Meeting sexual partners online: associated sexual behaviour and prevalent chlamydia infection among adolescents in Norway – a cross-sectional study

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ABSTRACT

Objectives: Evidence is mixed as to whether meeting sexual partners online ('internet-partners') is associated with risky sexual behaviour and/or STI transmission. Accordingly, we sought to estimate the prevalence of reporting various online romantic and sexual activities among Norwegian adolescents, including internet-partners, and the reason for meeting them; and to examine differences in sexual behaviour, partnership characteristics, and chlamydia infection prevalence among those reporting internet-partners versus those reporting only offline-partners.

Methods: Population-based cross-sectional survey among sexually-experienced girls and boys, 15-20 years, using electronic-questionnaires administered by e-mail and collecting urine samples for *Chlamydia trachomatis* PCR testing (79% provided both, n=1,023). We used logistic regression to examine associations, adjusting for potentially confounding variables.

Results: Overall, 30% of both genders reported internet-partners (ever). Boys (but not girls) with internet-partners had higher chlamydia prevalence than those reporting meeting sexual partners only offline (8.1%, 95%CI 4.3-13.7 vs 1.6%, 0.5-3.7). Two-thirds of girls and 37% of boys reported meeting their most recent internet-partner to start a romantic relationship, while the remainder did so to have sex. Among both genders, reporting sexual (vs romantic) reasons for meeting their most recent internet-partner was associated with reporting several risky sexual behaviours including multiple recent sex-partners (adjusted odds ratio girls: 3.27, boys: 2.48) and three-fold higher chlamydia infection prevalence.

Conclusions: This population-based study suggests that internet-partners are common among adolescents in Norway, and the reason for meeting them was more strongly associated with additionally reporting sexual risk behaviours and prevalent chlamydia infection, than the internet itself as a meeting venue.

INTRODUCTION

Existing research evidence is mixed as to whether seeking sexual partners on the internet is a marker of risky sexual behaviour in general, or if internet sex-seeking itself increases a person's risk of acquiring a sexually transmitted infection (STI).[1-6] The prevalence of many STIs is highest among young people[7] and they are also early adopters of new technologies and the most active internet users.[8] In recent years meeting romantic and sexual partners online has become more common among young people,[6 9 10] in part due to the internet's greater accessibility through the increasing availability of stationary and portable devices. At the time our study took place in Norway in 2009, it was estimated that 94% of young people aged 16-24 years had internet access at home, and 73% reported daily internet use, 75% chatted on the internet, and 80% used e-mail.[8 11] MSN messenger (80%), Facebook (77%), and the Norwegian social networking site 'Nettby' (34%) were the most frequently used social media for online communication.[11]

To date, internet sex-seeking practices have been studied using unrepresentative convenience samples, particularly among men who have sex with men (MSM), among whom partner seeking on the internet is common,[2 4 5 12] in clinical settings,[1 4 6 12] and among adults.[4 10 12 13] In order to capture exposure to STIs, previous studies have tended to use self-reported STI diagnosis history rather than current infection status.[2 5 9 10 13-15] Given the pervasiveness of social media use among adolescents and to better understand the relationship between internet use, sexual behaviour, and STI transmission among them, the need for larger studies in representative samples of the general population[2 16-18] with inclusion of biological outcomes[14] has been recognised.

In this paper, we use questionnaire data and *Chlamydia trachomatis* infection urine test results from a cross-sectional study conducted among high school students in Norway[19] to examine: i) the prevalence of reporting using the internet for different types of romantic and sexual activities among sexually-experienced adolescents in the general population, ii) the reasons cited for meeting sexual

partners online, and iii) associations between reporting internet-partners and key sexual behaviours, and prevalent chlamydia infection .

METHODS

Details of study design and data collection have been reported elsewhere.[19] In brief, we conducted a cross-sectional study in Finnmark county in Norway in 2009 where chlamydia notification rates have been above the national average (606/100,000 vs 458/100,000 in 2011).[20] All 123 classes in 5 of the 10 public high schools were invited to participate, and schools were purposively selected to be representative of the general population in terms of geography, ethnic mix, and number of students. Public high schools in Norway enroll 94% of the birth cohorts, include both academic programmes and vocational school, and so are assumed to be representative for the general adolescent population.[21] A link to an electronic questionnaire was sent to each participant's email address 10 minutes before researchers entered the classroom. Researchers invited students to complete this questionnaire, which included questions on demographics, sexual behaviour, and chlamydia infection history, and to provide first-void urine (FVU) samples for chlamydia testing. Researchers and the class teacher were present while participants spent 10-20 minutes answering the questionnaire (under 'exam conditions' i.e. whilst sitting in silence and without looking at each other's responses) on their laptops. Directly thereafter, participants provided 12 ml FVU samples, which were delivered to the laboratory the following day for *C. trachomatis* PCR testing (ProCelo as, Tromsø, Norway). The questionnaire data and chlamydia test result were linked via each participant's unique email address. Participants testing positive were called on their mobile phone within 2 days and given an appointment at the local youth clinic for treatment with azithromycin 1g, partner notification and follow-up.

The participation rate was 79% of 1,908 eligible individuals (Figure 1). Of these 1,515 participants, 442 reported no sexual intercourse (all of whom had negative chlamydia test results) and so were considered not to be at risk for chlamydia and were excluded from the current analysis. This analysis

is therefore based on a total of 1,023 participants (562 girls and 461 boys) who reported experience of sexual intercourse, had valid chlamydia test results, and provided a valid response to the question: 'Have you ever met someone on the internet who you later met and had sex with in real life?'. Mean age of these participants was 17.2 years (standard deviation, SD, 1.0), median 17.0 years and range 15-20 years.

Questionnaire data

Online romantic and sexual behaviour was assessed by 4 questions in a larger instrument developed for a US internet survey[22] and also used in several Swedish surveys.[10 23] The questionnaire later asked about participants' most recent sexual partners, including whether they had met on the internet, and condom use at first sex together (question wording is given in Supplementary file 1).

Statistical analyses

We used Stata (version 13.0) for all statistical analyses. 95% confidence intervals (CI) for proportions were calculated using the exact binominal method. Two-sided *p*-values <0.05 were considered statistically significant. Initial analyses were stratified by gender reflecting gender differences in sexual behaviour.[19] Logistic regression was used to calculate odds ratios (OR) to assess associations between having ever met a partner on the internet and later having sex with them (hereafter, 'internet-partner'), and demographic and sexual behaviour variables which were selected based on Buhi *et al*. [6] and assumed relevance. We also used multivariable logistic regression to calculate adjusted OR (AOR) to consider these associations after controlling for key demographic variables (ethnicity, high school year, educational programme, residence during high school, sexual orientation, and alcohol use). The variables 'age' and 'high school year' were strongly correlated and school year was considered as most appropriate to include in the statistical models.

Ethics

Written informed parental consent was obtained for participants aged <16 years. Participants aged ≥16 years gave their informed consent by filling in the web-based questionnaire. The study was approved by the Regional Committee for Medical and Health Research Ethics North Norway.

RESULTS

Internet activities related to love and sexuality

Among the 1,023 participants (562 girls and 461 boys) reporting ever experiencing sexual intercourse, half of the girls and three-quarters of the boys reported having ever used the internet in relation to love and sexuality. Among the 278 girls and 351 boys who reported this, there were significant gender differences in terms of their use (Figure 2). More boys than girls looked online for someone to flirt with (27% versus 15%), for a girlfriend/boyfriend (10% vs 6%), viewed erotica (34% vs 5%) and pornography (53% vs 11%), and visited contact sites (8% vs 4%). In contrast, more girls than boys reported *reading* erotica (11% vs 7%) and seeking sexual information/advice online (14% vs 6%). One-sixth of both genders reported chatting with like-minded people. No girls and very few boys reported replying to contact ads or using the internet to contact commercial sex workers.

Using the internet to find sexual partners

Similar proportions of sexually-experienced girls and boys reported ever having met a person online that led to a real-world sexual encounter (30.6%, 95%CI 26.8-34.6% vs 32.1%, 27.7-36.6%, respectively). Among these participants, the mean number of internet-partners ever was approximately 2 for both genders (girls 2.05, 95%CI 1.76-2.33 vs boys 2.28, 1.92-2.63). One-third of these girls, but almost two-thirds of these boys, stated their original intention of meeting their most recent internet-partner was to have sex, while the remainder cited their reason as wanting to start a romantic relationship (Table 1).

Table 1. Reason for meeting the most recent internet-partner and chlamydia infection prevalence among those reporting internet-partners (ever)

	Girls			Boys		
	% (95% CI)	CT+ (95% CI)	n_{CT}, D	% (95% CI)	CT+ (95% CI)	n_{CT}, D
Reporting internet-partners			13, 169			12, 146
Reason for meeting the most recent internet-partner						
To start a romantic relationship	63.9 (56.2-71.1)	4.6 (1.5-10.5)	5, 108	37.0 (29.2-45.3)	3.7 (0.5-12.7)	2, 54
To have sex	36.1 (28.9-43.8)	13.1 (5.8-24.2)	8, 61	63.0 (54.6-70.8)	10.9 (5.3-19.1)	10, 92

%, column percentage for 'reason for meeting the most recent internet-partner'; CI, confidence interval; CT+, chlamydia infection prevalence; n_{CT}, number of chlamydia cases; D, denominators

Around one in ten girls and boys reported having met their most recent sexual partner online (Supplementary file 2), while the most commonly reported way of meeting this partner was through friends/family (55% of girls vs 41% of boys), followed by at a party/disco/club (23% vs 25%, respectively).

Factors associated with ever having had an internet partner

In the multivariable analysis, both girls and boys reporting internet-partners were more likely to report: early sexual debut (before age 15), two or more sexual partners in the past 6 months, non-use of condom at first sex with the most recent sexual partner, and to have had a chlamydia test before taking part in the study (Table 2). Among girls only, being in the first year of high school and having known the first sexual partner for less than four weeks before having sex were independently associated with reporting internet-partners. Additionally, among boys, occasional and regular use of alcohol was associated with meeting internet-partners. Among girls, reporting lesbian, bisexual or uncertain sexual orientation was statistically significant in the crude analysis, but the association was attenuated (OR 1.78, p=0.096) in the multivariable model.

Table 2. Factors associated with reporting internet-partners (ever) among 1,023 sexually-experienced participants, by gender.

Characteristic	GIRLS					BOYS					Denomin.	
	%	OR, 95% CI	P	AOR, 95% CI	P	%	OR, 95% CI	P	AOR, 95% CI	P	Girls	Boys
Reported internet-partner (ever)												
All participants (15-20y)	30.6	NA				32.1	NA				562	461
Demographic												
Ethnicity			0.241		0.115			0.157		0.116		
Norwegian	28.5	1.00		1.00		29.2	1.00		1.00		400	322
Sami/Sami-Norwegian[1]	35.8	1.40, 0.91-2.14		1.54, 0.98-2.43		38.5	1.51, 0.95-2.41		1.58, 0.97-2.58		123	104
Other	35.9	1.40, 0.70-2.80		1.58, 0.76-3.36		38.2	1.50, 0.72-3.12		1.64, 0.77-3.50		39	34
High school year*												
First	40.2	1.00	<0.001	1.00	<0.001	32.0	1.00	0.837	1.00	0.576	209	178
Second	27.4	0.56, 0.37-0.85		0.57, 0.37-0.89		33.2	1.05, 0.68-1.62		0.94, 0.60-1.48		197	205
Third	21.8	0.41, 0.26-0.66		0.39, 0.23-0.65		29.5	0.89, 0.50-1.58		0.68, 0.34-1.40		156	78
Educational programme			0.154		0.940			0.155		0.718		
Academic	28.4	1.00		1.00		28.1	1.00		1.00		345	171
Vocational	34.1	1.30, 0.91-1.88		1.02, 0.67-1.54		34.5	1.35, 0.89-2.04		1.09, 0.66-1.83		217	290
Residence during high school			0.790		0.41			0.052		0.132		
At home	30.9	1.00		1.00		28.8	1.00		1.00		353	285
Other[2]	29.8	0.95, 0.65-1.38		0.84, 0.56-1.26		37.5	1.49, 1.00-2.21		1.38, 0.91-2.11		208	176
Sexual orientation			0.045		0.096			0.445		0.270		
Heterosexual/straight	29.6	1.00		1.00		31.8	1.00		1.00		520	437
Same-sex/bisexual/uncertain	45.0	1.94, 1.01-3.73		1.78, 0.89-3.39		40.0	1.43, 0.57-3.58		1.72, 0.66-4.49		40	20
Alcohol use*			0.994		0.672			0.004		0.003		
Never tried/have tried	30.4	1.00		1.00		20.2	1.00		1.00		115	114
Occasional use	30.7	1.01, 0.64-1.60		1.24, 0.77-2.02		36.6	2.28, 1.35-3.86		2.63, 1.49-4.63		371	246

Regular use	30.1	0.99, 0.52-1.87		1.21, 0.62-2.37		36.2	2.24, 1.20-4.17		2.59, 1.31-5.08		73	96
Sexual behaviour												
First sexual intercourse*			<0.001		0.001			<0.001		<0.001		
≥15 years	23.5	1.00		1.00		26.6	1.00		1.00		328	293
≤14 years	41.1	2.28, 1.58-3.28		1.98, 1.34-2.92		45.0	2.26, 1.50-3.41		2.25, 1.45-3.50		231	151
Time known first p. before sex			0.007		0.017			0.195		0.458		
≥ 1 month	27.2	1.00		1.00		30.3	1.00		1.00		390	277
0-4 weeks	38.6	1.68, 1.15-2.46		1.67, 1.12-2.48		36.2	1.30, 0.87-1.95		1.17, 0.77-1.79		171	174
Sexual partners past 6 months*			0.003		0.007			<0.001		<0.001		
0-1	25.8	1.00		1.00		23.3	1.00		1.00		322	253
≥ 2	37.8	1.75, 1.21-2.51		1.70, 1.15-2.50		46.6	2.87, 1.89-4.35		2.98, 1.92-4.62		233	176
Condom use at first sex with most recent sexual partner			0.007		0.019			<0.001		<0.001		
Yes	23.1	1.00		1.00		21.7	1.00		1.00		182	203
No	34.3	1.74, 1.16-2.61		1.65, 1.08-2.51		41.6	2.57, 1.69-3.91		2.32, 1.50-3.58		379	250
Chlamydia tested prior to study			0.003		0.002			<0.001		<0.001		
No	24.2	1.00		1.00		26.2	1.00		1.00		248	366
Yes	35.8	1.75, 1.20-2.53		1.88, 1.26-2.79		54.7	3.40, 2.13-5.42		3.20, 1.94-5.29		313	95

%, row percentage of outcome variable; OR, odds ratio; AOR, adjusted OR controlled for all demographic variables; CI, confidence interval; NA, not applicable; *Gender interactions ($p<0.05$) were present in crude and adjusted analysis of girls and boys combined.

[1]Indigenous population in the northern areas of Norway, Sweden, Finland and Russia; [2]Living with relatives, in students' homes, or in private accommodation; Denominators sum to less than 562 among girls and 461 among boys due to item non-response of 0-1.4% and 0-6.3%, respectively.

Separate logistic regression analyses were performed on the subsample of 169 girls and 146 boys reporting internet-partners (ever) using the outcome variable ‘meeting the most recent internet-partner for sexual reasons’ and selected key variables (see Supplementary file 3). In the multivariable analyses, both girls and boys reporting a sexual reason for meeting their most recent internet-partner were more likely to report multiple sexual partners in the past 6 months (AOR: 3.27 and 2.48, respectively). Girls were more likely to report non-use of condoms at first sex with the most recent partner (AOR: 2.74) while boys were more likely to report early first intercourse (before age 15) (AOR: 2.32).

Chlamydia infection prevalence by meeting venue

Chlamydia infection prevalence was 7.3% (95% CI 5.3-9.8) among the sexually-experienced girls, corresponding to 41 chlamydia cases, and 3.7% (95% CI 2.2-6.1) among the boys, corresponding to 17 cases, as has been reported previously.[19] Among boys reporting internet-partners (ever), chlamydia prevalence was significantly higher than among boys reporting meeting sexual partners exclusively offline (8.1%, 4.3-13.7 vs 1.6%, 0.5-3.7). This was not the case among the girls (6.9%, 4.6-9.9 vs 8.1%, 4.5-13.3, respectively). Chlamydia prevalence was three-fold higher in both genders among those reporting meeting their most recent internet-partner in order to have sex, compared to those who did so to start a romantic relationship (Table 1). The difference was not statistically significant among boys due to only 2 chlamydia cases among those with romantic intentions.

DISCUSSION

Principal findings

Findings from this population-based study show that in Norway, although significantly more sexually-experienced boys than girls had engaged in romantic and sexual activities online, three in ten among both genders reported ever meeting a sexual partner on the internet. Consistent with previous research among adolescents, reporting internet-partners (ever) was associated with numerous risky sexual behaviours.[6 24 25] Boys (but not girls) reporting internet-partners (ever) had higher chlamydia infection prevalence than those reporting exclusively offline-partners. A majority of boys had met their most recent internet-partner in order to have sex, while most girls had done so wanting to start a romantic relationship. Those who met their most recent internet-partner for sexual reasons, had two-fold higher chlamydia prevalence, and reported greater sexual risk behaviours, than those reporting romantic reasons for meeting this person.

Strengths and limitations

To our knowledge, this is the first study to investigate use of the internet for sexual purposes in a general adolescent population-sample, thereby avoiding the substantial selection bias related to sampling in clinics, online or other convenience venues. We believe our study is also the first to include the reported reason for meeting sexual partners online, and to explore this in relation to sexual risk behaviour and chlamydia infection. The inclusion of a biological outcome is a strength compared to reliance on self-reported STI, which is likely to underestimate true STI history.[26] Due to sampling in only one county, we should be cautious in generalising the results beyond Norway. However, now that internet access is almost universal among adolescents in Western European countries,[27] there is no particular reason to believe that the high proportion of participants reporting having met sexual partners online in our study, is unusual. Despite the high participation rate and a large study sample of 1,023 individuals in an area with high chlamydia notification rates , number of infections was low which limited our statistical power. Although the use of an electronic questionnaire is likely to have reduced social desirability bias in response,[28] such bias cannot be eliminated. Condom use at first sex with the most recent sexual partner was used as a proxy for condom use at first sex with former sexual partners,[29] including the most recent *internet*-partner. We recognise the limitation of this condom use measure, though because this occasion will be recent for adolescents, and is likely to be salient, we expect good recall and hence accurate responses. Unfortunately, our study did not ask participants about reasons for meeting offline sexual partners. Finally, data were collected in 2009. Changes in online sexual behaviours that may have occurred alongside changes in the internet or how it is accessed (e.g. increased use of smartphone apps for social networking and dating) will not have been captured.

Comparisons with other studies

The observed gender differences in the type and proportion of online romantic and sexual activities largely agree with a Swedish internet-survey among 18-24 years-olds from 2002, but overall, participants in the Swedish survey reported higher levels of these activities,[23] probably due to

online recruitment and older age group. Our finding that significantly more boys than girls had used the internet to view pornography is well-known from previous research.[17 23 30]

Nearly one-third of our participants reported internet-partner(s) reflecting that this is now exceedingly common among adolescents. We found a high prevalence, compared to previous studies among heterosexual young people with estimates of 6-33%,[6 10 14 24 25] varying considerably with how participants were recruited. Although our questionnaire did not ask the specific context and online meeting venue for internet-partners, both this study and previous research show that not all adolescents reporting internet-partners may explicitly have sought sexual partners online.[6 14] A recent study in a teen clinic in Florida among 273 participants (90% girls) found that 4 of 5 participants reporting internet-partners had met that partner on a social as opposed to sexual networking site suggesting an initial social reason.[6]

Our finding that additionally reporting sexual risk behaviours and three-fold higher chlamydia prevalence was associated with meeting the most recent internet-partner for sexual rather than romantic reasons indicates that risky behaviour and infection are more strongly associated with the purpose for doing so than the internet itself as a meeting venue, as also mentioned by others.[1 6]

The observation that first-year girls were more likely of reporting internet-partners than those in second and third year may be explained by those remaining in school being less prone to such behaviour. Alternatively, those who become sexually active after the first year may be less likely to have met partners online (yet), than those with earlier sexual debuts.

Similar to a small study of US homeless youths where girls with lesbian/bisexual orientation were more likely to report internet-partners the past three months[24] and the Florida teen clinic study where those identifying as gay/bisexual had increased odds of reporting internet-partner(s) (ever)[6] we found that girls reporting same-sex/bisexual/uncertain sexual orientation had increased crude odds of reporting internet-partners. It is well-established that MSM are more likely than

heterosexuals to find sexual partners online,[9 10 12 13] and our study does not necessarily contradict this, since the lack of statistically significant association among boys could be due to the small number of non-heterosexual participants, or their young age.

The Florida study found no association between seeking sexual partners online and previous or current STI among their mostly female convenience sample, although associations with risky sexual behaviours were observed.[6] Thus, our finding that boys (but not girls) reporting internet-partners (ever) had higher chlamydia prevalence than those reporting only offline-partners may not contradict these results. Two recent studies on college students and MSM, respectively, found significantly more risk-behaviours among individuals reporting both offline and internet-partners suggesting that among those engaging in risky sexual behaviour, the internet was an additional source of sexual partners,[5 14] but this could not be assessed in our data.

Implications for policy and further research

Adolescents are epidemiologically important in terms of STI transmission and sexual health more broadly, and easily reachable through the internet due to their heavy use. In addition to facilitating sexual encounters, the internet provides unique opportunities for public health interventions. For example, interactive websites can provide tailored sexual health advice[31] and STI self-testing services linked to online care may increase access to testing and care.[32]

With the continuous expansion of the internet, online social and sexual networking platforms, internet-partnering among adolescents may become even more common in the future. Our data show that there is a need to explore more details regarding the context and venues related to internet-partners, why and whom people meet, and the associated risks of sexual ill-health to tailor effective interventions for individuals and population groups. Future population-based studies should include national probability sampling to be more representative, larger sample size, a broader range of ages, and detailed questions on both offline- and internet-partnerships.[5 14]

Conclusion

Meeting internet-partners is a common, but heterogeneous behaviour among adolescents of both genders in Norway. The associated sexual risk varies greatly with the purpose and context of internet-partner seeking. In-depth research is needed to further understand the dynamics of internet as a meeting venue for sexual partners and to assess the potential for tailored online interventions with the aim to inform public policy.

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Competing interests None

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KEY MESSAGE BOX

- Meeting sexual partners on the internet is common among adolescents in Norway.
- This study sampled adolescents from the general population while previous research regarding sexual partners met online has been in unrepresentative convenience samples.
- The majority of girls reported meeting their most recent internet-partner in order to start a romantic relationship, while most boys did so to have sex.
- Sexual reasons for meeting a sexual partner online were more strongly associated with reporting risky behaviours and chlamydia prevalence than the internet itself as a meeting venue
- Clinicians and health promoters should target adolescents who report meeting sexual partners online - although for the individual it may not necessarily be a risky behaviour.

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Figure 1. Study population

Figure 2. Responses to the question 'What do you do on the internet related to love and sexuality?' shown as bar charts including 95% confidence intervals. Responses are presented in the order asked in the questionnaire and more than one answer was allowed.