal injuries are one of the most common presentations of DV.[8, 9] One in 50 women present to fracture clinics with an injury due to DV.[10] Recognition of DV as an injury mechanism is important and orthopaedic units have been suggested ideal for screening.[11, 12] However, the difficulties of identifying DV are many. Victims may be prevented from seeking medical attention which was found true for 36% of women in Canada.[8] A further challenge is the absence of active questioning in healthcare and that patients may not disclose occurrence of abuse.[13] Orthopaedic surgeons under-estimate the prevalence of DV,[14] and do not ask about DV.[10]

Implementation of screening within healthcare may lead to a greater detection of DV, which in turn can be potentially lifesaving. Nevertheless, questioning for DV is not standard and formal documentation is poor.[15] Sweden is considered the most gender equal country in the European Union,[7] however, research on DV in orthopaedics is scarce and little is known about its prevalence in Sweden. The current project aimed to identify the year prevalence of orthopaedic injuries caused by DV, and current experience of DV, in female patients at the largest orthopaedic emergency department (ED) in Sweden.

Methods

Study design

This is a self-reported questionnaire-based study including questions validated for detection of partner violence in an orthopaedic setting.[11]

Setting

The study was conducted at the ED of the Sahlgrenska University Hospital/Mölndal in Gothenburg, Sweden from 21st September 2021 to 21st September 2022. The ED averages 45,000 unique attendances yearly and the orthopaedic section has an average of 38 female attendances daily.

Sets of study information, marked with name and social security number, were assembled upon triage. Staff were instructed to hand out the forms to all female patients fulfilling the study inclusion criteria. Forms were handed out in the examination room to fill out in private and put in a sealed envelope (Figure 1). ED staff were unaware of status of study participation. The forms were contained inside the ED as a precautious measure to diminish the risk of unauthorized persons identifying potential victims. There were two forms (A and B) of which B was simplified to encourage higher responder rates (Supplementary material, S1). If ED staff discovered a case of DV when informing patients about the study, they were asked to mark the envelope with an "X". However, the patient was only included in the further analysis if she consented to study participation. Medical records of consenting patients reporting DV were reviewed to assess injury type and severity.

Patients who wished to meet a project counsellor were booked for a medical follow-up without mention of the counsellor. This was intentional to protect the patient in cases of cohabitation.

Participants

Patients of female sex of at least 18 years of age and with residency in Sweden triaged to the orthopaedic section of the ED were included in the study. Study forms were provided in Swedish and translated two-way in English and Arabic. Patients accompanied by someone, or with cognitive impairment or physical impairment, i.e. dementia or poor eyesight, were excluded. No sample size calculation was conducted as the objective was to establish the year prevalence of DV victims.

Objectives

The primary objective was to identify the prevalence of orthopaedic injuries sustained directly due to DV. The secondary objective was to establish the prevalence of current experience of DV.

Definitions

DV was defined as emotional, physical or sexual abuse. Any occurrence within the family, domestic unit or by former intimate partners, was included, as defined by the Istanbul Convention (2011).[16] A relationship was defined as a partnership lasting at least one month.

Data analysis

Data was analysed descriptively with frequency counts and percentages for categorical variables. Software IBM SPSS version 29 was used for data analysis.

Ethical considerations

Written consent was obtained upon study enrolment in line with the Ethical Review Board's regulations (DNR 2021-01752).

Patient and Public Involvement

It was not deemed appropriate to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Results

In total, 4,192 (30.4%) out of 13,801 unique female attendances registered at the orthopaedic section of the ED were given study forms. Of these, 1,366 (32.6%) agreed to inclusion (Figure 2). The majority of responders spoke Swedish (99.4%), did not live in a socially disadvantaged area (80.4%) and were in a relationship (62.2%) (Table 1).

Experience of DV

Of the 1,366 patients, 100 patients (7.5%) had current experience of DV and 21 (1.5%) of them had an injury due to DV. Of the 21 patients, 16 consented to filling out the study forms. The remaining 5 patients disclosed DV to healthcare staff, but declined to fill out the study forms and were not included in the further analysis, leaving 95 patients for further analysis (Figure 2).

DV (any type) was reported by 89 (89/1361, 6.5%) patients in their current relationship. Emotional abuse was most common (69/89, 77.5%) followed by physical abuse (33/89, 37.1%) and sexual abuse (19/89, 21.3%) (Figure 3).

DV as a direct cause of injury

In total, 21 patients with an injury due to DV were identified (Figure 2), meaning that one in 65 patients needed medical attention due to physical abuse. Of the 16 consenting DV victims, 8 had previously been in contact with healthcare for an injury due to abuse. Formal documentation of DV was noted in 8 medical records, and in the remaining cases the injury mechanism was unspecified fall trauma (Table 2).

The age span of DV victims was 18–76 years. 3 patients were from socially disadvantaged areas and 3 patients had female partners. The majority of patients had completed high school, but had no further academic education (Table 1). 8 patients reported on repeated abuse in their current relationship of which 5 stated an occurrence of both emotional, physical and sexual abuse.

Fractures were the most prevalent injury followed by contusions and joint distortions (Table 3). Five patients sustained injuries requiring sick leave and 2 patients required surgery (Table 3). Thirty-seven follow-up visits were recorded due to DV injuries (excluding visits to the counsellor).

Screening for DV

In total, 1208 women (89.0%) were of the opinion that healthcare staff should ask about DV (Table 1). However, 2 of the 16 patients (12.5%) injured due to DV did not feel that screening

was necessary. Fifty-four patients (4.0%) had previously contacted healthcare for physical abuse (Table 1), whereof 34 of these patients were still in an abusive relationship.

The project counsellors had contact with 23 patients whereof 8 had been injured due to DV. 12 patients (52.2%) showed up for their appointment. 6 patients failed to appear, 4 had misunderstood or were too injured to come for their appointment. 1 patient had given a faulty address and did not respond to phone calls.

Discussion

The DORIS study aimed to establish the prevalence of current experience of DV, and injuries directly caused by DV, in female patients in the largest orthopedic ED in Northern Europe. A rate of one in 14 patients (100/1366, 7.5%) with current experience of DV and one in 65 patients (21/1366, 1.6%) injured due to DV was established.

The prevalence of injuries due to DV is comparable with the results of a multi-national investigation in orthopedic injury clinics, conducted by the PRAISE group, of 0-3%.[10] Previous research has reported a 12-month prevalence of DV of 15–22% in orthopedic patients.[10, 17] The 12-month prevalence was not investigated in the DORIS study. However, 6.5% (89/1366) experienced DV in a current partner relationship. This excludes current experience of DV carried out by a family member or former partner which may explain the relatively low prevalence. Differences in recruitment methods, study settings and staff engagement could be a further explanation. The lower prevalence may also reflect governmental and societal policies on gender equality in Sweden.

When comparing proportions of type of abuse, the present study established that emotional abuse was most common. This is also true in Scottish, American and Canadian settings.[10, 17] However, surprisingly, in the Netherlands and in Denmark, countries seemingly more comparable to Sweden, physical abuse was most common.[10] It may be difficult to understand what is meant by emotional abuse, the DORIS study forms contained examples of emotional abuse which may explain the higher prevalence.

Formal documentation of DV was noted in 50% of cases, meaning that 50% were not identified in the regular healthcare setting. Routine screening of DV leads to higher detection rates,[18] however, only 2% of healthcare workers in orthopedics routinely ask about it.[19] Surgeons feel uncomfortable and unsure of what to do if their patient is a victim which calls for better education and support models within healthcare.[20, 21]

Although it is important to be suspicious of inconsistent injury mechanisms or “red flags”, such as falling down the stairs,[22] feasible injury mechanisms were disclosed in 50% of the DV cases. Hence, questioning for DV should not just be conducted when suspicion is raised, as is often the case. Within the DORIS study, direct questioning, in questionnaire format, was used as this has proven efficient for DV screening and is less time consuming in an ED setting.[11, 23] However, the study forms contained a lot of text due to regulations stated by the Ethical Review Board, which may have discouraged potential responders. In the continued work of improving DV detection at the study site efforts will be made to optimise the screening tool.

Merely 50% of patients with an injury due to DV had previously been in contact with healthcare for DV. Hence, the remaining patients may have presented with an index injury. This finding supports the, previously suggested,[11, 19] need for screening in orthopaedic

settings, as early intervention can be potentially lifesaving. Up to 81% of female patients are of the opinion that healthcare staff should ask about DV.[10, 19, 23] The corresponding numbers were somewhat higher in the DORIS study (89% in the entire cohort and 94-96% in abused patients). Cultural differences and thereby expectations on healthcare may explain the aforementioned span.

The strength of the DORIS study is its setting at the largest orthopaedic ED in Northern Europe. After, the PRAISE study,[10] DORIS is the largest prevalence study in orthopedics. Due to COVID restrictions during the study period, company was generally not allowed in the ED which facilitated the distribution of study forms. Victims of DV were also offered follow-up with a counsellor within the study.

A major limitation may be nonresponse bias. Although the study was regarded important by ED staff, the distribution rate of study forms was 30% and response rate 33%. The authors had meetings with ED staff and two counsellors were recruited to provide an in-house support program to increase the likelihood for staff engagement.[19] Unfortunately, due to management issues, the staffing situation became more turbulent with several experienced nurses and assistant nurses choosing to resign throughout the year. The authors believe that the inconsistencies in staffing were the main reason for poor study enrolment (Supplementary material, Figure 1). In addition, despite being an excellent forum for DV screening,[18] in regard to the "open window phase" (in which victims may be more receptive and prone to seek help after abuse),[24] the ED as such is a busy and stressful place. In general, detecting DV may be difficult in such a setting: staff may be unaware of DV as a problem, and patients may feel uncomfortable confiding in ED staff. For this reason, it is crucial to structure EDs in a

manner where triage can be done in private, as also suggested by Ahmad et al.,[18] and where patients are unaccompanied in triage as standard routine.

Poor response rate was partly expected. Similar studies,[10, 17] have had different approaches to recruitment making it difficult to evaluate what an acceptable response rate is. Due to the delicate nature of the study, the authors had preferred that social security number and further personal details were omitted when consenting to the study. The need to do this may have deterred potential victims from disclosing DV. However, full disclosure of personal details was a requirement from the Ethical Review Board due to research regulations. Furthermore, the authors have reason to believe that the 2,325 patients who for some reason did not wish to participate in the study may not have received proper study information or been given a chance to fill out the study forms.

The exclusion criteria imply certain limitations. Elderly patients, either accompanied by caregivers or with the diagnosis of dementia, were not included. Despite the difficulties of capturing cases in this group, it is important to acknowledge their vulnerability and that both dementia and female sex are predictive of abuse.[25] Furthermore, the authors acknowledge that DV affects both female and male patients. Screening of females was chosen as female DV patients have a greater fracture risk, 83% of ED visits due to DV are female, and 50% of female homicides are due to DV.[12] However, the long-term goal for the DORIS project is to provide a healthcare program dedicated to DV patients regardless of sex.

The DORIS study focused on current abuse, whereas previous research, such as conducted by the PRAISE group and Sardinha et al. also investigated life-time abuse.[1, 10, 17] In hindsight, the inclusion of life-time abuse would have been interesting for comparative reasons. However,

when designing the study, the authors decided that the patient's current situation was the most clinically relevant and therefore most important.

Despite its limitations, and a probable under-reporting of DV, the finding of one in 65 patients translates to one victim of DV injuries nearly every second day, and two to three patients with current experience of DV daily, at the study center. Interventions are essential to disrupt continued abuse and healthcare has an important role in the detection of DV.[9, 26] The experience generated by the present study suggests that screening is necessary in order to improve identification of DV cases and that patients expect healthcare to engage in detecting DV. The results from the DORIS study will be used to improve routines at the study site, and hopefully inspire to similar actions elsewhere.

Conclusion

The prevalence of DV established in the current study implies a high annual volume of DV victims at the study site. DV victims may come to an orthopaedic setting with an index injury and healthcare staff have an unique opportunity to intervene. The DORIS study adds to the growing body of evidence that DV needs attention in the healthcare setting. Increased awareness and actions to identify DV is imperative and it is important to educate, engage and provide adequate conditions for healthcare staff to conduct screening. Future work should focus on implementing DV screening as a routine and provide a safe environment for DV victims in all healthcare disciplines.

Author contributions

KSM participated in the planning and design of the study, collection of patient data, analyzed the data, interpreted the data, drafted the manuscript and critically revised the manuscript. ECC participated in the planning and design of the study and critically revised the manuscript. MS participated in the planning and design of the study and critically revised the manuscript.

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Competing interest statement

All authors have completed the ICMJE uniform disclosure form at http://www.icmje.org/disclosure-of-interest/ and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work

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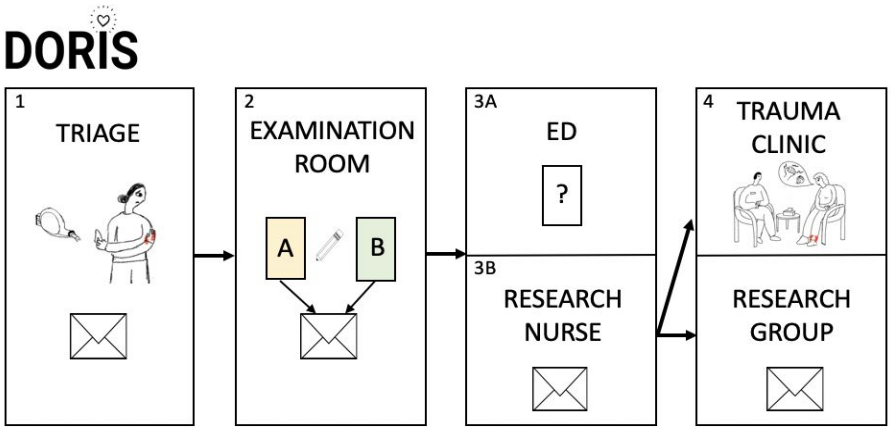

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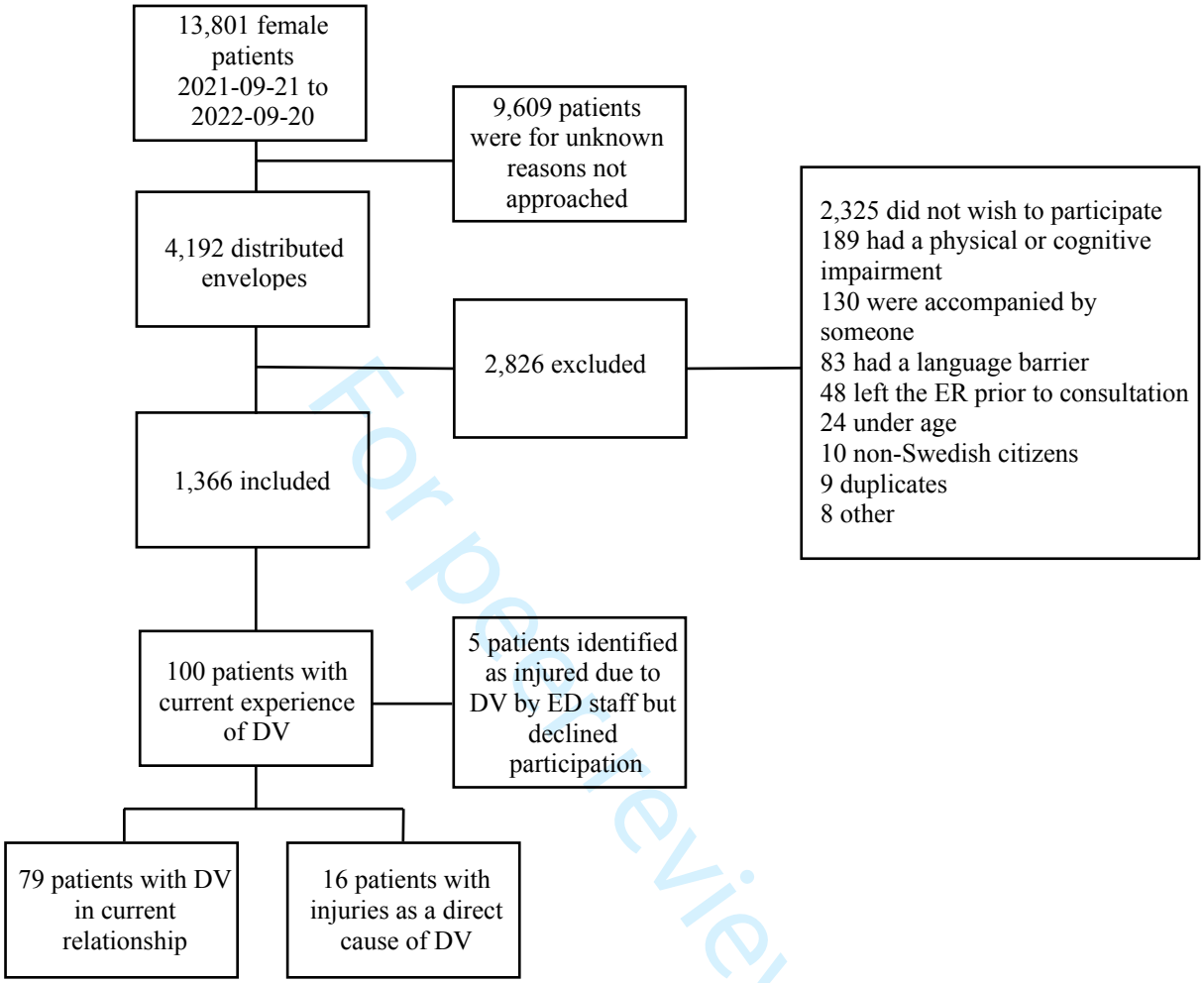


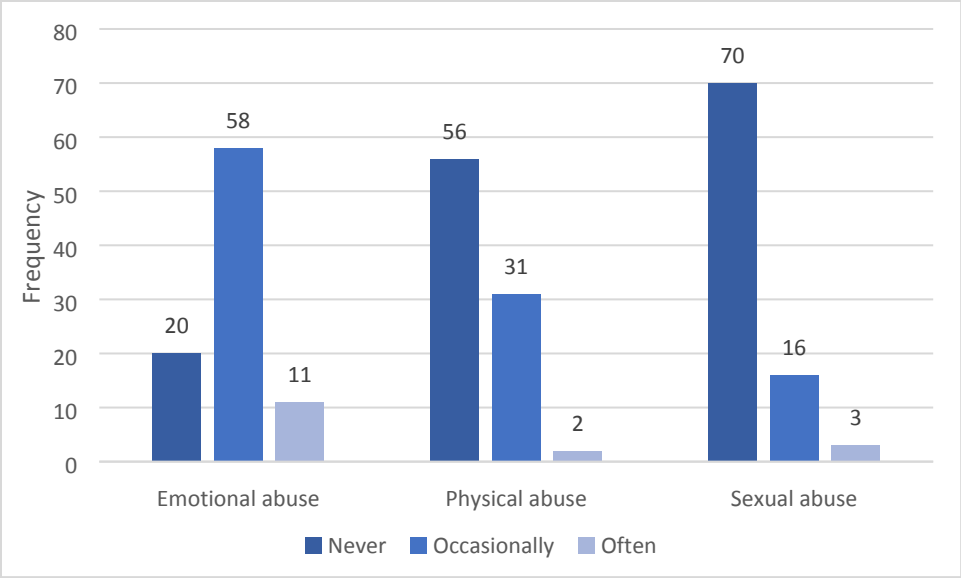


Table 1. Demographics of all responders and whether health care should ask about DV grouped by experience of DV.

	All responders (n=1,361)	Responders reporting no experience of DV in current relationship (n=1,165)	Responders reporting current DV, not DV as direct cause of injury (n=79)	Responders reporting DV as direct cause of injury (n=16)	Responders with missing or incomplete answers on current DV (n=101)
Age (range, years)					
18-29	226 (16.6)	201 (17.3)	8 (10.1)	2 (12.5)	15 (14.8)
30-39	211 (15.5)	182 (15.6)	13 (16.5)	4 (25.0)	12 (11.9)
40-49	211 (15.5)	174 (14.9)	17 (21.5)	4 (25.0)	16 (15.8)
50-59	262 (19.3)	234 (20.1)	15 (19.0)	1 (6.3)	12 (11.9)
60-69	239 (17.6)	199 (17.1)	17 (21.5)	4 (25.0)	19 (18.8)
>70	202 (14.8)	167 (14.3)	8 (10.1)	1 (6.3)	26 (25.7)
Missing	10 (0.7)	8 (0.7)	1 (1.3)	0 (0.0)	1 (1.0)
Resident of a socially disadvantaged area					
Yes	227 (16.7)	184 (15.8)	16 (20.3)	3 (18.8)	24 (23.8)
No	1101 (80.9)	954 (81.9)	58 (73.4)	13 (81.3)	75 (75.2)
Protected person/not a resident in Gothenburg	9 (0.7)	6 (0.1)	3 (3.8)	0 (0.0)	0 (0.0)
Missing	24 (1.8)	21 (1.8)	2 (2.5)	0 (0.0)	1 (1.0)
Language					
Swedish	1353 (99.4)	1161 (99.7)	77 (97.5)	15 (94.1)	100 (99.0)
English	5 (0.4)	3 (0.3)	1 (1.3)	0 (0.0)	1 (1.0)
Arabic	3 (0.2)	1 (0.0)	1 (1.3)	1 (5.9)	0 (0.0)
Education level					
Compulsory school	104 (7.6)	82 (7.0)	5 (6.3)	2 (12.5)	15 (14.9)
High school	459 (33.7)	395 (33.9)	30 (38.0)	9 (56.3)	25 (24.8)
University	727 (53.4)	650 (55.8)	43 (54.4)	4 (25.0)	29 (28.7)
Missing	71 (5.3)	38 (3.3)	1 (1.3)	1 (6.3)	31 (30.7)
Partner sex					
No partner	430 (31.6)	427 (36.7)	0 (0.0)	3 (17.6)	0 (0.0)
Male	806 (59.2)	711 (61.0)	75 (95.0)	10 (64.7)	10 (10.0)
Female	40 (2.9)	22 (2.0)	2 (2.5)	2 (11.8)	14 (13.9)
Missing	85 (6.2)	5 (0.4)	2 (2.5)	1 (5.9)	77 (76.2)
Duration of relationship					
Less than one year	36 (2.6)	30 (2.6)	4 (5.1)	2 (12.5)	1 (1.0)
1-5years	165 (12.1)	144 (12.4)	12 (15.2)	3 (18.8)	6 (5.9)
6-10 years	96 (7.1)	80 (6.9)	12 (15.2)	2 (12.5)	2 (2.0)
More than 10 years	567 (41.7)	476 (40.9)	50 (63.3)	5 (31.3)	36 (35.6)
No partner	440 (32.3)	430 (36.9)	1 (1.3)	3 (18.8)	6 (5.9
Missing	57 (4.2)	5 (0.4)	0 (0.0)	2 (12.5)	50 (50.0)
Have you ever sought medical care for DV?					
No	1050 (77.1)	942 (80.9)	57 (72.2)	8 (50.0)	43 (42.6)
Yes	54 (4.0)	38 (3.3)	10 (12.7)	3 (18.8)	4 (4.0)
Missing	257 (18.9)	185 (15.9)	13 (16.5)	5 (31.3)	54 (53.5)
Should health care workers ask about DV?					
Yes	1209 (88.8)	1068 (91.7)	76 (96.2)	14 (87.5)	51 (50.5)
No	41 (3.0)	30 (2.6)	2 (2.5)	0 (0.0)	9 (8.9)
Missing	111 (8.2)	67 (5.8)	1 (1.3)	2 (12.5)	41 (40.6)

Table 2. Injury mechanism as stated in the medical records and treatment needs due to DV

	Frequency n (%)
Formal documentation of DV in medical record	
Yes	8 (50)
No	8 (50
Stated injury mechanism in medical record	
Fall trauma, unspecified	8 (50)
Abuse	8 (50)
Orthopaedic treatment	
Pain medication and physiotherapy	8 (50)
Immobilization (cast/orthosis)	6 (38)
Surgery	2 (12)
Need for sick leave	
Yes	5 (31)
No	11 (69)

Table 3. Type of injuries noted in cases with DV as direct cause of injury

Injury type and localisation	Frequency n (%)
Fracture	6 (38)
Hand	5
Foot	1
Contusion	4 (25)
Upper extremity	1
Lower extremity	3
Distortion	4 (25)
Shoulder	1
Knee	1
Foot	2
Joint dislocation	1 (6)
Ligament rupture	1 (6)
Laterality of injury	
Right	10 (63)
Left	4 (25)
Missing	2 (12)

DORIS

In order to complete the study in the most optimal way, we would be grateful if you would do your best to answer all the questions.

What we mean by violence in close relationships is the emotional, physical or sexual violence that someone you feel emotionally close to (in the household, family or partner relationship) has subjected you to.

Answer using answer sheet A (yellow):

1. How long have you been together with your current partner?
(0) Less than 1 year (1) 1-5 years (2) 6-10 years (3) More than 10 years (4) I have no partner

*If you have answered **that you do not have a partner** you can skip to question 7*

2. Is your current partner biologically:
(0) Man (1) Woman (2) I prefer not to answer

3. Has your current partner ever subjected you to physical violence?
Physical violence includes, for example, pushing, hitting, scratching.
(0) Never (1) Occasionally (2) Often

4. Has your current partner ever subjected you to emotional violence?
Emotional violence includes, for example, threats, insults, controlling of social contacts.
(0) Never (1) Occasionally (2) Often

5. Has your current partner ever subjected you to sexual violence?
Sexual violence includes, for example, sexual humiliation, assault, rape.
(0) Never (1) Occasionally (2) Often

6. Are you currently seeking medical care for an injury caused by your *current* partner?
(0) Yes (1) No (2) I prefer not to answer

7. Are you currently seeking medical care for an injury caused by violence from another person?
(0) Yes (1) No (2) I prefer not to answer

8. If you answered yes, what is your relationship with the person who committed the violence?

9. Was the person who committed the violence under the influence of any substance when they hurt you?
(0) Yes, alcohol (1) Yes, drugs (2) I do not know (3) No

10. Have you previously been seeking medical care for an injury caused by violence in a close relationship?
(0) Yes: (*circle this if it happened in the current/past relationship)* (1) No (2) I prefer not to answer

11. Do you think it is important that health care services ask about violence in close relationships?
(0) Yes (1) No

12. What is your level of education?
(0) Primary school (1) High School (2) College/University

13. If you have been subjected to violence in a **current** close relationship, you have the option to receive counselling with a social worker at the trauma center at Mölndal Hospital. You will be called for a return visit in 1-2 weeks and the social worker's visit will not be visible in your medical record or on the call on paper you receive at home. The call will look like a regular call for a medical appointment. If your injury also requires a medical follow-up, you will be scheduled to see the social worker after your medical appointment. The social worker is subject to existing healthcare laws. Do you wish to speak to a social worker?

DORIS

Answer sheet A

please check the option that best applies to you

---

1. [0] Less than 1 year [1] 1-5 years [2] 6-10 years [3] More than 10 years [4] I have no partner

*If you have answered **that you do not have a partner** you can skip to question 7!*

2. [0] Man [1] Woman [2] I prefer not to answer
3. [0] Never [1] Occasionally [2] Often
4. [0] Never [1] Occasionally [2] Often
5. [0] Never [1] Occasionally [2] Often
6. [0] Yes [1] No [2] I prefer not to answer
7. [0] Yes [1] No [2] I prefer not to answer
8. _____
9. [0] Yes, alcohol [1] Yes, drugs [2] I do not know [3] No
10. [0] Yes: currently / in the past [1] No [2] I prefer not to answer

If you have answered yes, how many times have you been seeking medical care: _____

11. [0] Yes [1] No
12. [0] Primary school [1] High School [2] College/University

13. [0] Yes [1] No

Consent to the DORIS study

I have been provided with the written information and hereby consent to the processing of my information in the DORIS study as described in the information for research participants.

_____ _____

Signature Clarification of signature

_____ _____

National identification number Date

Questionnaire B

What we mean by violence in close relationships is the emotional, physical or sexual violence that someone you feel emotionally close to (in the household, family or partner relationship) has subjected you to.

1. Are you currently seeking medical care for an injury caused by violence in a close relationship?

YES NO

2. Do you think that health care services should routinely ask about violence in close relationships as the cause of injuries?

YES NO

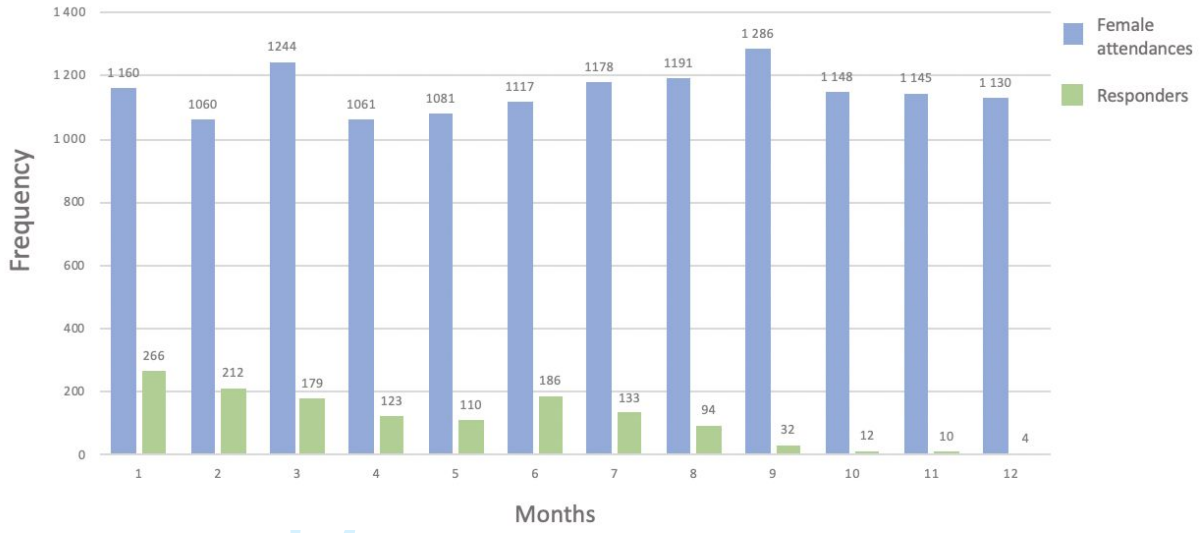
Answer sheet B

please circle the answer that best applies to you

---

1. YES NO

2. YES NO



Supplementary material, Figure S1. The responder frequency per month The number of unique female attendances (blue) and responders (green) per study month (21st to 21st of the next calendar month).

DORIS

The incidence of DOmestic violence in ORthopaedIcS as a cause of acute injury in female patients

Karin Svensson Malchau MD PhD[1], Eva-Corina Caragounis MD PhD[2], Mikael Sundfeldt MD PhD[1]

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[2]Department of Surgery, Institute of Clinical Sciences, The Sahlgrenska Academy, Gothenburg University, Gothenburg, Sweden

Background

Intimate partner violence (IPV) is defined as abuse within a close partner relationship and can be both psychological, sexual and/or physical. According to the Centres for Disease Control and Prevention (CDC), one in four women and one in ten men experience IPV in the United States.[1] The corresponding numbers in Sweden are one in four women and one in six men, and in a nationwide study from 2012 the prevalence of IPV was 7.0%.[2] The same study concluded a life-time prevalence of physical abuse in a former or current relationship of 15% in women.[2] Reportedly, IPV leads to physical injuries in 19-55% of women who have been made subject to it.[3] Victims of IPV are at a greater risk for physical and mental health issues,[3] and IPV has economic consequences such as medical costs, absence from work and legal costs alongside the individual's suffering.[4] Further, IPV can lead to death and nearly 20% of female homicides, in which the relationship to the perpetrator is known, are caused by a former or current intimate partner.[5, 6] IPV is also correlated with a greater risk of suicide.[3, 7, 8]

IPV has been described as a step-wise process starting off with phases of verbal and systematic psychological abuse and thereafter often leading to physical abuse.[7] IPV is one of the most common cause for injuries in women. Several studies have evaluated which injuries are typical in patients with IPV and musculoskeletal injuries are one of the most common presentations.[9] An international multi-centre study investigating the prevalence in orthopaedic clinics concluded that one in 50 women present with an injury directly due to IPV.[10] In an orthopaedic setting, fractures are the most frequent injury due to IPV followed by dislocations or sprains of joints.[11] The prevalence of IPV in female patients at a fracture clinic has been reported at 32%.[12] Sprague *et al.* concluded that the recognition of IPV as a mechanism of injury is important, and orthopaedic clinics have previously been suggested as a good setting in which to screen for IPV.[11]

Since IPV can result in injuries needing medical attention, medical workers play an important role in the identification of victims. However, nearly one third of victims report that they are not offered the help or support they need when they contact authorities.[2] It can be difficult to detect IPV in a busy clinical setting such as the emergency room (ER), and staff may be unaware of which injuries are related to IPV. Around 75% of female patients think that healthcare staff, and specifically orthopaedic surgeons, should ask about IPV.[12] In one study, female patients reported that no orthopaedic surgeon asked them if IPV was a cause of their injury,[10] and few orthopaedic surgeons report screening injured patients for IPV.[14] When asked, orthopaedic surgeons under-estimated the prevalence, and a majority (80%) of surgeons believed that IPV occurred in less than 1% of their patients.[13] This highlights the importance to raise awareness of this cause of injury.

In Sweden, only 29% of women who have been severely physically abused seek medical attention.[2] Bhandari *et al.* found that 36% of women had been prevented from seeking medical attention.[9] A further challenge in capturing IPV cases may be that the patient does not disclose occurrence of abuse when asked. Abused women are more uncomfortable answering questions about abuse than non-abused women.[15] Several different screening instruments for IPV have been developed and adapted for use in clinical settings. However, direct questioning has proven most efficient in an orthopaedic setting.[11]

Research within IPV in orthopaedics in Sweden is scarce and little is known about the prevalence and how support programs best should be implemented in an orthopaedic clinic. Screening is not used in clinical routine, but the implementation of screening within a healthcare setting may lead to a greater detection of IPV. However, a greater detection alone may not lead to an increased rate of referral to specialist care or a decrease in abuse.

Surgeons have previously reported that they feel uncomfortable asking about IPV and that they have limited knowledge in what to do if their patient is a victim.[14] The current project aims to identify the prevalence of orthopaedic injuries caused by IPV in female patients at Mölndal's hospital and the regional trauma centre at Sahlgrenska University Hospital. A further aim is to establish whether there is a correlation between IPV and certain types of orthopaedic injuries. Within this project, a support program offered to victims of IPV at the orthopaedic clinic will be developed and the staff will be educated in IPV. The patient's perception of the support program will be evaluated.

Research questions

- What is the prevalence of orthopaedic injuries as a direct result of IPV in female patients?
- Do female patients who have been made subject to IPV present with a certain type of orthopaedic fracture/injury?
- How do female patients who have been made subject to IPV perceive the support they receive from a novel support program set up within healthcare?

Methods and materials

In this project, female patients with orthopaedic injuries who come to the ER at Mölndal's hospital will be approached with a questionnaire in which direct questioning will be used.[11] At the ER at Mölndal's hospital, patients are directed to an examination room one-by-one. The questionnaire will be handed to the patient by the health care staff at the ER whilst the patient is waiting for the physician. The staff will briefly explain the ongoing study and the patient will be able to go through the study information and questionnaire privately. Upon study enrolment, written consent will be obtained.

If a patient reports on IPV she will be offered an out-patient appointment to the orthopaedic clinic where she will have the opportunity to talk in-depth with a welfare officer. The summoning letter to this out-patient visit is sent by mail. The letter will not mention the appointment with the welfare officer and will merely summon to a control of the fracture. This is intentional in order to protect the patient in cases where the patient's partner is a cohabitant.

Once the patient returns to her out-patient appointment she will meet a welfare officer and receive further help as a part of the new support program. Patients who have participated in the support program will be asked to complete an evaluation questionnaire of their experiences of study participation.

Study population

The inclusion criteria in this project are:

- The patient is female
- The patient is 18 years or older
- The patient presents with an orthopaedic injury at the emergency department at Mölndal's hospital or at the trauma ward at the Sahlgrenska University Hospital

The exclusion criteria in this project are:

- The patient is unable to provide consent due to any reason
- The patient is cognitively impaired

Study definitions

In this project IPV is defined as any type of psychological, emotional or physical abuse.

Orthopaedic injuries are defined as fractures of the extremities, joint dislocations, joint strains or trauma to the extremities resulting in pain severe enough for medical attention.

An intimate partner relationship is defined as a partnership lasting at least one month.

Statistical analysis

The results of the questionnaires will be inputted manually in a database by the research group. The prevalence of orthopaedic injuries in female patients caused by IPV will be presented using descriptive statistics. A multivariable regression analysis will be conducted to investigate selected demographic characteristics including type of injury and their association to IPV. The project evaluation survey will be presented using descriptive statistics.

Data will be analysed using SPSS Statistics (version 26, IBM corporation, USA).

Clinical impact

Identifying the prevalence of orthopaedic fractures caused by IPV is of great importance to establish the magnitude, and increase awareness, of this problem. The identification of IPV may lead to interventions from the health care staff which in turn may increase the patient's security and health. Identifying IPV may even lead to life-saving interventions. Further, it is of importance to acquire a greater understanding for what support model is desired by patients who present to an orthopaedic clinic with injuries due to IPV to improve the care of these patients.

DORIS

Study group

Mikael Sundfeldt (MS), Karin Svensson Malchau (KSM) and Eva-Corina Caragounis (ECC) have designed the study and intend on involving a welfare officer and research nurse part-time within the project. The research nurse will collect the questionnaires from the ER and KSM/MS will create and input data in a database. The research nurse will coordinate scheduled visits to the welfare officer. The welfare officer will help the patients in need of further support.

Time plan

Study start is planned for June 2021 and the study will continue for one year onward to June 2022. Data will continuously be inputted in the database. Data will be analysed and the manuscript will be prepared between July to October 2022.

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STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4, 6
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (*b*) For matched studies, give matching criteria and number of exposed and unexposed	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	-
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding (*b*) Describe any methods used to examine subgroups and interactions (*c*) Explain how missing data were addressed (*d*) If applicable, explain how loss to follow-up was addressed (*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	7
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	7
Outcome data	15*	Report numbers of outcome events or summary measures over time	7

Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9-12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13
Generalisability	21	Discuss the generalisability (external validity) of the study results	13
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

BMJ Open

The DORIS study: Domestic violence in ORthopaedIcS, a prospective cohort study on the annual prevalence of domestic violence in orthopaedic emergency care

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Primary Subject Heading:	Epidemiology
Secondary Subject Heading:	Public health, Emergency medicine, Patient-centred medicine
Keywords:	ACCIDENT & EMERGENCY MEDICINE, Awareness, Health, Mass Screening, ORTHOPAEDIC & TRAUMA SURGERY

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DORIS

The DORIS study: Domestic violence in ORthopaedIcS, a prospective cohort study on the annual prevalence of domestic violence in orthopaedic emergency care

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ABSTRACT

Background

Domestic violence (DV) is a major problem which despite many efforts persists globally. Victims of DV can present with various injuries, whereof musculoskeletal presentation is common.

Objectives

The DORIS study aimed to establish the annual prevalence of DV at an orthopaedic emergency department (ED) in Sweden.

Design

Female adult patients with orthopaedic injuries seeking treatment at a tertiary orthopaedic centre between September 2021–2022 were screened during their ED visit.

Setting

A single-centre study at a tertiary hospital.

Participants

Adult female patients seeking care for acute orthopaedic injuries were eligible for the study. During the study period, 4,192 female patients were provided with study forms and 1,366 responded (32.5%).

Primary and secondary outcome measures

The primary outcome measure was to establish the annual prevalence of injuries due to DV and secondly, establish the rate of current experience of any type of DV.

Results

One in 14 had experience of current DV (n=100, 7.5%) and one in 65 (n=21, 1.5%) had an injury due to DV.

Conclusions

The prevalence of DV found in the current study is comparable to international findings and adds to the growing body of evidence that it needs to be considered in clinical practice. It is important to raise awareness of DV, and frame strategies, as healthcare staff have a unique position to identify and offer intervention to DV victims.

ARTICLE SUMMARY

Strengths and limitations of this study

- This is a prospective observational study investigating the annual prevalence of domestic violence (DV) in female orthopaedic patients using questionnaires containing validated questions for DV.
- Study participants were approached individually without the presence of company and great discretion was taken to ascertain the safety of DV victims.
- The study was designed to screen all female patients consecutively, and although difficulties in the practical implementation of the screening program impeded the desired inclusion rate, a large volume of patients were included.
- Study participants could not choose to be anonymous which may have deterred some patients from filling out the study questionnaires.

Keywords: orthopaedics, domestic violence, trauma

Introduction

Domestic violence (DV) is a serious public health problem estimated to affect as many as 27% of women in partner relationships during their lifetime.[1] It is an insidious process, starting off with phases of systematic psychological abuse often leading to physical abuse.[2] Aside its societal and individual economic consequences,[3] it is one of the most common causes for physical injuries in women and victims are at great risk for mental health issues,

suicide and homicide.[4] 20–50% of female homicides, are caused by a former or current intimate partner,[5, 6] and in Sweden, the death toll due to known DV was 13 in 2020.[7]

Musculoskeletal injuries are one of the most common presentations of DV.[8, 9] One in 50 women present to fracture clinics with an injury due to DV.[10] Recognition of DV as an injury mechanism is important and orthopaedic units have been suggested ideal for screening.[11, 12] However, the difficulties of identifying DV are many. Victims may be prevented from seeking medical attention by their abuser which was found true for 36% of women in Canada.[8] A further challenge is the absence of active questioning in healthcare and that patients may not disclose occurrence of abuse.[13] Orthopaedic surgeons under-estimate the prevalence of DV,[14] and do not ask about DV.[10]

Implementation of screening within healthcare may lead to a greater detection of DV, which in turn can be potentially lifesaving. Nevertheless, questioning for DV is not standard and formal documentation is poor.[15] Sweden is considered the most gender equal country in the European Union,[7] however, research on DV in orthopaedics is scarce and little is known about its prevalence in Sweden. The current project aimed to identify the annual prevalence of orthopaedic injuries caused by DV and current experience of DV, in female patients at the largest orthopaedic emergency department (ED) in Sweden. Types of DV, injury due to DV and stated injury mechanisms were also evaluated.

Methods

Study design

This is a self-reported questionnaire-based study including questions validated for detection of partner violence in an orthopaedic setting.[11]

Objectives

The primary objective was to identify the annual prevalence of orthopaedic injuries sustained directly due to DV. The secondary objectives were to establish the annual prevalence of current experience of DV and investigate which types of DV, injuries and stated injury mechanisms were most common.

Setting

The study was conducted at the ED of the Sahlgrenska University Hospital/Mölndal in Gothenburg, Sweden from 21st September 2021 to 21st September 2022. The ED averages 45,000 unique attendances yearly and the orthopaedic section has an average of 38 female attendances daily.

Sets of study information, marked with name and social security number, were assembled upon triage. Staff were instructed to hand out the forms to all female patients fulfilling the study inclusion criteria. Forms were handed out in the examination room, filled out in private, and put in a sealed envelope (Figure 1). ED staff were unaware of status of study participation. The forms were contained inside the ED as a precautious measure to diminish the risk of unauthorized persons identifying potential victims. If ED staff discovered a case of DV when informing patients about the study, they were asked to mark the envelope with an "X". However, the patient was only included in the further analysis if she consented to study participation. Medical records of consenting patients reporting DV were reviewed to assess injury type and severity.

Patients who wished to meet a project counsellor were booked for a medical follow-up without mention of the counsellor. This was intentional to protect the patient in cases of cohabitation with the abuser.

Participants

Patients of female sex of at least 18 years of age and with residency in Sweden triaged to the orthopaedic section of the ED were included in the study. Patients accompanied by someone, or with cognitive impairment or physical impairment, i.e. dementia or poor eyesight, were excluded. Furthermore, patients who could not understand Swedish, English or Arabic were also excluded. No sample size calculation was conducted as the objective was to establish the annual prevalence of DV victims.

Study questionnaire

Screening was performed using paper questionnaires, which had been developed based on the work of Sprague et al., where the direct questioning approach detected DV to a greater extent than other tools evaluated for orthopaedic use .[11] Additional questions on demography were added (see Supplementary material). There were two forms (A and B) of which B was simplified and more anonymous in order to encourage higher responder rates (Supplementary material, S1). Participants received both forms and could choose which form to fill in. Study forms were provided in Swedish and translated two-way in English and Arabic.

Definitions

DV was defined as emotional, physical or sexual abuse. Any occurrence within the family, domestic unit or by former intimate partners, was included, as defined by the Istanbul Convention (2011).[16] A relationship was defined as a partnership lasting at least one month.

Data analysis

	All responders (n=1,361)	Responders reporting no experience of DV in current relationship (n=1,165)	Responders reporting current DV, not DV as direct cause of injury (n=79)	Responders reporting DV as direct cause of injury (n=16)	Responders with missing or incomplete answers on current DV (n=101)
Age (range, years)					
18-29	226 (16.6)	201 (17.3)	8 (10.1)	2 (12.5)	15 (14.8)
30-39	211 (15.5)	182 (15.6)	13 (16.5)	4 (25.0)	12 (11.9)
40-49	211 (15.5)	174 (14.9)	17 (21.5)	4 (25.0)	16 (15.8)
50-59	262 (19.3)	234 (20.1)	15 (19.0)	1 (6.3)	12 (11.9)
60-69	239 (17.6)	199 (17.1)	17 (21.5)	4 (25.0)	19 (18.8)
>70	202 (14.8)	167 (14.3)	8 (10.1)	1 (6.3)	26 (25.7)
Missing	10 (0.7)	8 (0.7)	1 (1.3)	0 (0.0)	1 (1.0)

Data was analysed descriptively with frequency counts and percentages for categorical variables. Software IBM SPSS version 29 was used for data analysis.

Ethical considerations

Written consent was obtained upon study enrolment in line with the Ethical Review Board's regulations (DNR 2021-01752).

Patient and Public Involvement

It was not deemed appropriate to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Results

In total, 4,192 (30.4%) out of 13,801 unique female attendances registered at the orthopaedic section of the ED were given study forms. Of these, 1,366 (32.6%) agreed to inclusion (Figure 2). The majority of responders spoke Swedish (99.4%), did not live in a socially disadvantaged area (80.4%) and were in a relationship (62.2%) (Table 1).

Resident of a socially disadvantaged area					
Yes	227 (16.7)	184 (15.8)	16 (20.3)	3 (18.8)	24 (23.8)
No	1101 (80.9)	954 (81.9)	58 (73.4)	13 (81.3)	75 (75.2)
Protected person/not a resident in Gothenburg	9 (0.7)	6 (0.1)	3 (3.8)	0 (0.0)	0 (0.0)
Missing	24 (1.8)	21 (1.8)	2 (2.5)	0 (0.0)	1 (1.0)
Language					
Swedish	1353 (99.4)	1161 (99.7)	77 (97.5)	15 (94.1)	100 (99.0)
English	5 (0.4)	3 (0.3)	1 (1.3)	0 (0.0)	1 (1.0)
Arabic	3 (0.2)	1 (0.0)	1 (1.3)	1 (5.9)	0 (0.0)
Education level					
Compulsory school	104 (7.6)	82 (7.0)	5 (6.3)	2 (12.5)	15 (14.9)
High school	459 (33.7)	395 (33.9)	30 (38.0)	9 (56.3)	25 (24.8)
University	727 (53.4)	650 (55.8)	43 (54.4)	4 (25.0)	29 (28.7)
Missing	71 (5.3)	38 (3.3)	1 (1.3)	1 (6.3)	31 (30.7)
Partner sex					
No partner	430 (31.6)	427 (36.7)	0 (0.0)	3 (17.6)	0 (0.0)
Male	806 (59.2)	711 (61.0)	75 (95.0)	10 (64.7)	10 (10.0)
Female	40 (2.9)	22 (2.0)	2 (2.5)	2 (11.8)	14 (13.9)
Missing	85 (6.2)	5 (0.4)	2 (2.5)	1 (5.9)	77 (76.2)
Duration of relationship					
Less than one year	36 (2.6)	30 (2.6)	4 (5.1)	2 (12.5)	1 (1.0)
1-5years	165 (12.1)	144 (12.4)	12 (15.2)	3 (18.8)	6 (5.9)
6-10 years	96 (7.1)	80 (6.9)	12 (15.2)	2 (12.5)	2 (2.0)
More than 10 years	567 (41.7)	476 (40.9)	50 (63.3)	5 (31.3)	36 (35.6)
No partner	440 (32.3)	430 (36.9)	1 (1.3)	3 (18.8)	6 (5.9
Missing	57 (4.2)	5 (0.4)	0 (0.0)	2 (12.5)	50 (50.0)
Have you ever sought medical care for DV?					
No	1050 (77.1)	942 (80.9)	57 (72.2)	8 (50.0)	43 (42.6)
Yes	54 (4.0)	38 (3.3)	10 (12.7)	3 (18.8)	4 (4.0)
Missing	257 (18.9)	185 (15.9)	13 (16.5)	5 (31.3)	54 (53.5)
Should health care workers ask about DV?					
Yes	1209 (88.8)	1068 (91.7)	76 (96.2)	14 (87.5)	51 (50.5)
No	41 (3.0)	30 (2.6)	2 (2.5)	0 (0.0)	9 (8.9)
Missing	111 (8.2)	67 (5.8)	1 (1.3)	2 (12.5)	41 (40.6)

Table 1. Demographics of all responders and whether health care should ask about DV grouped by experience of DV.

Experience of DV

Of the 1,366 patients, 100 patients (7.5%) had current experience of DV and 21 (1.5%) of them had an injury due to DV. Of the 21 patients, 16 consented to filling out the study forms. The remaining five patients disclosed DV to healthcare staff but declined to fill out the study

forms. Therefore, they were not included in the further analysis, leaving 95 patients of the 100 patients who had stated current experience of DV, eligible for further analysis (Figure 2).

	Frequency n (%)
Formal documentation of DV in medical record	
Yes	8 (50)
No	8 (50
Stated injury mechanism in medical record	
Fall trauma, unspecified	8 (50)
Abuse	8 (50)
Orthopaedic treatment	
Pain medication and physiotherapy	8 (50)
Immobilization (cast/orthosis)	6 (38)
Surgery	2 (12)
Need for sick leave	
Yes	5 (31)

DV (any type) was reported by 89 current (89/1361, 6.5%) patients in their relationship. Emotional abuse was most common (69/89, 77.5%) followed by physical abuse (33/89, 37.1%) and sexual abuse (19/89, 21.3%) (Figure 3).

DV as a direct cause of injury

In total, 21 patients with an injury due to DV were identified (Figure 2), meaning that one in 65 patients needed medical attention due to physical abuse. Of the 16 consenting DV victims, eight had previously been in contact with healthcare for an injury due to abuse. Formal documentation of DV was noted in eight medical records, and in the remaining cases the injury mechanism was unspecified fall trauma (Table 2).

No	11 (69)	**Injury mechanism as stated in the medical records**

Table 2. and treatment needs due to DV

The age span of DV victims was 18–76 years. Three patients were from socially disadvantaged areas and three patients had female partners. The majority of patients had completed high school but had no further academic education (Table 1). Eight patients reported on repeated abuse in their current relationship of which five stated an occurrence of both emotional, physical, and sexual abuse.

Fractures were the most prevalent injury followed by contusions and joint distortions (Table 3). Five patients sustained injuries requiring sick leave and two patients required surgery (Table 3). Thirty-seven follow-up visits were recorded due to DV injuries (excluding visits to the counsellor).

Injury type and localisation	Frequency n (%)
Fracture	6 (38)
Hand	5
Foot	1
Contusion	4 (25)
Upper extremity	1
Lower extremity	3
Distortion	4 (25)
Shoulder	1
Knee	1
Foot	2
Joint dislocation	1 (6)
Ligament rupture	1 (6)
Laterality of injury	
Right	10 (63)
Left	4 (25)
Missing	2 (12)

Table 3. Type of injuries noted in cases with DV as direct cause of injury

Screening for DV

In total, 1,208 women (89.0%) were of the opinion that healthcare staff should ask about DV (Table 1). However, two of the 16 patients (12.5%) injured due to DV did not feel that screening was necessary. Fifty-four patients (4.0%) had previously contacted healthcare for physical abuse (Table 1), whereof 34 of these patients were still in an abusive relationship.

The project counsellors had contact with 23 patients whereof 8 had been injured due to DV. 12 patients (52.2%) showed up for their appointment. Six patients failed to appear, four had misunderstood or were too injured to come for their appointment. One patient had given a faulty address and did not respond to phone calls.

Discussion

The DORIS study aimed to establish the prevalence of injuries directly caused by DV, current experience of DV, types of DV, injuries and stated injury mechanisms in female patients in the largest orthopedic ED in Northern Europe. It also evaluated the rate of types of DV, injuries due to DV and what injury mechanisms were stated by victims. A rate of one in 14 patients (100/1366, 7.5%) with current experience of DV and one in 65 patients (21/1366, 1.6%) injured due to DV was established.

The prevalence of injuries due to DV (1.6%) is within the span of prevalence reported by the PRAISE group (0-3%), who conducted a multi-national investigation of intimate partner violence in female patients at orthopaedic injury clinics.[10] Current experience of DV was recorded in the DORIS study whereas previous studies have investigated the 12-month prevalence. A 12-month prevalence of DV of 15–22% in orthopaedic patients has previously been reported.[10, 17] In the DORIS study, 6.5% (89/1366) experienced DV in a current partner relationship. Differences in recruitment methods, study settings and staff engagement could serve as explanations to the lower prevalence in Sweden. The lower prevalence may also reflect governmental and societal policies on gender equality in Sweden.

When comparing proportions of type of abuse, the present study established that emotional abuse was most common. This is also true in Scottish, American and Canadian settings.[10, 17] However, surprisingly, in the Netherlands and in Denmark, countries seemingly more comparable to Sweden, physical abuse was most common.[10] It may be difficult to understand what is meant by emotional abuse, the DORIS study forms contained examples of emotional abuse which may explain the higher prevalence.

Formal documentation of DV was noted in 50% of cases, meaning that 50% were not identified in the regular healthcare setting. Routine screening of DV leads to higher detection rates,[18] however, only 2% of healthcare workers in orthopedics routinely ask about it.[19] Surgeons feel uncomfortable and unsure of what to do if their patient is a victim which calls for better education and support models within healthcare.[20, 21]

Although it is important to be suspicious of inconsistent injury mechanisms or "red flags", such as falling down the stairs,[22] feasible injury mechanisms were disclosed in 50% of the DV cases. Hence, questioning for DV should not just be conducted when suspicion is raised, as is often the case. Within the DORIS study, direct questioning, in questionnaire format, was used as this has proven efficient for DV screening and is less time consuming in an ED setting.[11, 23] However, the study forms contained a lot of text due to regulations stated by the Ethical Review Board, which may have discouraged potential responders. In the continued work of improving DV detection at the study site efforts will be made to optimise the screening tool.

Merely 50% of patients with an injury due to DV had previously been in contact with healthcare for DV. Hence, the remaining patients may have presented with an index injury. This finding supports the, previously suggested,[11, 19] need for screening in orthopaedic

settings, as early intervention can be potentially lifesaving. Up to 81% of female patients are of the opinion that healthcare staff should ask about DV.[10, 19, 23] The corresponding numbers were somewhat higher in the DORIS study (89% in the entire cohort and 94-96% in abused patients). Cultural differences and thereby expectations on healthcare may explain the aforementioned variances.

The strength of the DORIS study is its setting at the largest orthopaedic ED in Northern Europe. After, the PRAISE study,[10] DORIS is the largest prevalence study in orthopedics. Due to COVID restrictions during the study period, company was generally not allowed in the ED which facilitated the distribution of study forms. Victims of DV were also offered follow-up with a counsellor within the study.

A major limitation may be nonresponse bias. Although the study was regarded important by ED staff, the distribution rate of study forms was 30% and response rate 33%. The authors had meetings with ED staff and two counsellors were recruited to provide an in-house support program to increase the likelihood for staff engagement.[19] Unfortunately, due to management issues, the staffing situation became more turbulent with several experienced nurses and assistant nurses choosing to resign throughout the year. The authors believe that the inconsistencies in staffing were the main reason for poor study enrolment (Supplementary material, Figure 1). In addition, despite being an excellent forum for DV screening,[18] in regard to the "open window phase" (in which victims may be more receptive and prone to seek help after abuse),[24] the ED as such is a busy and stressful place. In general, detecting DV may be difficult in such a setting: staff may be unaware of DV as a problem, and patients may feel uncomfortable confiding in ED staff. For this reason, it is crucial to structure EDs in a

manner where triage can be done in private, as also suggested by Ahmad et al.,[18] and where patients are unaccompanied in triage as standard routine.

Poor response rate was partly expected. Similar studies,[10, 17] have had different approaches to recruitment making it difficult to evaluate what an acceptable response rate is. Due to the delicate nature of the study, the authors had preferred that social security number and further personal details were omitted when consenting to the study. The need to do this may have deterred potential victims from disclosing DV. However, full disclosure of personal details was a requirement from the Ethical Review Board due to research regulations. Furthermore, the authors have reason to believe that the 2,325 patients who for some reason did not wish to participate in the study may not have received proper study information or been given a chance to fill out the study forms.

The exclusion criteria imply certain limitations. Elderly patients, either accompanied by caregivers or with the diagnosis of dementia, were not included. Despite the difficulties of capturing cases in this group, it is important to acknowledge their vulnerability and that both dementia and female sex are predictive of abuse.[25] Furthermore, the authors acknowledge that DV affects both female and male patients. Screening of females was chosen as female DV patients have a greater fracture risk, 83% of ED visits due to DV are female, and 50% of female homicides are due to DV.[12] However, the long-term goal for the DORIS project is to provide a healthcare program dedicated to DV patients regardless of sex.

The DORIS study focused on current abuse, whereas previous research, such as conducted by the PRAISE group and Sardinha et al. also investigated life-time abuse.[1, 10, 17] In hindsight, the inclusion of life-time abuse would have been interesting for comparative reasons. However,

when designing the study, the authors decided that the patient's current situation was the most clinically relevant and therefore most important.

Despite its limitations, and a probable under-reporting of DV, the finding of one in 65 patients translates to one victim of DV injuries nearly every second day, and two to three patients with current experience of DV daily, at the study center. Interventions are essential to disrupt continued abuse and healthcare has an important role in the detection of DV.[9, 26] The experience generated by the present study suggests that screening is necessary in order to improve identification of DV cases and that patients expect healthcare to engage in detecting DV. The results from the DORIS study will be used to improve routines at the study site, and hopefully inspire to similar actions elsewhere.

Conclusion

The prevalence of DV established in the current study implies a high annual volume of DV victims at the study site. DV victims may come to an orthopaedic setting with an index injury and healthcare staff have an unique opportunity to intervene. The DORIS study adds to the growing body of evidence that DV needs attention in the healthcare setting. Increased awareness and actions to identify DV is imperative, and it is important to educate, engage and provide adequate conditions for healthcare staff to conduct screening. Future work should focus on implementing DV screening as a routine and provide a safe environment for DV victims in all healthcare disciplines.

Author contributions

KSM participated in the planning and design of the study, collection of patient data, analyzed the data, interpreted the data, drafted the manuscript, and critically revised the manuscript. ECC participated in the planning and design of the study and critically revised the manuscript. MS participated in the planning and design of the study and critically revised the manuscript.

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Competing interest statement

All authors have completed the ICMJE uniform disclosure form at http://www.icmje.org/disclosure-of-interest/ and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work

Ethical considerations

Written consent was obtained upon study enrolment in line with the Ethical Review Board's regulations (DNR 2021-01752).

Data availability statement

Data supporting this study cannot be shared publicly in order to protect DV victims.

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Figure Legends

Figure 1. **The organisation of data collection** Study packages were assembled upon triage (1) and patients were asked to fill out the forms A and B in private in the examination room and put them in a sealed envelope

(2). Forms containing questions and study information were re-collected and stored in the ED (3A) in order to diminish spread of word about the study. Sealed envelopes containing forms A and B were collected daily by the study research nurse (3B). The research nurse identified patients who wished to meet a welfare officer and booked them to the trauma clinic before data was inputted by the research group (4).
Abbreviations: ED = emergency department

Figure 2. Flow chart of study inclusion

Figure 3. Occurrence and type of abuse among patients reporting on DV in a current relationship
Note: Three of the 95 patients reporting on DV were not in a current relationship and an additional three patients did not fill in the questions about abuse in their relationship.

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18
19
20

1

TRIAGE

2

EXAMINATION ROOM

A

B

3A

ED

?

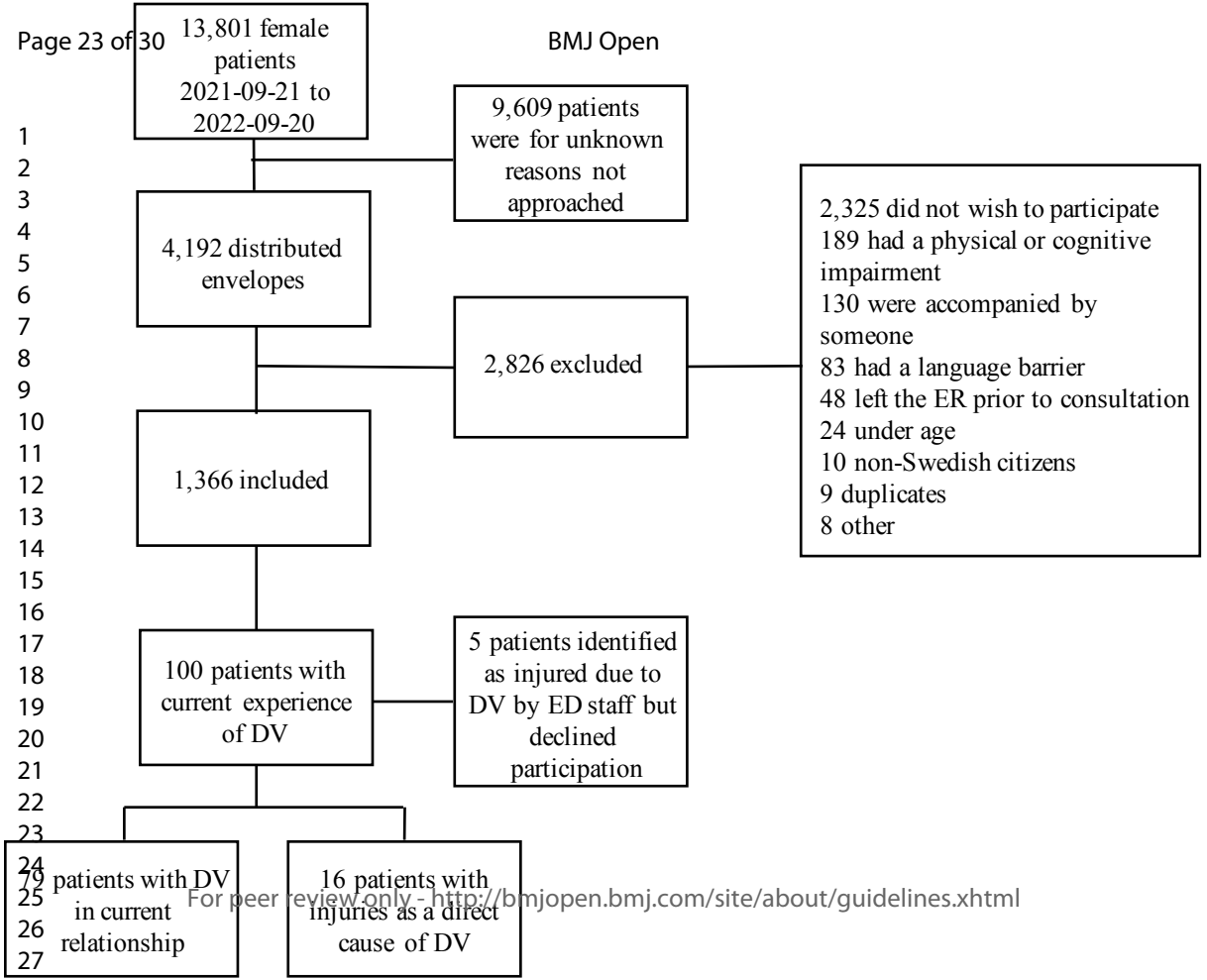
3B

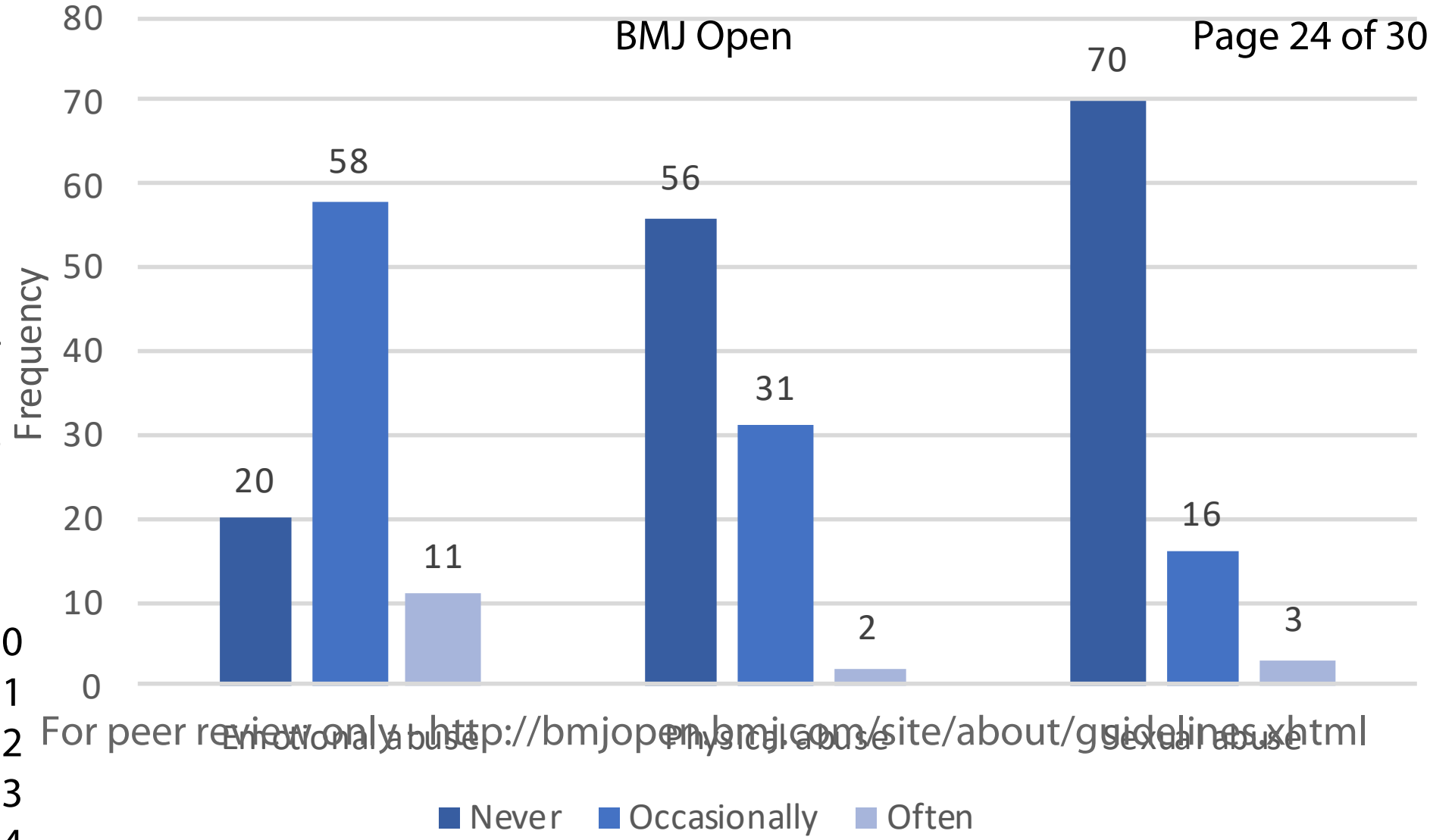
RESEARCH NURSE

4

TRAUMA CLINIC

RESEARCH GROUP





DORIS

In order to complete the study in the most optimal way, we would be grateful if you would do your best to answer all the questions.

What we mean by violence in close relationships is the emotional, physical or sexual violence that someone you feel emotionally close to (in the household, family or partner relationship) has subjected you to.

Answer using answer sheet A (yellow):

1. How long have you been together with your current partner?
(0) Less than 1 year (1) 1-5 years (2) 6-10 years (3) More than 10 years (4) I have no partner

*If you have answered **that you do not have a partner** you can skip to question 7*

2. Is your current partner biologically:
(0) Man (1) Woman (2) I prefer not to answer

3. Has your current partner ever subjected you to physical violence?
Physical violence includes, for example, pushing, hitting, scratching.
(0) Never (1) Occasionally (2) Often

4. Has your current partner ever subjected you to emotional violence?
Emotional violence includes, for example, threats, insults, controlling of social contacts.
(0) Never (1) Occasionally (2) Often

5. Has your current partner ever subjected you to sexual violence?
Sexual violence includes, for example, sexual humiliation, assault, rape.
(0) Never (1) Occasionally (2) Often

6. Are you currently seeking medical care for an injury caused by your *current* partner?
(0) Yes (1) No (2) I prefer not to answer

7. Are you currently seeking medical care for an injury caused by violence from another person?
(0) Yes (1) No (2) I prefer not to answer

8. If you answered yes, what is your relationship with the person who committed the violence?

9. Was the person who committed the violence under the influence of any substance when they hurt you?
(0) Yes, alcohol (1) Yes, drugs (2) I do not know (3) No

10. Have you previously been seeking medical care for an injury caused by violence in a close relationship?
(0) Yes: (*circle this if it happened in the current/past relationship)* (1) No (2) I prefer not to answer

11. Do you think it is important that health care services ask about violence in close relationships?
(0) Yes (1) No

12. What is your level of education?
(0) Primary school (1) High School (2) College/University

13. If you have been subjected to violence in a **current** close relationship, you have the option to receive counselling with a social worker at the trauma center at Mölndal Hospital. You will be called for a return visit in 1-2 weeks and the social worker's visit will not be visible in your medical record or on the call on paper you receive at home. The call will look like a regular call for a medical appointment. If your injury also requires a medical follow-up, you will be scheduled to see the social worker after your medical appointment. The social worker is subject to existing healthcare laws. Do you wish to speak to a social worker?

DORIS

Answer sheet A
please check the option that best applies to you

---

1. [0] Less than 1 year [1] 1-5 years [2] 6-10 years [3] More than 10 years [4] I have no partner

*If you have answered **that you do not have a partner** you can skip to question 7!*

2. [0] Man [1] Woman [2] I prefer not to answer
3. [0] Never [1] Occasionally [2] Often
4. [0] Never [1] Occasionally [2] Often
5. [0] Never [1] Occasionally [2] Often
6. [0] Yes [1] No [2] I prefer not to answer
7. [0] Yes [1] No [2] I prefer not to answer
8. _____
9. [0] Yes, alcohol [1] Yes, drugs [2] I do not know [3] No
10. [0] Yes: currently / in the past [1] No [2] I prefer not to answer

If you have answered yes, how many times have you been seeking medical care: _____

11. [0] Yes [1] No
12. [0] Primary school [1] High School [2] College/University

13. [0] Yes [1] No

Consent to the DORIS study
I have been provided with the written information and hereby consent to the processing of my information in the DORIS study as described in the information for research participants.

_____ _____
Signature Clarification of signature

_____ _____
National identification number Date

Questionnaire B

What we mean by violence in close relationships is the emotional, physical or sexual violence that someone you feel emotionally close to (in the household, family or partner relationship) has subjected you to.

1. Are you currently seeking medical care for an injury caused by violence in a close relationship?

YES NO

2. Do you think that health care services should routinely ask about violence in close relationships as the cause of injuries?

YES NO

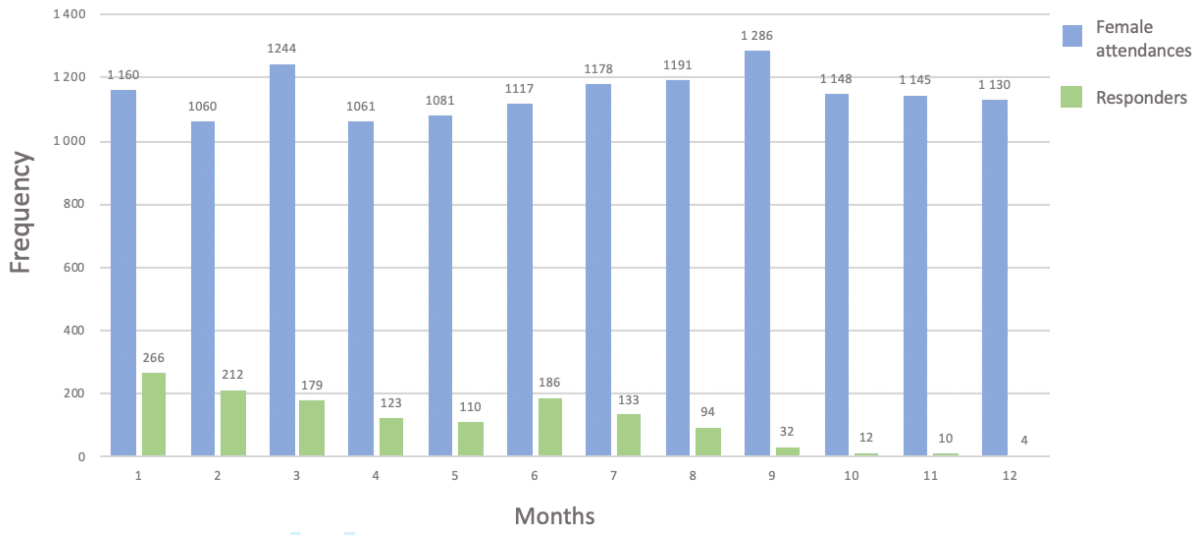
Answer sheet B

please circle the answer that best applies to you

---

1. YES NO

2. YES NO



Supplementary material, Figure S1. The responder frequency per month The number of unique female attendances (blue) and responders (green) per study month (21st to 21st of the next calendar month).

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4, 6
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (*b*) For matched studies, give matching criteria and number of exposed and unexposed	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	-
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding (*b*) Describe any methods used to examine subgroups and interactions (*c*) Explain how missing data were addressed (*d*) If applicable, explain how loss to follow-up was addressed (*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	7
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	7
Outcome data	15*	Report numbers of outcome events or summary measures over time	7

Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9-12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13
Generalisability	21	Discuss the generalisability (external validity) of the study results	13
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

BMJ Open

The DORIS study: Domestic violence in ORthopaedIcS, a prospective cohort study at a Swedish hospital on the annual prevalence of domestic violence in orthopaedic emergency care

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DORIS

The DORIS study: Domestic violence in ORthopaedIcS, a prospective cohort study at a Swedish hospital on the annual prevalence of domestic violence in orthopaedic emergency care

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ABSTRACT

Background

Domestic violence (DV) is a major problem which despite many efforts persists globally. Victims of DV can present with various injuries, whereof musculoskeletal presentation is common.

Objectives

The DORIS study aimed to establish the annual prevalence of DV at an orthopaedic emergency department (ED) in Sweden.

Design

Female adult patients with orthopaedic injuries seeking treatment at a tertiary orthopaedic centre between September 2021–2022 were screened during their ED visit.

Setting

A single-centre study at a tertiary hospital.

Participants

Adult female patients seeking care for acute orthopaedic injuries were eligible for the study. During the study period, 4,192 female patients were provided with study forms and 1,366 responded (32.5%).

Primary and secondary outcome measures

The primary outcome measure was to establish the annual prevalence of injuries due to DV and secondly, establish the rate of current experience of any type of DV.

Results

One in 14 had experience of current DV (n=100, 7.5%) and one in 65 (n=21, 1.5%) had an injury due to DV.

Conclusions

The prevalence of DV found in the current study is comparable to international findings and adds to the growing body of evidence that it needs to be considered in clinical practice. It is important to raise awareness of DV, and frame strategies, as healthcare staff have a unique position to identify and offer intervention to DV victims.

ARTICLE SUMMARY

Strengths and limitations of this study

- This is a prospective observational study investigating the annual prevalence of domestic violence (DV) in female orthopaedic patients using questionnaires containing validated questions for DV.
- Study participants were approached individually without the presence of company and great discretion was taken to ascertain the safety of DV victims.
- The study was designed to screen all female patients consecutively, and although difficulties in the practical implementation of the screening program impeded the desired inclusion rate, a large volume of patients were included.
- Study participants could not choose to be anonymous which may have deterred some patients from filling out the study questionnaires.

Keywords: orthopaedics, domestic violence, trauma

Introduction

Domestic violence (DV) is a serious public health problem estimated to affect as many as 27% of women in partner relationships during their lifetime.[1] It is an insidious process, starting off with phases of systematic psychological abuse often leading to physical abuse.[2] Aside its societal and individual economic consequences,[3] it is one of the most common

causes for physical injuries in women and victims are at great risk for mental health issues, suicide and homicide.[4] 20–50% of female homicides, are caused by a former or current intimate partner,[5, 6] and in Sweden, the death toll due to known DV was 13 in 2020.[7]

Musculoskeletal injuries are one of the most common presentations of DV.[8, 9] One in 50 women present to fracture clinics with an injury due to DV.[10] Recognition of DV as an injury mechanism is important and orthopaedic units have been suggested ideal for screening.[11, 12] However, the difficulties of identifying DV are many. Victims may be prevented from seeking medical attention by their abuser which was found true for 36% of women in Canada.[8] A further challenge is the absence of active questioning in healthcare and that patients may not disclose occurrence of abuse.[13] Orthopaedic surgeons under-estimate the prevalence of DV,[14] and do not ask about DV.[10]

Implementation of screening within healthcare may lead to a greater detection of DV, which in turn can be potentially lifesaving. Nevertheless, questioning for DV is not standard and formal documentation is poor.[15] Sweden is considered the most gender equal country in the European Union,[7] however, research on DV in orthopaedics is scarce and little is known about its prevalence in Sweden. The current project aimed to identify the annual prevalence of orthopaedic injuries caused by DV and current experience of DV, in female patients at the largest orthopaedic emergency department (ED) in Sweden. Types of DV, injury due to DV and stated injury mechanisms were also evaluated.

Methods

Study design

This is a self-reported questionnaire-based study including questions validated for detection of partner violence in an orthopaedic setting.[11]

Objectives

The primary objective was to identify the annual prevalence of orthopaedic injuries sustained directly due to DV. The secondary objectives were to establish the annual prevalence of current experience of DV and investigate which types of DV, injuries and stated injury mechanisms were most common.

Setting

The study was conducted at the ED of the Sahlgrenska University Hospital/Mölndal in Gothenburg, Sweden from 21st September 2021 to 21st September 2022. The ED averages 45,000 unique attendances yearly and the orthopaedic section has an average of 38 female attendances daily.

Sets of study information, marked with name and social security number, were assembled upon triage. Staff were instructed to hand out the forms to all female patients fulfilling the study inclusion criteria. Forms were handed out in the examination room, filled out in private, and put in a sealed envelope (Figure 1). ED staff were unaware of status of study participation. The forms were contained inside the ED as a precautious measure to diminish the risk of unauthorized persons identifying potential victims. If ED staff discovered a case of DV when informing patients about the study, they were asked to mark the envelope with an "X". However, the patient was only included in the further analysis if she consented to study participation. Medical records of consenting patients reporting DV were reviewed to assess injury type and severity.

Patients who wished to meet a project counsellor were booked for a medical follow-up without mention of the counsellor. This was intentional to protect the patient in cases of cohabitation with the abuser.

Participants

Patients of female sex of at least 18 years of age and with residency in Sweden triaged to the orthopaedic section of the ED were included in the study. Patients accompanied by someone, or with cognitive impairment or physical impairment, i.e. dementia or poor eyesight, were excluded. Furthermore, patients who could not understand Swedish, English or Arabic were also excluded. No sample size calculation was conducted as the objective was to establish the annual prevalence of DV victims.

Study questionnaire

Screening was performed using paper questionnaires, which had been developed based on the work of Sprague et al., where the direct questioning approach detected DV to a greater extent than other tools evaluated for orthopaedic use .[11] Additional questions on demography were added (see Supplementary material). There were two forms (A and B) of which B was simplified and more anonymous in order to encourage higher responder rates (Supplementary material, S1). Participants received both forms and could choose which form to fill in. Study forms were provided in Swedish and translated two-way in English and Arabic.

Definitions

DV was defined as emotional, physical or sexual abuse. Any occurrence within the family, domestic unit or by former intimate partners, was included, as defined by the Istanbul Convention (2011).[16] A relationship was defined as a partnership lasting at least one month.

	All responders (n=1,361)	**Responders reporting no experience of DV in current relationship** (n=1,165)	**Responders reporting current DV, not DV as direct cause of injury** (n=79)	**Responders reporting DV as direct cause of injury** (n=16)	**Responders with missing or incomplete answers on current DV** (n=101)

Data analysis

Data was analysed descriptively with frequency counts and percentages for categorical variables. Software IBM SPSS version 29 was used for data analysis.

Ethical considerations

Written consent was obtained upon study enrolment in line with the Ethical Review Board's regulations (DNR 2021-01752).

Patient and Public Involvement

It was not deemed appropriate to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

Results

In total, 4,192 (30.4%) out of 13,801 unique female attendances registered at the orthopaedic section of the ED were given study forms. Of these, 1,366 (32.6%) agreed to inclusion (Figure 2). The majority of responders spoke Swedish (99.4%), did not live in a socially disadvantaged area (80.4%) and were in a relationship (62.2%) (Table 1).

Age (range, years)					
18-29	226 (16.6)	201 (17.3)	8 (10.1)	2 (12.5)	15 (14.8)
30-39	211 (15.5)	182 (15.6)	13 (16.5)	4 (25.0)	12 (11.9)
40-49	211 (15.5)	174 (14.9)	17 (21.5)	4 (25.0)	16 (15.8)
50-59	262 (19.3)	234 (20.1)	15 (19.0)	1 (6.3)	12 (11.9)
60-69	239 (17.6)	199 (17.1)	17 (21.5)	4 (25.0)	19 (18.8)
>70	202 (14.8)	167 (14.3)	8 (10.1)	1 (6.3)	26 (25.7)
Missing	10 (0.7)	8 (0.7)	1 (1.3)	0 (0.0)	1 (1.0)
Resident of a socially disadvantaged area					
Yes	227 (16.7)	184 (15.8)	16 (20.3)	3 (18.8)	24 (23.8)
No	1101 (80.9)	954 (81.9)	58 (73.4)	13 (81.3)	75 (75.2)
Protected person/not a resident in Gothenburg	9 (0.7)	6 (0.1)	3 (3.8)	0 (0.0)	0 (0.0)
Missing	24 (1.8)	21 (1.8)	2 (2.5)	0 (0.0)	1 (1.0)
Language					
Swedish	1353 (99.4)	1161 (99.7)	77 (97.5)	15 (94.1)	100 (99.0)
English	5 (0.4)	3 (0.3)	1 (1.3)	0 (0.0)	1 (1.0)
Arabic	3 (0.2)	1 (0.0)	1 (1.3)	1 (5.9)	0 (0.0)
Education level					
Compulsory school	104 (7.6)	82 (7.0)	5 (6.3)	2 (12.5)	15 (14.9)
High school	459 (33.7)	395 (33.9)	30 (38.0)	9 (56.3)	25 (24.8)
University	727 (53.4)	650 (55.8)	43 (54.4)	4 (25.0)	29 (28.7)
Missing	71 (5.3)	38 (3.3)	1 (1.3)	1 (6.3)	31 (30.7)
Partner sex					
No partner	430 (31.6)	427 (36.7)	0 (0.0)	3 (17.6)	0 (0.0)
Male	806 (59.2)	711 (61.0)	75 (95.0)	10 (64.7)	10 (10.0)
Female	40 (2.9)	22 (2.0)	2 (2.5)	2 (11.8)	14 (13.9)
Missing	85 (6.2)	5 (0.4)	2 (2.5)	1 (5.9)	77 (76.2)
Duration of relationship					
Less than one year	36 (2.6)	30 (2.6)	4 (5.1)	2 (12.5)	1 (1.0)
1-5years	165 (12.1)	144 (12.4)	12 (15.2)	3 (18.8)	6 (5.9)
6-10 years	96 (7.1)	80 (6.9)	12 (15.2)	2 (12.5)	2 (2.0)
More than 10 years	567 (41.7)	476 (40.9)	50 (63.3)	5 (31.3)	36 (35.6)
No partner	440 (32.3)	430 (36.9)	1 (1.3)	3 (18.8)	6 (5.9
Missing	57 (4.2)	5 (0.4)	0 (0.0)	2 (12.5)	50 (50.0)
Have you ever sought medical care for DV?					
No	1050 (77.1)	942 (80.9)	57 (72.2)	8 (50.0)	43 (42.6)
Yes	54 (4.0)	38 (3.3)	10 (12.7)	3 (18.8)	4 (4.0)
Missing	257 (18.9)	185 (15.9)	13 (16.5)	5 (31.3)	54 (53.5)
Should health care workers ask about DV?					
Yes	1209 (88.8)	1068 (91.7)	76 (96.2)	14 (87.5)	51 (50.5)
No	41 (3.0)	30 (2.6)	2 (2.5)	0 (0.0)	9 (8.9)
Missing	111 (8.2)	67 (5.8)	1 (1.3)	2 (12.5)	41 (40.6)

Table 1. Demographics of all responders and whether health care should ask about DV grouped by experience of DV.

Experience of DV

Of the 1,366 patients, 100 patients (7.5%) had current experience of DV and 21 (1.5%) of them had an injury due to DV. Of the 21 patients, 16 consented to filling out the study forms. The remaining five patients disclosed DV to healthcare staff but declined to fill out the study forms. Therefore, they were not included in the further analysis, leaving 95 patients of the 100 patients who had stated current experience of DV, eligible for further analysis (Figure 2).

	Frequency n (%)
Formal documentation of DV in medical record	
Yes	8 (50)
No	8 (50
Stated injury mechanism in medical record	
Fall trauma, unspecified	8 (50)
Abuse	8 (50)
Orthopaedic treatment	
Pain medication and physiotherapy	8 (50)

DV (any type) was reported by 89 (89/1361, 6.5%) patients in their current relationship. Emotional abuse was most common (69/89, 77.5%) followed by physical abuse (33/89, 37.1%) and sexual abuse (19/89, 21.3%) (Figure 3).

DV as a direct cause of injury

In total, 21 patients with an injury due to DV were identified (Figure 2), meaning that one in 65 patients needed medical attention due to physical abuse. Of the 16 consenting DV victims, eight had previously been in contact with healthcare for an injury due to abuse. Formal documentation of DV was noted in eight medical records, and in the remaining cases the injury mechanism was unspecified fall trauma (Table 2).

Table 2. Injury mechanism as stated in the medical records and treatment needs due to DV

Immobilization (cast/orthosis)	6 (38)
Surgery	2 (12)
Need for sick leave	
Yes	5 (31)
No	11 (69)

The age span of DV victims was 18–76 years. Three patients were from socially disadvantaged areas and three patients had female partners. The majority of patients had completed high school but had no further academic education (Table 1). Eight patients reported on repeated abuse in their current relationship of which five stated an occurrence of both emotional, physical, and sexual abuse.

Fractures were the most prevalent injury followed by contusions and joint distortions (Table 3). Five patients sustained injuries requiring sick leave and two patients required surgery (Table 3). Thirty-seven follow-up visits were recorded due to DV injuries (excluding visits to the counsellor).

Injury type and localisation	Frequency n (%)
Fracture	6 (38)
Hand	5
Foot	1
Contusion	4 (25)
Upper extremity	1
Lower extremity	3
Distortion	4 (25)
Shoulder	1
Knee	1
Foot	2
Joint dislocation	1 (6)
Ligament rupture	1 (6)
Laterality of injury	
Right	10 (63)
Left	4 (25)
Missing	2 (12)

Table 3. Type of injuries noted in cases with DV as direct cause of injury

Screening for DV

In total, 1,208 women (89.0%) were of the opinion that healthcare staff should ask about DV (Table 1). However, two of the 16 patients (12.5%) injured due to DV did not feel that screening was necessary. Fifty-four patients (4.0%) had previously contacted healthcare for physical abuse (Table 1), whereof 34 of these patients were still in an abusive relationship.

The project counsellors had contact with 23 patients whereof 8 had been injured due to DV. 12 patients (52.2%) showed up for their appointment. Six patients failed to appear, four had misunderstood or were too injured to come for their appointment. One patient had given a faulty address and did not respond to phone calls.

Discussion

The DORIS study aimed to establish the prevalence of injuries directly caused by DV, current experience of DV, types of DV, injuries and stated injury mechanisms in female patients in the largest orthopedic ED in Northern Europe. It also evaluated the rate of types of DV, injuries due to DV and what injury mechanisms were stated by victims. A rate of one in 14 patients (100/1366, 7.5%) with current experience of DV and one in 65 patients (21/1366, 1.6%) injured due to DV was established.

The prevalence of injuries due to DV (1.6%) is within the span of prevalence reported by the PRAISE group (0-3%), who conducted a multi-national investigation of intimate partner violence in female patients at orthopaedic injury clinics.[10] Current experience of DV was recorded in the DORIS study whereas previous studies have investigated the 12-month prevalence. A 12-month prevalence of DV of 15–22% in orthopaedic patients has previously been reported.[10, 17] In the DORIS study, 6.5% (89/1366) experienced DV in a current partner relationship. Differences in recruitment methods, study settings and staff engagement could serve as explanations to the lower prevalence in Sweden. The lower prevalence may also reflect governmental and societal policies on gender equality in Sweden.

When comparing proportions of type of abuse, the present study established that emotional abuse was most common. This is also true in Scottish, American and Canadian settings.[10, 17] However, surprisingly, in the Netherlands and in Denmark, countries seemingly more comparable to Sweden, physical abuse was most common.[10] It may be difficult to understand what is meant by emotional abuse, the DORIS study forms contained examples of emotional abuse which may explain the higher prevalence.

Formal documentation of DV was noted in 50% of cases, meaning that 50% were not identified in the regular healthcare setting. Routine screening of DV leads to higher detection rates,[18] however, only 2% of healthcare workers in orthopedics routinely ask about it.[19] Surgeons feel uncomfortable and unsure of what to do if their patient is a victim which calls for better education and support models within healthcare.[20, 21]

Although it is important to be suspicious of inconsistent injury mechanisms or "red flags", such as falling down the stairs,[22] feasible injury mechanisms were disclosed in 50% of the DV cases. Hence, questioning for DV should not just be conducted when suspicion is raised, as is often the case. Within the DORIS study, direct questioning, in questionnaire format, was used as this has proven efficient for DV screening and is less time consuming in an ED setting.[11, 23] However, the study forms contained a lot of text due to regulations stated by the Ethical Review Board, which may have discouraged potential responders. In the continued work of improving DV detection at the study site efforts will be made to optimise the screening tool.

Merely 50% of patients with an injury due to DV had previously been in contact with healthcare for DV. Hence, the remaining patients may have presented with an index injury. This finding supports the, previously suggested,[11, 19] need for screening in orthopaedic

settings, as early intervention can be potentially lifesaving. Up to 81% of female patients are of the opinion that healthcare staff should ask about DV.[10, 19, 23] The corresponding numbers were somewhat higher in the DORIS study (89% in the entire cohort and 94-96% in abused patients). Cultural differences and thereby expectations on healthcare may explain the aforementioned variances.

The strength of the DORIS study is its setting at the largest orthopaedic ED in Northern Europe. After, the PRAISE study,[10] DORIS is the largest prevalence study in orthopedics. Due to COVID restrictions during the study period, company was generally not allowed in the ED which facilitated the distribution of study forms. Victims of DV were also offered follow-up with a counsellor within the study.

A major limitation may be nonresponse bias. Although the study was regarded important by ED staff, the distribution rate of study forms was 30% and response rate 33%. The authors had meetings with ED staff and two counsellors were recruited to provide an in-house support program to increase the likelihood for staff engagement.[19] Unfortunately, due to management issues, the staffing situation became more turbulent with several experienced nurses and assistant nurses choosing to resign throughout the year. The authors believe that the inconsistencies in staffing were the main reason for poor study enrolment (Supplementary material, Figure 1). In addition, despite being an excellent forum for DV screening,[18] in regard to the "open window phase" (in which victims may be more receptive and prone to seek help after abuse),[24] the ED as such is a busy and stressful place. In general, detecting DV may be difficult in such a setting: staff may be unaware of DV as a problem, and patients may feel uncomfortable confiding in ED staff. For this reason, it is crucial to structure EDs in a

manner where triage can be done in private, as also suggested by Ahmad et al.,[18] and where patients are unaccompanied in triage as standard routine.

Poor response rate was partly expected. Similar studies,[10, 17] have had different approaches to recruitment making it difficult to evaluate what an acceptable response rate is. Due to the delicate nature of the study, the authors had preferred that social security number and further personal details were omitted when consenting to the study. The need to do this may have deterred potential victims from disclosing DV. However, full disclosure of personal details was a requirement from the Ethical Review Board due to research regulations. Furthermore, the authors have reason to believe that the 2,325 patients who for some reason did not wish to participate in the study may not have received proper study information or been given a chance to fill out the study forms.

The exclusion criteria imply certain limitations. Elderly patients, either accompanied by caregivers or with the diagnosis of dementia, were not included. Despite the difficulties of capturing cases in this group, it is important to acknowledge their vulnerability and that both dementia and female sex are predictive of abuse.[25] Furthermore, the authors acknowledge that DV affects both female and male patients. Screening of females was chosen as female DV patients have a greater fracture risk, 83% of ED visits due to DV are female, and 50% of female homicides are due to DV.[12] However, the long-term goal for the DORIS project is to provide a healthcare program dedicated to DV patients regardless of sex.

The DORIS study focused on current abuse, whereas previous research, such as conducted by the PRAISE group and Sardinha et al. also investigated life-time abuse.[1, 10, 17] In hindsight, the inclusion of life-time abuse would have been interesting for comparative reasons. However,

when designing the study, the authors decided that the patient's current situation was the most clinically relevant and therefore most important.

Despite its limitations, and a probable under-reporting of DV, the finding of one in 65 patients translates to one victim of DV injuries nearly every second day, and two to three patients with current experience of DV daily, at the study center. Interventions are essential to disrupt continued abuse and healthcare has an important role in the detection of DV.[9, 26] The experience generated by the present study suggests that screening is necessary in order to improve identification of DV cases and that patients expect healthcare to engage in detecting DV. The results from the DORIS study will be used to improve routines at the study site, and hopefully inspire to similar actions elsewhere.

Conclusion

The prevalence of DV established in the current study implies a high annual volume of DV victims at the study site. DV victims may come to an orthopaedic setting with an index injury and healthcare staff have an unique opportunity to intervene. The DORIS study adds to the growing body of evidence that DV needs attention in the healthcare setting. Increased awareness and actions to identify DV is imperative, and it is important to educate, engage and provide adequate conditions for healthcare staff to conduct screening. Future work should focus on implementing DV screening as a routine and provide a safe environment for DV victims in all healthcare disciplines.

Author contributions

KSM participated in the planning and design of the study, collection of patient data, analyzed the data, interpreted the data, drafted the manuscript, and critically revised the manuscript. ECC participated in the planning and design of the study and critically revised the manuscript. MS participated in the planning and design of the study and critically revised the manuscript.

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Competing interest statement

All authors have completed the ICMJE uniform disclosure form at http://www.icmje.org/disclosure-of-interest/ and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work

Ethical considerations

Written consent was obtained upon study enrolment in line with the Ethical Review Board's regulations (DNR 2021-01752).

Data availability statement

Data supporting this study cannot be shared publicly in order to protect DV victims.

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Figure Legends

Figure 1. **The organisation of data collection** Study packages were assembled upon triage (1) and patients were asked to fill out the forms A and B in private in the examination room and put them in a sealed envelope

(2). Forms containing questions and study information were re-collected and stored in the ED (3A) in order to diminish spread of word about the study. Sealed envelopes containing forms A and B were collected daily by the study research nurse (3B). The research nurse identified patients who wished to meet a welfare officer and booked them to the trauma clinic before data was inputted by the research group (4).
Abbreviations: ED = emergency department

Figure 2. Flow chart of study inclusion

Figure 3. Occurrence and type of abuse among patients reporting on DV in a current relationship
Note: Three of the 95 patients reporting on DV were not in a current relationship and an additional three patients did not fill in the questions about abuse in their relationship.

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1

TRIAGE

2

EXAMINATION ROOM

A

B

3A

ED

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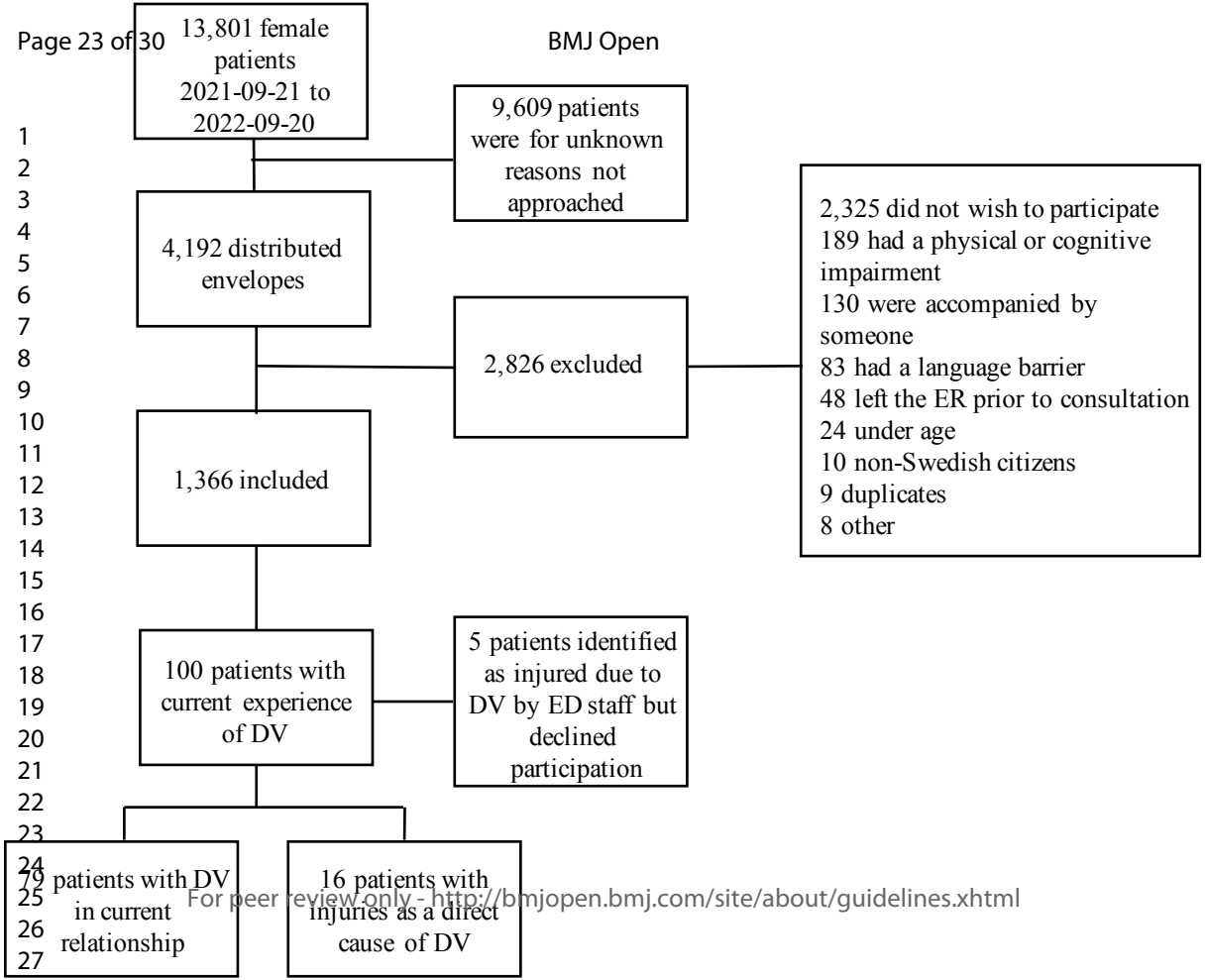
3B

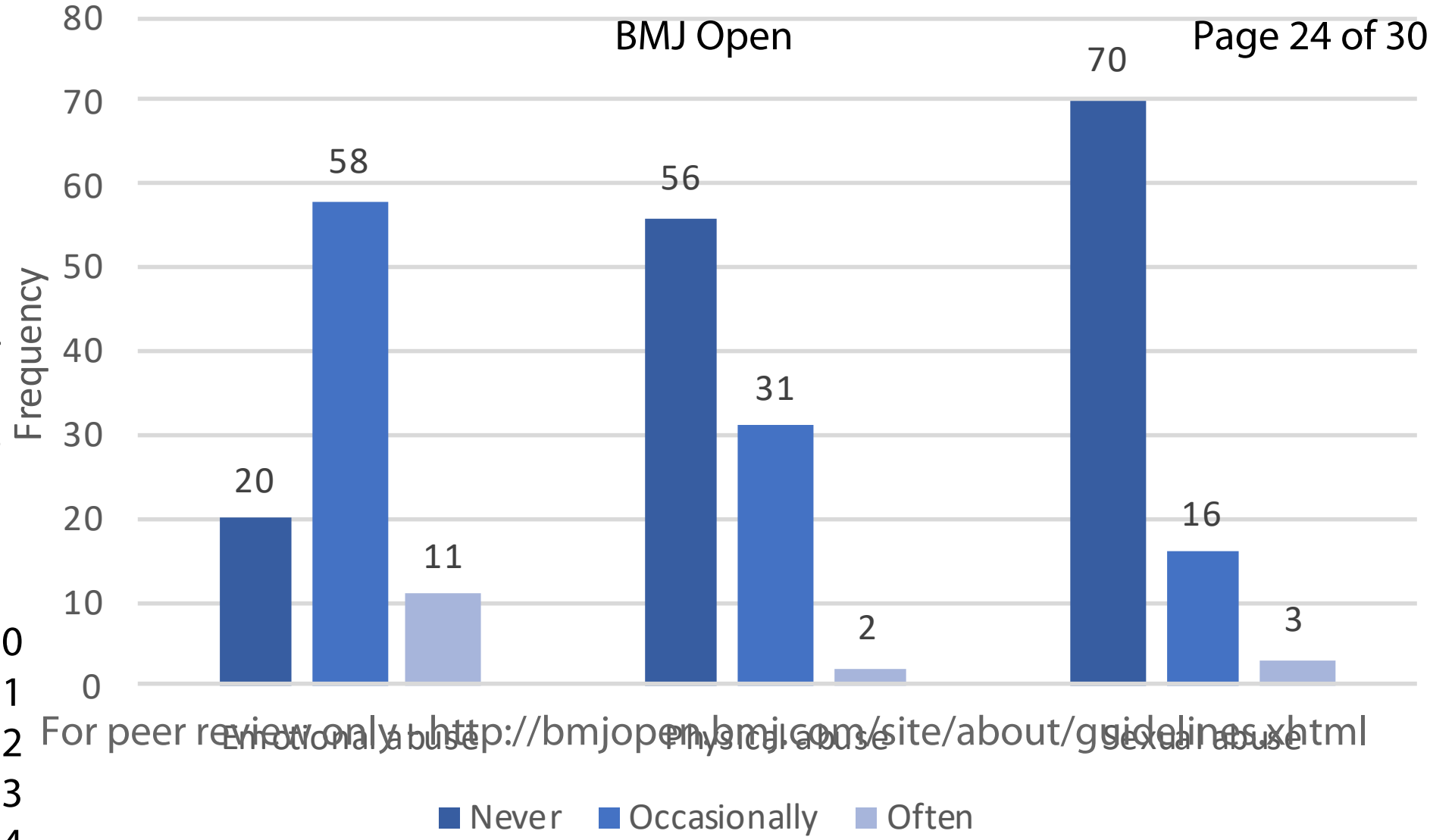
RESEARCH NURSE

4

TRAUMA CLINIC

RESEARCH GROUP





DORIS

In order to complete the study in the most optimal way, we would be grateful if you would do your best to answer all the questions.

What we mean by violence in close relationships is the emotional, physical or sexual violence that someone you feel emotionally close to (in the household, family or partner relationship) has subjected you to.

Answer using answer sheet A (yellow):

1. How long have you been together with your current partner?
(0) Less than 1 year (1) 1-5 years (2) 6-10 years (3) More than 10 years (4) I have no partner

*If you have answered **that you do not have a partner** you can skip to question 7*

2. Is your current partner biologically:
(0) Man (1) Woman (2) I prefer not to answer

3. Has your current partner ever subjected you to physical violence?
Physical violence includes, for example, pushing, hitting, scratching.
(0) Never (1) Occasionally (2) Often

4. Has your current partner ever subjected you to emotional violence?
Emotional violence includes, for example, threats, insults, controlling of social contacts.
(0) Never (1) Occasionally (2) Often

5. Has your current partner ever subjected you to sexual violence?
Sexual violence includes, for example, sexual humiliation, assault, rape.
(0) Never (1) Occasionally (2) Often

6. Are you currently seeking medical care for an injury caused by your *current* partner?
(0) Yes (1) No (2) I prefer not to answer

7. Are you currently seeking medical care for an injury caused by violence from another person?
(0) Yes (1) No (2) I prefer not to answer

8. If you answered yes, what is your relationship with the person who committed the violence?

9. Was the person who committed the violence under the influence of any substance when they hurt you?
(0) Yes, alcohol (1) Yes, drugs (2) I do not know (3) No

10. Have you previously been seeking medical care for an injury caused by violence in a close relationship?
(0) Yes: (*circle this if it happened in the current/past relationship)* (1) No (2) I prefer not to answer

11. Do you think it is important that health care services ask about violence in close relationships?
(0) Yes (1) No

12. What is your level of education?
(0) Primary school (1) High School (2) College/University

13. If you have been subjected to violence in a **current** close relationship, you have the option to receive counselling with a social worker at the trauma center at Mölndal Hospital. You will be called for a return visit in 1-2 weeks and the social worker's visit will not be visible in your medical record or on the call on paper you receive at home. The call will look like a regular call for a medical appointment. If your injury also requires a medical follow-up, you will be scheduled to see the social worker after your medical appointment. The social worker is subject to existing healthcare laws. Do you wish to speak to a social worker?

DORIS

Answer sheet A
please check the option that best applies to you

---

1. [0] Less than 1 year [1] 1-5 years [2] 6-10 years [3] More than 10 years [4] I have no partner

*If you have answered **that you do not have a partner** you can skip to question 7!*

2. [0] Man [1] Woman [2] I prefer not to answer
3. [0] Never [1] Occasionally [2] Often
4. [0] Never [1] Occasionally [2] Often
5. [0] Never [1] Occasionally [2] Often
6. [0] Yes [1] No [2] I prefer not to answer
7. [0] Yes [1] No [2] I prefer not to answer
8. _____
9. [0] Yes, alcohol [1] Yes, drugs [2] I do not know [3] No
10. [0] Yes: currently / in the past [1] No [2] I prefer not to answer

If you have answered yes, how many times have you been seeking medical care: _____

11. [0] Yes [1] No
12. [0] Primary school [1] High School [2] College/University

13. [0] Yes [1] No

Consent to the DORIS study
I have been provided with the written information and hereby consent to the processing of my information in the DORIS study as described in the information for research participants.

_____ _____
Signature Clarification of signature

_____ _____
National identification number Date

Questionnaire B

What we mean by violence in close relationships is the emotional, physical or sexual violence that someone you feel emotionally close to (in the household, family or partner relationship) has subjected you to.

1. Are you currently seeking medical care for an injury caused by violence in a close relationship?

YES NO

2. Do you think that health care services should routinely ask about violence in close relationships as the cause of injuries?

YES NO

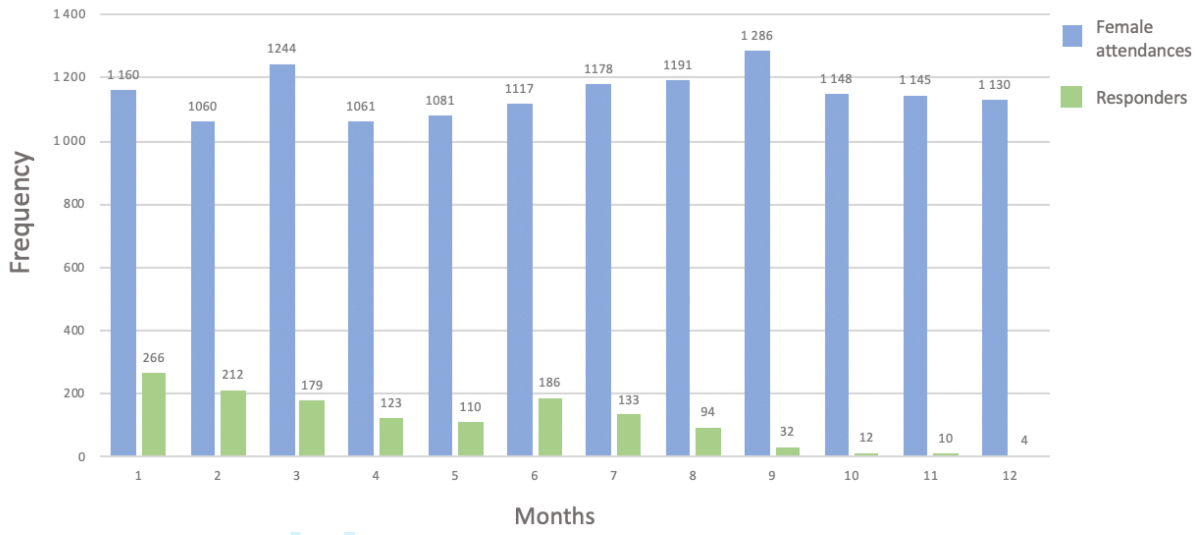
Answer sheet B

please circle the answer that best applies to you

---

1. YES NO

2. YES NO



Supplementary material, Figure S1. The responder frequency per month The number of unique female attendances (blue) and responders (green) per study month (21st to 21st of the next calendar month).

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4, 6
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (*b*) For matched studies, give matching criteria and number of exposed and unexposed	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	-
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding (*b*) Describe any methods used to examine subgroups and interactions (*c*) Explain how missing data were addressed (*d*) If applicable, explain how loss to follow-up was addressed (*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	7
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	7
Outcome data	15*	Report numbers of outcome events or summary measures over time	7

Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9-12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13
Generalisability	21	Discuss the generalisability (external validity) of the study results	13
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.