

FULL-LENGTH ORIGINAL RESEARCH

Sexual function in people with epilepsy: Similarities and differences with the general population

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Abstract

Objective: The potential impact of epilepsy on sexual function is important for patient welfare, but often neglected. This study explored the occurrences of different sexual problems in patients with both well-controlled and mostly refractory epilepsy, and compared these with equivalent information from the general population.

Methods: Between 2015 and 2017, a total of 221 adult inpatients and outpatients, mostly with intractable epilepsy, at the National Centre for Epilepsy in Norway, and 78 outpatients with well-controlled epilepsy at Lillehammer hospital participated in a questionnaire survey on sexual function. Information on the individual patient's epilepsy was collected. The results were compared with equivalent data on sexual function from 1671 adult Norwegians in the general population.

Results: Patients with epilepsy reported a significantly higher frequency of problems with orgasm, dyspareunia, erectile dysfunction, and feelings of sexual deviance. However, reduced sexual desire, premature ejaculation/climax, and vaginal dryness occurred at similar frequencies in the general population. After controlling for gender, we found no significant association between sexual problems and seizure control or use of enzyme-inducing antiepileptic drugs. In both genders, feelings of sexual deviance were associated with lower quality of life. Fewer patients with epilepsy were satisfied with their sex lives. The perception of sex as an important part of daily life was similar among women with epilepsy and women from the general population, whereas significantly fewer men with epilepsy than men in the general population reported that sex was an important part of their daily lives. Women with mostly refractory epilepsy reported asking for help with their sexual problems significantly more often than women in the other groups.

Significance: Some sexual problems occur significantly more often in patients with epilepsy than in the general population and feelings of sexual deviancy occur more frequently. No epilepsy-related factors could be identified as specific predictors.

KEYWORDS

comorbidity, epilepsy, quality of life, sexual dysfunction, sexual problems

1 | INTRODUCTION

Since the early 1950s, epilepsy has been reported to be associated with an increased rate of sexual problems.¹ However, this subject is generally neglected among neurologists.² Estimates of the occurrence of sexual dysfunction reported in the general population are highly variable, ranging from 10% to 52% in men and from 25% to 63% in women.^{3–5} This variation probably reflects differences in how sexual dysfunction has been defined, different study populations, and different methods for assessing such problems. In addition, there are cultural variations regarding sexuality among different world regions that might also influence the results.^{3,6}

Data on sexual problems in people with epilepsy are limited. Although two studies reported reduced rate of sexual problems, or even better sexual functioning, in people with epilepsy,^{7,8} nevertheless, there seems to be agreement that sexual problems occur more frequently in epilepsy patients than in the general population.^{9–13} Two further studies report no significant differences regarding sexual functioning between people with epilepsy and controls.^{14,15}

We have previously shown a significantly higher prevalence of sexual problems in women with epilepsy than in controls (75% vs 12%), and in men with epilepsy than in controls (63% vs 10%).¹¹ The large differences found in that study were probably due to selection bias, as the study included patients with severe epilepsy and a slightly different way of assessing sexual problems.

The aim of the current study was to determine the prevalence of sexual problems and sexual satisfaction in three different groups of adults: (a) patients from a tertiary referral epilepsy center with *mostly* refractory epilepsy; (b) patients with well-controlled seizures; and (c) a control group from the general Norwegian population.

In addition, we investigated whether particular epilepsy-related risk factors were associated with any of the sexual problems considered in this study.

2 | METHODS

2.1 | Study population

Between 2015 and 2017, epilepsy patients were recruited to this study from two locations. These were the following. (a) The Norwegian National Epilepsy Center in Sandvika, Norway; this is a tertiary national referral center, and patients recruited from here tend more often to have refractory epilepsy. (b) The outpatient clinic at Lillehammer hospital; this is a second-line neurology specialist service, and patients recruited from here tend to have well-controlled epilepsy. Inclusion criteria were that the patients had received an epilepsy diagnosis, that they were at least 18 years of age, and that they were capable of understanding and completing a questionnaire.

Key Points

- Various sexual problems were more prevalent in patients with epilepsy than in the general population
- Sexual desire in patients with epilepsy was similar to that in the general population
- The occurrence of sexual problems is not associated with seizure control and antiepileptic drug treatment
- Patients with refractory epilepsy asked more often for professional help to deal with sexual problems than patients with well-controlled epilepsy

Because the study was anonymous, approval from the regional ethical committee was not required (ref. no.: 2014/1011A).

For comparison with the two epilepsy cohorts (mostly refractory epilepsy and well-controlled epilepsy), data from a representative sample of 4285 Norwegians 18–67 years of age, were obtained from the market-research company, Synovate.¹⁶

2.2 | The questionnaire

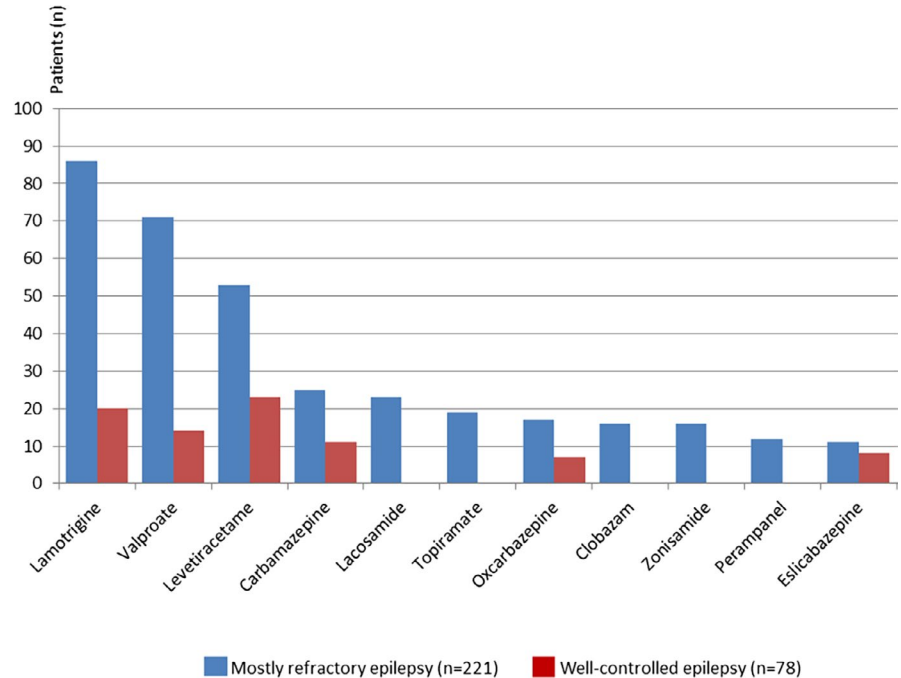
The patients answered the same questions that had been included in the Synovate questionnaire for the general population regarding sociodemographic characteristics (gender, age, level of education), and also regarding sex life (partnership, sexual problems, sexual behavior, and sexual functioning). In addition, the patients scored their perceived quality of life (QoL) on a visual analog scale and were also asked supplementary questions regarding their epilepsy (seizure frequency, use of antiepileptic drugs [AEDs]; carbamazepine, phenobarbital, phenytoin, and primidone were defined as enzyme-inducing AEDs.¹⁷ In the questionnaire patients also reported symptoms for depression and adverse events.

A score over 14 in the Neurological Disorders Depression Inventory for Epilepsy (NDDI-E)¹⁸ was used to detect depression. The adverse events profile (AEP)¹⁹ was used to describe the degree of perceived adverse events; a score over 44 was considered an adverse effects overload. Three or more empty rows in the AEP led to exclusion of the answer for calculation of adverse effect burden.

2.3 | Operationalization of the sexuality questions

Information on *sexual problems* was obtained from responses to the question: “Have you experienced one of the following problems?” The eight problems listed are shown in Figure 1. The response categories for each problem listed

FIGURE 1 Reported use of antiepileptic drugs (n) by patients with mostly refractory epilepsy and patients with well-controlled epilepsy. Only drugs used by at least 5% of patients are shown



were: 1 = “Never,” 2 = “rarely,” 3 = “often,” 4 = “nearly all the time,” and 5 = “always.” The response variables were stratified into 1 = “never or rarely” (categories 1 and 2), and 2 = “often” (categories 3-5).

Information on *satisfaction with sex life* was obtained from responses to the question: “All things considered, how satisfied are you with your sex life?” The response categories were: 1 = “very satisfied,” 2 = “quite satisfied,” 3 = “neither satisfied nor dissatisfied,” 4 = “slightly dissatisfied,” and 5 = “very dissatisfied.” The response variables were stratified into 1 = “satisfied” (categories 1 and 2) and 2 = “dissatisfied” (categories 4 and 5); response category 3 was not included in further analysis.

Information on *the importance of sex in daily life* was obtained from responses to the question: “How important do you consider sex to be as a part of your overall life?” The response categories were: 1 = “very important,” 2 = “quite important,” 3 = “neither important nor unimportant,” 4 = “slightly unimportant,” and 5 = “not important at all.” The response variables were stratified into 1 = “important” (previous categories 1 and 2) and 2 = “unimportant” (previous categories 4 and 5); response category 3 was not included in further analysis.

Information on *help-seeking behavior regarding sexual problems* was obtained from responses to the question “Have you contacted health-care providers for help regarding sexual problems?” The response categories were: “yes” or “no.”

2.4 | Statistics

IBM SPSS Statistics, version 25, release 25.0.0.1. (SPSS Inc) was used for statistical analyses. All *P*-values reported here are based on two-sided tests, with a significance level of .05.

To test possible group differences, Pearson's chi-square tests or independent sample *t*-tests were performed. Variables like gender; above or below the mean age of the participants; having been seizure-free for the previous 12 months; AEP score of 45 or more; NDDI-E score of 15 or more and QoL under the mean score; use of lamotrigine, levetiracetam, or valproate; and use of enzyme-inducing AED were tested using Pearson's chi-square test. We applied Hosmer's step-down procedure, which means that variables significant at the 0.25 level were included in the multivariate logistic regression model.²⁰ Odds ratios for factors associated with perceived sexual dysfunction were estimated using bivariate and multivariate logistic regression analysis with 95% confidence intervals.

3 | RESULTS

3.1 | Characteristics of survey participants

Of 237 patients invited to the study at the National Epilepsy Center (cohort with mostly refractory epilepsy), 221 (93.2%) participated, and of 81 patients invited to the study at Lillehammer hospital (cohort with well-controlled epilepsy) 78 (96.3%) participated. The response rate in the general population survey by Synovate was 39% (1671 persons of 4285 invited to participate).

Data on those who chose not to complete the surveys are not available.

An overview of the sociodemographic characteristics of the three groups of respondents (mostly refractory epilepsy cohort, well-controlled epilepsy cohort, general population) is presented in Table 1.

TABLE 1 Overview of the sociodemographic characteristics of the three groups of respondents

	Mostly refractory epilepsy patients (n = 221)	Well-controlled epilepsy patients (n = 78)	General population (n = 1671)
Gender			
Female, n (%)	130 (58.8) [‡]	47 (60.3) [†]	776 (46.4)
Male, n (%)	91 (41.2) [‡]	31 (39.7) [†]	895 (53.6)
Age,			
mean (SD; min.-max.)	39.1 (13.5; 18-72) ^{a,*,†}	43.3 (16.7; 18-77) [§]	42.6 (12.2; 18-67)
Level of education			
University, n (%)	80 (36.5) ^{b,*,§}	17 (21.8) [§]	971 (58.1)
Below university, n (%)	139 (63.9) ^{b,*,§}	61 (78.2) [§]	700 (41.9)
Partnership			
Cohabiting or in a relationship, n (%)	142 (56.1) ^{c,§}	54 (69.2) [†]	1316 (78.8)
Single, n (%)	73 (34.0) ^{c,§}	24 (30.8) [†]	355 (21.2)
Have had intercourse, n (%)	198 (90.8) ^{a,§}	68 (93.2) ^{e,†}	1620 (97.6) ^g
Age of sexual debut, mean (SD; min.-max.)	17.7 (3.2; 12-36) ^d	17.9 (3.4; 13-33) ^f	18.0 (3.6; 7-65) ^h

Notes: *P*-values calculated between the group from the National Epilepsy Center and the group from the second-line service (Pearson's chi-square or independent samples *t*-test).

P-values describe statistically significant differences between the general population and the epilepsy cohorts using Pearson's chi-square or independent samples *t*-test.

^a218/221 answered.

^b219/221 answered.

^c215/221 answered.

^d192/221 answered.

^e73/78 answered.

^f64/78 answered.

^g1659/1671 answered.

^h1602/1671 answered.

**P* < .05.

***P* < .01.

[†]*P* < .05.

[‡]*P* < .01.

[§]*P* < .001.

Clinical characteristics of both epilepsy cohorts regarding seizure freedom, seizure frequency, use of enzyme-inducing AED, NDDI-E score, AEP score, and QoL are shown in Table 2.

Use of number of different AED used and AED used by at least 5% in the two populations with epilepsy are shown in Table 3 and Figure 1.

As expected, seizure freedom was more common among the more refractory epilepsy patients than in well-controlled epilepsy patients (60% vs 24%). Moreover, the cohort with well-controlled epilepsy patients reported a better quality of life (higher rate of QoL over the mean) than the more refractory epilepsy patients (Table 2).

3.2 | Sexual problems

The following sexual problems were reported significantly more often by the patients with epilepsy than by respondents from the general population: problems with orgasm and

erectile dysfunction in men, pain during intercourse in women, late ejaculation/climax, and feeling sexually deviant in both women and men (Figure 2). There were no significant differences between the two epilepsy cohorts regarding prevalence and types of sexual problems. For both genders, significantly fewer patients with epilepsy were satisfied with their sex life compared with satisfaction among the general population, and significantly fewer men with epilepsy reported that sex was an important part of their daily life. Patients from the cohort with more refractory epilepsy reported asking for help with sexual problems more frequently, although the difference was only statistically significant for women (Figure 3).

3.3 | Risk factors associated with sexual dysfunction

Multivariate logistic regression analysis indicated that patients age over the mean age (OR 2.744, CI 1.308-5.757;

TABLE 2 Clinical characteristics of the epilepsy groups (n = 299)

Epilepsy characteristics	Mostly refractory epilepsy patients (n = 221) n (%)	Well-controlled epilepsy patients (n = 78) n (%)
Seizure-free during previous 12 mo	51 (24.5) ^{e,***}	42 (60.0) ⁱ
Enzyme-inducing AEDs ^a	30 (13.6)	13 (16.7)
NDDI-E <15 ^b	156 (73.2) ^f	55 (82.1) ^j
AEP >44 ^c	77 (42.5) ^g	19 (30.3) ^k
QoL over mean (6.7) ^d	104 (49.5) ^{h,*}	46 (63.9) ^l

P-values describe statistically significant differences between the two groups of epilepsy patients.

^aEnzyme-inducing antiepileptic drugs (carbamazepine, phenytoin, phenobarbital, primidone).

^bNeurological Disorders Depression Inventory for Epilepsy.

^cAdverse events profile.

^dQuality of life.

^e208/221 answered.

^f213/221 answered.

^g181/221 answered.

^h210/221 answered.

ⁱ70/78 answered.

^j67/78 answered.

^k63/78 answered.

^l72/78 answered.

**P* < .05.

****P* < .001.

P = .008) and an NDDI-E score over 14 (OR 3.904, CI 1.692-9.009; *P* = .001) were significant independent variables that were associated with reduced sexual desire in women with epilepsy. In men with epilepsy, QoL under mean (OR 3.484, CI 1.161-10.417; *P* = .026) and being in a relationship (OR 3.791, CI 1.018-13.586; *P* = .047) were significant independent variables associated with reduced sexual desire. Multivariate logistic regression analysis indicated that patients age over the mean age (OR 2.762, CI 1.122-6.802; *P* = .027) and a QoL under mean (OR 2.777, CI 1.027-7.518; *P* = .044) were significant independent variables associated with feelings of sexual deviance in women with epilepsy.

Being seizure-free during the previous 12 months; use of enzyme-inducing AEDs; use of lamotrigine, levetiracetam, or valproate; a high burden of adverse events (AEP > 44); and level of education were not significantly correlated with any of the types of sexual dysfunction investigated here.

4 | DISCUSSION

The results from our study support previous findings indicating that patients with epilepsy have a significantly higher frequency of sexual problems than adults in the general population.^{10-13,21} Independent of seizure control, significantly more respondents in the epilepsy groups reported problems with orgasm, dyspareunia, late ejaculation/climax, erectile

TABLE 3 Number of antiepileptic drugs in use in epilepsy patients

	Mostly refractory epilepsy patients (n = 221) n (%)	Well-controlled epilepsy patients (n = 78) n (%)
Number of antiepileptic drugs in use:		
0	20 (9.0)	9 (11.5)
1	75 (33.9)	44 (56.4)
2	92 (41.6)	22 (28.2)
3	31 (14.0)	3 (3.8)
4	3 (1.4)	-

dysfunction, and feelings of sexual deviance. However, the occurrence of problems with premature ejaculation/climax and vaginal lubrication was similar in the epilepsy patients to that of the general population. Surprisingly and in contrast to other studies,^{10,11,15} we also found that the proportion of people reporting a lack in sexual desire in epilepsy patients and in the general population was similar.

We found that there was no association between seizure control or use of AEDs (including enzyme-inducing AEDs) or the degree of adverse effects and the frequency of reporting different types of sexual dysfunction. Enzyme-inducing AEDs may reduce free testosterone by increasing sex-hormone-binding globulin and thus lower libido.²² However, the relationship between libido and testosterone levels is not linear, and therefore some patients using these drugs might experience compromised sexual function, whereas others might

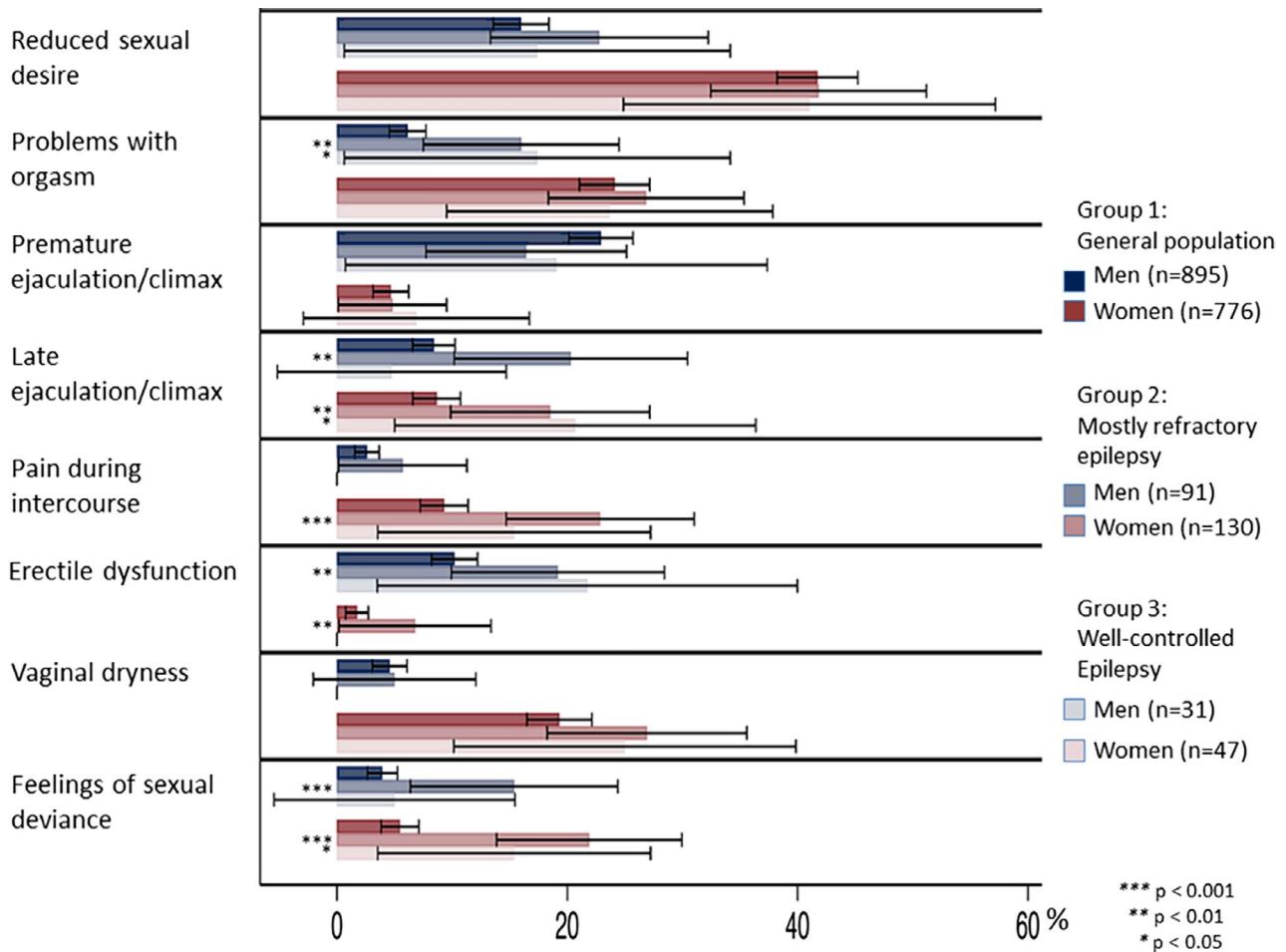


FIGURE 2 Sexual problems reported (%) by patients with mostly refractory epilepsy, patients with well-controlled epilepsy, and the general population, divided by gender. Error bars show a 95% confidence interval for the different groups. Statistical comparisons (shown by asterisks) are between the epilepsy groups and the general population within each gender

not.²³ This may explain the lack of correlation between sexual problems and use of enzyme-inducing AEDs in our study. In addition, Herzog et al found a significant difference in sexual function and testosterone levels between men treated with lamotrigine and normal controls vs men treated with carbamazepine or phenytoin.²⁴ Lack of similar findings is probably due to the small sample size in our study.

Pain during intercourse among women can be caused by insufficient lubrication. A decreased physiological response to sexual stimuli in women with epilepsy has been suggested as a possible explanation for vaginal dryness.²⁵ Although an increase in reports of vaginal dryness was apparent among the women with epilepsy in this study, the difference from that of the general population was not significant.

In our study, patients with epilepsy more frequently reported feeling sexually deviant, compared to what was reported in the general population. This is a rather nonspecific type of sexual problem and may simply reflect that psychological factors are involved in perceptions of sexuality, rather than indicating a specific problem. This may be related to our

finding that low quality of life was associated with sexual dysfunction among the epilepsy patients. A review from 2007 found that feeling sexually deviant in relation to epilepsy was sparse in the literature and mostly related to temporal lobe seizures.²⁶ In addition, reports on localized brain injuries or dysfunctions give variable reports. Although frontal lesions might to a larger degree result in hypersexuality,^{27,28} temporolimbic lesions were found to be associated with change of sexual preferences.²⁷ However, there are other reports showing hypersexuality in patients with temporal lobe dysfunctions and change of sexual preferences after basal frontal damage.^{29,30}

In our study, the epilepsy group, especially those with more refractory epilepsy, reported less satisfaction with their sex life than respondents in the general population. This result was expected and supports findings from previous studies.^{11,31}

Compared with the general population, women with epilepsy did not differ in their opinion from the general population, but significantly fewer men with epilepsy than men in

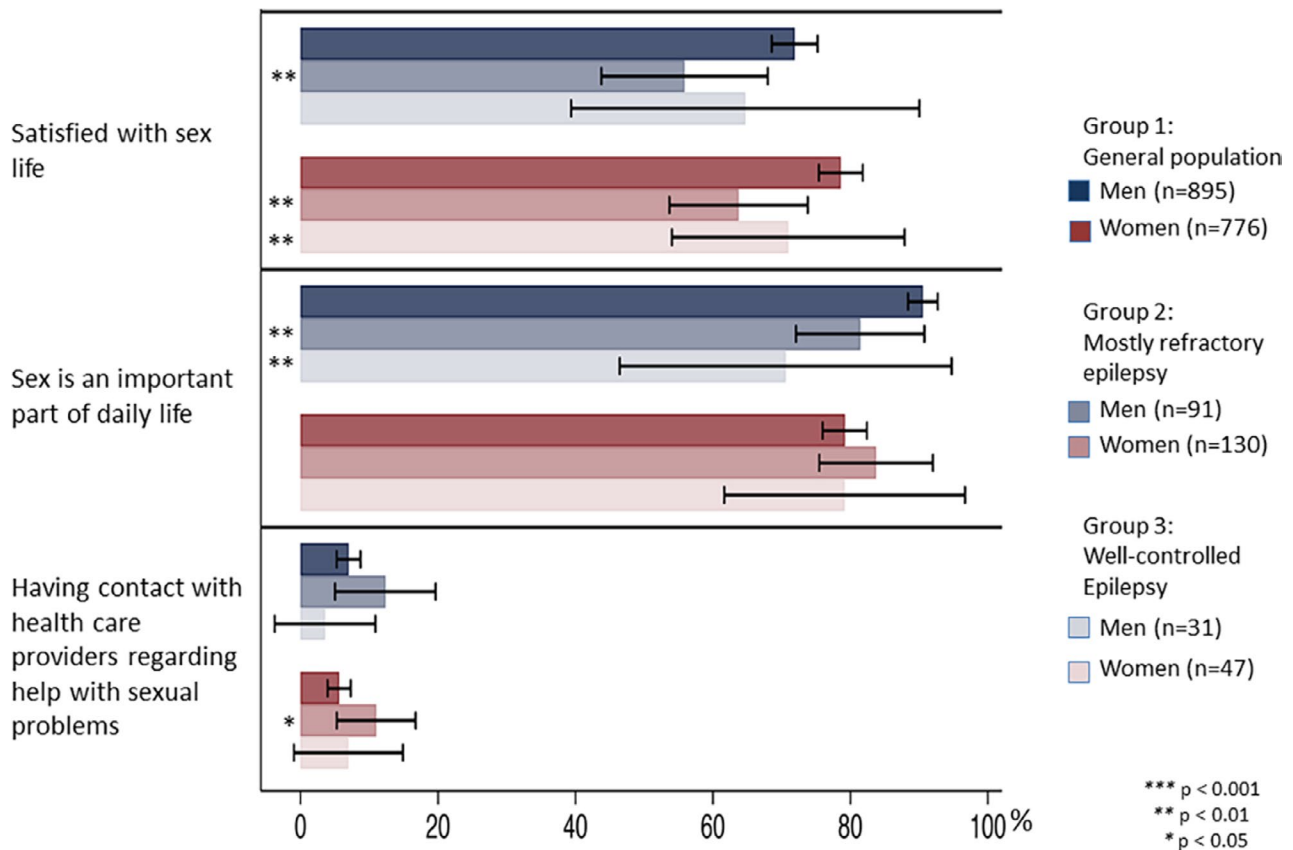


FIGURE 3 Satisfaction with sex life, importance of sex in daily life, and contact with health care providers regarding sexual problems as reported (%) patients with mostly refractory epilepsy, patients with well-controlled epilepsy, and the general population, divided by gender. Error bars show a 95% confidence interval for the different groups. Statistical comparisons (shown by asterisks) are between the epilepsy groups and the general population within each gender

the general population considered that sex was an important part of daily life. The reasons for this are not clear and such findings have not, to our knowledge, been reported in other studies. It may be speculated that, having experienced sexual problems, men may attempt to diminish its importance or, for psychological reasons, be more inclined not to initiate sexual activity. However, it should be noted that there is a significant difference between genders regarding the importance of sex as part of daily life in the general population, and this will influence the results.

The proportion of respondents that had never had sexual intercourse was higher in the epilepsy group, particularly among those from the more refractory epilepsy (National Epilepsy Center) cohort, than in the general population. Most previous studies examining sexual problems and epilepsy are based on sexually active patients, and thus exclude those patients who have never had sexual intercourse. One survey reported that about 15% of women with epilepsy in their study claimed that they had never had sexual intercourse.⁹

In addition to the effect of AEDs on the neuroendocrine regulation, a sexual dysfunction might also be caused by the epilepsy itself. Especially temporolimbic epileptiform discharges might interrupt hypothalamic regulation of pituitary

secretion.³² Although some larger controlled studies did not look at seizure localization or lateralization,^{10,11,13,15} right-sided temporal lobe epilepsy has been associated with a higher degree of sexual dysfunction.³³

In both the general population and among patients with epilepsy, it appears that seeking help from health care providers about sexual problems is uncommon,^{2,9,34} and our results reiterate this. Although we found it encouraging that women with mostly refractory epilepsy seemed more willing to seek help regarding sexual problems, it is clear that this should also be promoted among men with well-controlled epilepsy (the group with lowest contact with health care providers regarding sexual problems). It is possible that the relatively high contact with health care providers regarding sexual problems for both men and women apparently shown here may actually reflect the close contact that these patients have with health care providers rather than that these patients actively seek assistance.

Our study has some other limitations. Questionnaires have the disadvantage that misunderstandings or unintentional scoring cannot be corrected by follow-up questions, as can be done in an interview. Female respondents who answered questions on erectile dysfunction and male respondents who answered

questions regarding vaginal dryness might have misunderstood the questions, or might have answered regarding their partners. However, because sexuality may be a sensitive subject to discuss openly in an interview setting for some respondents, a questionnaire might provide more accurate data than an interview; some respondents might answer more honestly in an anonymous questionnaire than in an interview setting.

Although use of data from a large control group from the general population strengthens the findings of our study, the sample size from the well-controlled epilepsy cohort (Lillehammer Hospital) was smaller than the cohort with mostly refractory epilepsy recruited from the National Epilepsy Center, and this may have skewed the results. In addition, the two epilepsy populations have to a small degree some overlap. In the group with mostly refractory epilepsy, about one-fourth were seizure-free the last 12 month, whereas in the group with rather well-controlled epilepsy, 40% were not seizure free.

Another limitation of the study is that the data from the general population are derived from a survey that was performed in 2008, about 7-9 years before the data from the groups with epilepsy were obtained. It is possible that during the intervening years, the prevalence of sexual problems in the Norwegian population might have changed and thereby affected the relevance of the comparative data. However, there is no evidence to suggest that this is likely to be the case.

In conclusion, our study supports previous findings that patients with epilepsy are significantly less likely to be satisfied with their sex lives. More epilepsy patients report feelings of sexual deviance, having problems with pain during intercourse, and problems with orgasm and late ejaculation/climax than in the general population. However, we were unable to identify any epilepsy-related factors as specific predictors for these problems. Although male patients with mostly refractory epilepsy were more likely to ask for professional help with sexual problems than male patients with well-controlled epilepsy, no other differences between the two epilepsy populations were identified.

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CONFLICTS OF INTEREST

Oliver Henning has received speaker's honoraria from Eisai, UCB, and LivaNova. Cecilie Johannessen Landmark has received speaker's honoraria from Eisai and GW Pharma. Morten Ingvar Lossius has given talks and participated

in expert panels for Eisai and UCB. Torleiv Svendsen has received honoraria for attending advisory boards and/or speaker's honoraria from Eisai, GlaxoSmithKline, and UCB. Karl Otto Nakken, Anette Farmen, and Bente Træen have no conflicts of interest to disclose.

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