Prevalence and determinants of sexually transmitted infections in women at risk undergoing abortion in a swiss primary care setting

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Abstract: Background: Specific prevalence data are needed to assess the burden of sexually transmitted infections (STIs) in specific settings where data are scant, such as women seeking early termination of pregnancy (TOP). We aimed to investigate the prevalence of STIs and its determinants in women at risk (e. g. pathological cervical swab) undergoing TOP in a primary care setting in Switzerland. Methods: Cross-sectional study of 620 women seeking abortion counselling at a general practice in Zurich, Switzerland. Patients' characteristics were assessed and in case of pathological cervical swab a PCR-based screening for Chlamydia trachomatis (CT), Mycoplasma genitalium (MG) and Neisseria gonorrhoeae (NG) was initiated to estimate STI prevalence. Bi-and multivariable analysis were used to investigate STI determinants. Results: 585 out of the 620 women presenting for counselling resulted in TOP. 581 (93,7%) cervical specimens were available with 272 having pathological signs (46,8%), thus were considered at risk for STIs. In 192 screened samples 28 STIs (14,6%) (95% CI: 10,3-20,3%) were detected, predominantly CT (17 cases) followed by MG (9 cases) and NG (2 cases). Compared to non-immigrants, immigrants were more likely to have a STI (adjusted OR 2,63; p=0,037) Non-screened women were significantly more often self-payers (31,3%) compared to screened women (8,3%) (p<0,001). Conclusion: We found a high STI prevalence in women presenting for TOP in a Swiss primary care setting. Women with a migration background seemed to be a vulnerable subgroup. Public health efforts are needed to implement cost-effective screening and case management programmes in this population at risk for STIs.

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Prevalence and Determinants of Sexually Transmitted Infections in Women at Risk Undergoing Abortion in a Swiss Primary Care Setting

Prävalenz und Risikofaktoren für sexuell übertragbare Infektionen bei Frauen, welche in der Hausarztpraxis einen Schwangerschaftsabbruch durchführen lassen

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Key words: general practice, pregnancy, Chlamydia trachomatis, screening, sexually transmitted infections

Ü1 Abstract

Background: Specific prevalence data are needed to assess the burden of sexually transmitted infections (STIs) in specific settings where data are scant, such as women seeking early termination of pregnancy (TOP). We aimed to investigate the prevalence of STIs and its determinants in women at risk (e.g. pathological cervical swab) undergoing TOP in a primary care setting in Switzerland.

Methods: Cross-sectional study of 620 women seeking abortion counselling at a general practice in Zurich, Switzerland.. Patients' characteristics were assessed and in case of pathological cervical swab a PCR-based screening for Chlamydia trachomatis (CT), Mycoplasma genitalium (MG) and Neisseria gonorrhoeae (NG) was initiated to estimate STI prevalence. Bi-and multivariable analysis were used to investigate STI determinants.

Results: 585 out of the 620 women presenting for counselling resulted in TOP. 581 (93.7%) cervical specimens were available with 272 having pathological signs (46.8%), thus were considered at risk for STIs. In 192 screened samples 28 STIs (14.6%) (95% CI: 10.3-20.3%) were detected, predominantly CT (17 cases) followed by MG (9 cases) and NG (2 cases). Compared to non-immigrants, immigrants were more likely to have a STI (adjusted OR 2.63; p=0.037) Non-screened women were significantly more often self-payers (31.3%) compared to screened women (8.3%) (p<0.001).

Conclusion: We found a high STI prevalence in women presenting for TOP in a Swiss primary care setting. Women with a migration background seemed to be a vulnerable subgroup. Public health efforts are needed to implement cost-effective screening and case management programs in this population at risk for STIs.

Ü1 Abbreviations

CT: Chlamydia trachomatis

MG: Mycoplasma genitalium

NG: Neisseria gonorrhoeae

STI: Sexually transmitted infection

TOP: Termination of pregnancy

Ü1 Introduction

Sexually transmitted infections (STI) are among the most common causes of illness in the world and have far-reaching health, social and economic consequences for many countries. Chlamydia trachomatis (CT), Mycoplasma genitalium (MG) and Neisseria gonorrhoeae (NG) are considered being common sexually transmitted pathogens and can cause genitourinary infections with a wide range of symptoms; in women MG and NG can cause cervicitis, urethritis and endometritis (1-5). The causal connection of MG with salpingitis as well as potentially resulting infertility remains controversial, whereas CT and NG are known to cause salpingitis and have an impact on infertility (1, 4, 6-10). An untreated CT infection can also lead to peritonitis, perihepatitis, pelvic inflammatory disease (PID) and ectopic pregnancy (EP) (4, 6, 7). Genital CT and NG infections are asymptomatic or just show mild symptoms in up to 70% and 50% of cases, respectively (4, 11). As a consequence, these infections often remain undetected thus abetting further transmission. Similarly, asymptomatic MG infections have also been described, raising the question whether also asymptomatic subgroups, such as women presenting for early termination of pregnancy (TOP), should be screened for MG (12, 13).

International prevalence rates of STIs vary, depending on the study setting. A population-based Danish screening program with subjects aged 21 to 23 years in 1997-98 assessed CT and MG prevalence rates of 8.4% and 2.3% in women, respectively (14). Data on the prevalence of NG infection in the general population do not seem to exist. Studies based on females undergoing TOP in a hospital setting mentioned infection rates as follows: CT 2.8% to 15.74%; MG 0.98% to 8.7%; NG 0.67% to 3% (12, 15-18). Reasons for these wide ranges are multifarious, e.g. different detection techniques, differences in socio-demographics. A study from the UK reported CT prevalence rates in pregnancy termination clinics more than twice as often than in the general population, suggesting TOP to be a risk for STIs (19). Beyond the number of sexual partners, an established risk factor for STIs, results for age and

migration background as potential risk factors for STIs in women seeking pregnancy testing and TOP are controversial (15, 20, 21).

In Switzerland TOP is also provided by general practitioners in a primary care setting (22). Whereas data on STI prevalence in women seeking for TOP are mainly derived from studies in specialized secondary care settings (e.g. hospital settings), data from the primary care setting, especially from Switzerland, are scant. We aimed to estimate STI prevalence rates of CT, MG and NG in women seeking TOP in a primary care setting in Switzerland. Furthermore we investigated potential determinants for STIs among this population.

Ü1 Methods

We performed a retrospective analysis of patients presenting for TOP in a single-handed general practice from 01.01.2006 to 10.03.2009. After receiving counseling for induced abortion patients were asked for their informed consent to participate in an anonymous data analysis along with the written request for TOP. Since data were anonymised by the attending physician before analysis, the study did not require a formal ethics approval according to Swiss ethics guidelines.

Ü2 Setting and Data collection

The data was collected by the general practice located in the centre of Zurich, Switzerland (population approximately 400.000). The physician has extensive experience in medication and aspiration abortion as an outpatient treatment and provides standard medical services in addition.

Legal TOP up to the 12th pregnancy week is at the women's own discretion (beyond the 12th week a medical attest is needed) and reimbursed by the mandatory health insurance. However direct payment related to high deductibles are possible.

Anonymised patients' characteristics were entered into an Excel-Sheet including following parameters: patients age, first consultations date, estimated pregnancy age, origin/ethnicity,

numbers of gravidities and deliveries, numbers of TOP and their procedures, date of TOP, date of follow-up visit, date of re-aspiration in case of incomplete abortion and method of payment. Positive migration status was defined in case of immigration in the first generation.

Ü2 Diagnostic and treatment procedures

Females presenting for abortion were counseled and carefully examined by the same physician. After gynecological exploration a cervical specimen was taken. Additionally a first void urine analysis was conducted with a urine test strip. In the case of a pathological cervical swab (defined as elevated number of leucocytes per high power microscope field) a PCR screening for CT, MG and NG was initiated out of the cervical swab, whenever the patient agreed.

Antibiotic prophylaxis (Metronidazol 2×500mg vaginally and Azithromycin 1x1g perorally) as recommended by current guidelines was routinely administered in all women undergoing TOP (23) .

To confirm an actual pregnancy a qualitative β-HCG (human chorionic gonadotropin hormone) urine assay was conducted. To determine the gestational age a transvaginal ultrasound was performed. The patients were informed on the procedures, alternatives and risks recommended by the Swiss Society for Gynecology and Obstetrics (24).

For pharmacological abortion the woman took 200 mg mifepristone orally followed by vaginally administered misoprostol 400mcg 36-48 hours later. In the three-week follow-up visit the complete abortion was confirmed with ultrasound and if necessary β-HCG serum levels were assessed.

For aspiration abortion 400mcg of misoprostol were administered vaginally at least two hours before the intervention. Mostly a follow-up was performed 3-10 days after the intervention.

Ü2 Primary and secondary outcomes

Primary outcome: prevalence of STIs in women undergoing TOP in a primary care setting, defined as the proportion of women with a pathological cervical swab resulting in a positive PCR screening test (CT, MG or NG).

Secondary outcome: patient characteristics associated with a sexually transmitted pathogen.

Ü2 Statistical analysis

Descriptive statistics were calculated for all variables and presented as means (SD) and proportions. Bivariate comparisons between women with and without a STI were performed using unpaired t-tests and pearson's chi-squared test statistics accordingly. To further assess the independent association between a positive screening result for STI and patients' characteristics we applied multiple logistic regression analysis.Two-sided p-values <0.05 were considered as statistically significant. All statistical analyses were performed with STATA, version 11.2 (Stata Incorporation, College Station, TX, USA).

Ü3 Results

Ü2 Patient Characteristics

During the study period, 620 women were seeking for abortion counselling at the general practice. Detailed patient characteristics are listed in Table 1. Patients mean (SD) age was 29.4 (6.9) years. The study population consisted of 49.7% patients with migration background. Most of the women were nulliparous (63.4%) and the majority (75%) never had a TOP before. The proportion of women who previously had a TOP was significantly higher in women with migration background (32.5% vs. 17.7%, p<0.001). In 585 women (94.4%) the counselling resulted in TOP. Among the other 5.6% the main reason not to proceed with a TOP was the decision to carry the child to term (40%). In 64.4% (n=377) the abortions were performed medically, in 35.6% by curettage. The mean estimated gestational age was 7.0 weeks (SD 1.7) at the time of abortion counselling.

Ü2 Prevalence of STI

As seen in Figure 1, from the 585 women who underwent a TOP, 581 (99.3%) cervical swab specimens were available for further analysis: 272 (46.8%) of the cervical swabs showed pathological signs. In 192 contacts (70.6% of cases with pathological cervical swab) PCR screening was performed. In 28 cases an STI was detected, corresponding to a prevalence (95%-CI) of 14.6% (10.3-20.3). In 5 (1.6%) cases with normal cervical swab specimens a PCR was performed, all of which were negative. The reasons for performing these PCR varied (patient's request, prior STI history, and promiscuous behaviour). STI-specific frequencies for CT, MG, and NG were as followed: 17 (8.9%), 9 (4.7%), and 2 (1.04%). One woman showed a double infection with CT and MG.

Ü2 Comparisons between women with and without STI

Detailed bivariate group comparisons are presented in Table 2. Patients with a positive STI screening were significantly more likely to have a migration background compared to women with Swiss origin (66.7% vs. 33.3%; p=0.044). Women with a positive CT test were significantly younger compared to their non-infected counterparts (25.6 vs. 29.6; p=0.03). Migrants showed a tendency in having CT infections more often when compared to non-migrants (70.6% vs. 29.4%; p=0.055.). The number of previous TOP was significantly higher in women with a detection of MG compared to MG negative women (0.78 vs. 0.3; p=0.039). Due to the small number of NG infections we did not perform additional subgroup analyses. In the multivariable analysis (Table 3) we further assessed the independent association between a positive screening result for STI and patients' characteristics. Patient determinants showinga bivariate association with a STI detection (defined as a p-value <0.1 in Table 2) were included in the regression model. In addition results of the urine analyses (e.g. occurrence of protein, leucocytes or erythrocytes) and mode of payment of TOP were included as potential confounders. A migration background remained significantly associated with a positive STI screening test with an OR of 2.63 (p=0.037) compared to women with a

Swiss origin, when controlled for age, number of TOP in the past, pathological urine analyses and mode of payment of the TOP.

Ü2 Determinants for screening

In the case of a pathological cervical swab the proposed PCR based screening for STIs was at the patient's own discretion, thus prevalence estimates can be biased due to a selection. Screened and non-screened women having a pathological cervical swab, did not differ with regard to age (p=0.47) and number of TOP in the past (p=0.73) . In 25 out of the 80 non-screened women (31.3%) medical costs of the TOP were directly paid by the patients themselves. In screened women the proportion of women who directly paid the medical costs only reached 8.9% (17 out of 192 patients) (p<0.001). Women with migration background were significantly more often self-payers (24.7%) compared to non-immigrants (9.6%) (p<0.001). There was a tendency of slightly higher screening rates in patients without migration background compared to patients with migration background (75.4% vs. 66.0%; p=0.089).

Ü1 Discussion

In our study on 585 women who had first trimester TOP in a primary care setting nearly half were considered at increased risk for STI due to a pathological cervical swab and thus were offered a PCR screening for common STI pathogens. In this setting STI prevalence of 14.6 % was observed. Migration background was significantly associated with the detection of STI.

Our STI prevalence is comparable with a study from Denmark, which involved patients requesting an abortion in a hospital setting (15). In this study an STI prevalence (without NG) of 16.7% was detected. Another hospital based study with women presenting for TOP in New Zealand, which only analyzed patients below 25 years, reported a higher STI prevalence of 25.1% with a CT prevalence of 15.7% and a NG prevalence below 1% (12). The majority of

STIs in our study population was caused by CT infection resulting in a CT prevalence of 9%, being lower than the prevalence found in Denmark and in New Zealand, both reporting a CT prevalence around 15%. Our 4.7% prevalence of MG infections lies in between the study from New Zealand and Denmark with prevalence ranging between 8.7% and 0.98%.
STI prevalence estimates from primary care settings providing TOP, especially from Switzerland, are scant thus we were not able to compare our results in a similar setting. Our prevalence rates were clearly higher compared to a representative population-based sample of young adults in the United States reporting a prevalence of MG, CT, and NG of 1.0%, 4.2%, and 0.4%, respectively (25). Our findings seemed to be more similar to a secondary or specialized care setting compared to a population-based setting, probably reflecting the fact that an unintended pregnancy might be related to sexual risk behavior and the possibility of exposure to sexually transmitted pathogens. We found a higher CT prevalence compared to women aged less than 35 years having a first consultation for pregnancy with their gynecologist in Switzerland, reporting a CT prevalence of 1.3% (26) further indicating that TOP might be a risk factor for STI. However STI prevalence comparisons even in the same health care setting have to be handled with caution. Williams et al. (27) found different prevalence rates and risk factors of CT infections in women attending two sexual and reproductive health clinics in Melbourne, Australia, pointing out that prevalence and identifiable risk factors are not transferable between population even in the same city.

Our multivariable analysis was associated with a significant 2.6 times higher overall STI detection rate in women with migration background compared to women with Swiss origin. This difference in overall STI was mainly related to the most prevalent STI, namely CT infection, showing a prevalence of 13.04 % in women with migration background compared to a CT prevalence of 5.1% in women without migration background. These numbers are consistent with Wolff et al. (20) analyzing prevalence of CT infection in women requesting TOP in a Swiss university hospital. In this study undocumented migrants were nearly three

times more likely to be infected with CT than their controls with legal residency permits (12.8% vs. 4.4%).

In the bivariate analysis of our study younger age was significantly associated with a positive CT result; inon average patients with CT infection were four years younger than patients without CT infection. Findings in literature on the association of CT infection with age are not consistent. The above mentioned Danish study (15), involving women requesting an abortion in a hospital setting, showed a higher CT prevalence in the younger age group (18-24 years) compared to the age group older than 24 years, with the difference not reaching statistical significance. In women of younger agegroup however bacterial load was significantly higher. In contrast, a survey from family-planning clinics in South Carolina (21), including women seeking for pregnancy testing, identified younger age as a significant predictor of CT infection in multivariate analysis (additionally controlled for patient characteristics such as race and pregnancy). Age as a risk factor for CT infection has been found in populations with higher prevalence rates (27, 28), indicating that differences in prevalence rates might influence and/or explain different study findings. This observation is in line with a Swiss study evaluating the CT prevalence in a low-risk population consisting of sexually active women aged less than 35 years having a routine check-up with their gynecologist. Among these women a CT prevalence of 2.8% has been observed with no difference between age groups (26). A higher number of induced abortions in the past was a significant determinant for the detection of an MG infection in bivariate analysis. In contrast Lawton and colleagues (12) did not find an association between MG infections and number of abortions in women seeking for TOP in New Zealand. In this study MG prevalence was higher (8.7%) compared to our study population (4.7%). The fact that we could not detect a significant association which persisted in the multivariate analysis might suggest confounding as a potential explanation for the significant results from our bivariate findings. Further research is needed to elucidate potential risk factors for MG infections.

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Ü2 Strengths and limitations

The current data analysis was based on a single-handed general practice, thus representativeness of the results could be questioned. Our patient population shows similar characteristics compared to the whole population seeking TOP in Switzerland during the study period with regard to age, TOP method used (e.g. medical vs. surgical) and gestational age (29). Although patient characteristics compare favourably with the general TOP population in Switzerland, caution in necessary concerning the generalization with respect to STI prevalence estimates. Different Settings (e.g. private practice, hospitals) have to be taken into consideration as well as different locations (e.g. urban, suburban), which have shown to affect prevalence rates (27). A limitation of our study is that in 29.4% of cases with a pathological cervical swab a PCR was not performed, thus our prevalence estimates are prone to a selection bias. Screened and non-screened women having a pathological cervical swab did not differ with regard to age and number of induced abortions in the past. However non-screened females consisted of significantly more self-payers and showed a trend for migration background. We hypothesised that self-payers have higher deductibles in order to reduce health insurance premium and thus are more sensitive to extra costs related with laboratory analysis. Furthermore the fact that non-screened women tended to have a migration background is in line with a former Swiss Health Survey study that found a lower uptake of breast cancer screening measures in immigrant women compared to Swiss nationals (30). The fact that STI detection was independently associated with a migration background supports the hypothesis that our observed prevalence rates might be underestimated.

CT screening is recommended for all pregnant women by the Center for Disease Control (CDC) (1), whereas the US Preventive Services Task Force (USPSTF) recommends screening in all pregnant women aged 24 years or younger and in older pregnant women who are at increased risk (31). Our results provide further evidence that women seeking TOP in a primary care setting in Switzerland have a high STI prevalence and efforts to implement

screening strategies followed by an efficient case management and contact tracing service (e.g. identification and treatment of sexual partners) are warranted. This is in contrast to the latest report on CT control activities in Europe that did not find an organised activity for Switzerland (32).

To our knowledge this is the first study that analyzed STI prevalence (e.g. CT, MG, NG) in women presenting for TOP in a Swiss primary care setting. We found an overall high prevalence with CT infection as the most commonly detected one. In addition migration background was independently associated with the detection of STI. Further research is needed focusing on cost-effective screening and case management programs in this population at risk. Finally public health activities are necessary to implement evidence-based recommendations.

Ü 1 Disclosure

The authors report no conflicts of interest in this work.

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Table 1: Characteristics of women seeking for abortion counselling	
	N* (%) or mean (SD)
Age (years)	29.4 (6.9)
Migration background	308 (49.7)
Nulliparous	393 (63.4)
Previous induced abortions: 0 1 2 3 >3	 465 (75.0) 121 (19.5) 20 (3.2) 9 (1.5) 5 (0.8)
Induced abortion following counselling by the GP	585 (94.4)
Medical pregnancy termination	377 (60.8)
Estimated gestational age (week)	7.0 (1.7)
Reasons not to proceed with pregnancy termination (n=35) Carry the child to term Sspontaneous early pregnancy loss Breaking off the contact Abortion preferred elsewhere No pregnancy Ectopic pregnancy Blighted ovum	 14 (40) 8 (22.9) 5 (14.3) 3 (8.6) 2 (5.7) 2 (5.7) 1 (2.9)
* N=620 women seeking for counselling at the primary care practice from 01-01-2006 to 10-03-2009	

Table 2: Bivariate Comparison of characteristics between women with a pathological cervical swab with and without STI detection before early pregnancy abortion (N=192)			
Determinants	**Positive STI screening**	**Negative STI screening**	**P-value for group comparison #**
Any positive STI screening			
Mean age (years)	28.1 (7.2)	29.4 (7.0)	0.40
Migration background			
- Yes % (N)	66.7 (18)	45.7 (75)	
- No % (N)	33.3 (9)	54.3 (89)	0.044
Mean number of TOP in the past (SD)	0.44 (0.64)	0.31 (0.68)	0.33
Mode of payment			
- Self % (N)	3.7 (1)	9.7(16)	
- Insurance % (N)	96.3 (26)	90.3 (149)	0.48
Positive C. trachomatis screening			
Mean age (years) (SD)	25.6 (6.4)	29.6 (7.1)	0.036
Migration background			
- Yes % (N)	70.6 (12)	46.2 (80)	
- No % (N)	29.4 (5)	53.8 (93)	0.055
Mean number of TOP in the past (SD)	0.29 (0.59)	0.33 (0.68)	0.845
Mode of payment			
- Self % (N)	0	9.8 (17)	
- Insurance % (N)	100 (17)	90.2 (157)	0.371
Positive M. genitalium screening			
Mean age (years) (SD)	31.8 (7.56)	29.1 (7.06)	0.262
Migration background			
- Yes % (n)	55.6 (5)	48.3 (87)	
- No % (n)	44.4 (4)	51.7 (93)	0.742
Mean number of TOP in the past (SD)	0.78 (0.67)	0.30 (0.67)	0.039
Mode of payment			
- Self % (N)	11.1 (1)	8.8 (16)	
- Insurance % (N)	88.9 (8)	91.2 (165)	0.578

Figures represent mean (SD) or % (N); N=Maximum sample size 192, differences reflect missing information in patient characteristics; # Group comparisons by Chi-squared or Fisher exact test for categorical variables as appropriate and t-tests for continuous variables.
TOP: Termination of pregnancy
STI: Sexually transmitted infection

Table 3: Adjusted association between a positive STI screening and migration background			
	Odds Ratio	**95%-CI**	**p-value**
Model 1			
Migration background	2.34	0.98-5.61	0.057
- Reference=No	1.00	-	-
Model 2			
Migration background	2.63	1.06-6.54	0.037
- Reference=No	1.00	-	-
Model 1: Odds ratio controlled for age, number of induced abortions and mode of TOP payment (self/insurance)			
Model 2: Odds ratio based on model 1 and additionally controlled for pathological first void urine (yes/no)			

Figure legend

Study flow of patients seeking for early pregnancy abortion counselling. Out of 585 women proceeding for induced abortion 272 women were considered at risk for STI due to pathological cervical swab, thus a PCR screening for M. genitalium, C. trachomatis, and N. gonorrhoeae was recommended. A total of 28 STIs were detected in 192 screening samples resulting in a prevalence (95%-CI) in this population at risk of 14.6% (10.3-20.3).

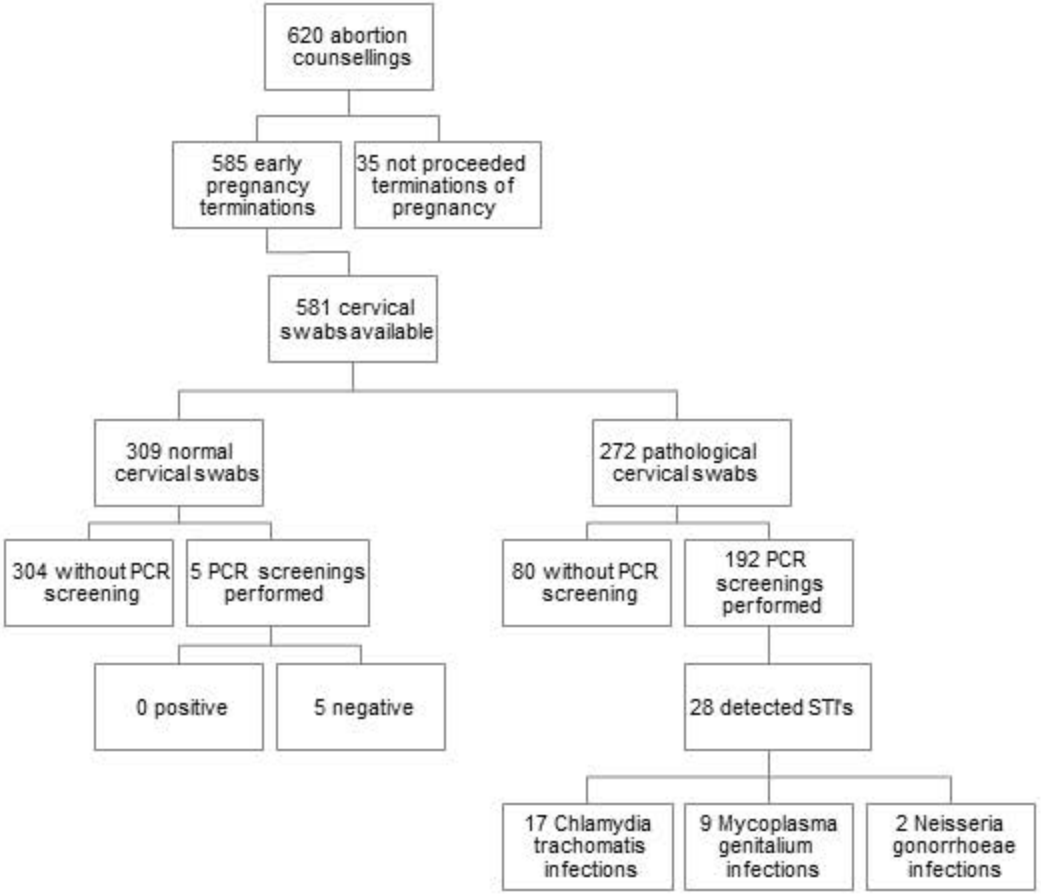
620 abortion counsellings
585 early pregnancy terminations
35 not proceeded terminations of pregnancy
581 cervical swabs available
309 normal cervical swabs
272 pathological cervical swabs
304 without PCR screening
5 PCR screenings performed
80 without PCR screening
192 PCR screenings performed
0 positive
5 negative
28 detected STIs
17 Chlamydia trachomatis infections
9 Mycoplasma genitalium infections
2 Neisseria gonorrhoeae infections

Figure 1