HSV

Sexual behaviour and condom use among individuals with a history of symptomatic genital herpes

R K Rana, J M Pimenta, D M Rosenberg, T Warren, S Sekhin, S F Cook, N J Robinson, on behalf of the Valaciclovir HSV Transmission Study Group*

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*Members of the group are list at end of text.

See end of article for authors' affiliations

Correspondence to:
Dr Jeanne M Pimenta,
Worldwide Epidemiology,
GlaxoSmithKline,
Greenford Road,
Greenford, Middlesex,
UB6 0BE, UK; jeanne.m.
pimenta@gsk.com

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Objectives: This study describes the differences in sexual behaviour in individuals with genital herpes (GH) during "symptomatic" and "asymptomatic" periods of the disease.

Methods: A cross sectional questionnaire was undertaken by 1193 individuals attending clinics between 1998 and 2001. All participants in this analysis were in heterosexual, monogamous partnerships, self identified with a history of symptomatic GH and with confirmed HSV-2 infection.

Results: Sexual activity reported during asymptomatic v symptomatic periods of GH was 98% v 40% ($p<0.001$), 76% v 29% ($p<0.001$), and 25% v 11% ($p<0.001$) for vaginal, oral, and anal intercourse, respectively, while "always" condom use during asymptomatic and symptomatic periods was 20% v 35% ($p<0.001$), 2% v 7% ($p<0.001$), and 10% v 15% ($p=0.131$), respectively. The proportion of individuals who either abstained from vaginal intercourse or "always" used condoms was 21% v 74% ($p<0.001$), for asymptomatic v symptomatic periods. Multivariable analyses indicated that factors associated with engaging in intercourse during symptomatic periods of GH included current intrauterine device use (adjusted odds ratio (aOR)=2.96, 95% confidence interval (CI)=1.46 to 6.02); living in Latin America (aOR=2.16, CI=1.19 to 3.91) or Europe (aOR=1.67, CI=1.21 to 2.28), compared with North America; previous sexually transmitted disease (aOR=1.42, CI=1.08 to 1.89); a higher number of sexual acts per month (aOR=1.09, CI=1.06 to 1.11); and a higher number of GH recurrences per year (aOR=1.08, CI=1.03 to 1.12).

Conclusions: These data indicate that the majority of people with GH either abstained from intercourse or "always" used condoms during symptomatic periods of GH. However, condom use was relatively low during asymptomatic periods in comparison with symptomatic periods. These results highlight that further education on GH prevention is warranted, particularly for symptomatic periods.

Genital herpes (GH) caused by herpes simplex virus type 2 (HSV-2) is one of the most common sexually transmitted diseases (STDs). Increasingly, however, HSV-1 is the cause of new GH infections.

GH is characterised by painful and recurrent genital lesions but, for the majority of individuals, symptoms are not easily recognised. Risk factors associated with HSV-2 infection include early age at first intercourse, higher numbers of lifetime sexual partners, not using condoms, engaging in commercial sex work, and being female.^{1–3} Transmission is most efficient during episodes when lesions are clinically apparent,⁴ and studies among discordant couples have shown that the risk of HSV-2 transmission can be reduced when infected individuals have been counselled to recognise the signs and symptoms of the disease and educated to avoid exposing a seronegative partner.⁴ More recently, suppressive therapy with valaciclovir has been shown to significantly reduce the risk of transmission of GH.⁵

The majority of HSV-2 transmission occurs during asymptomatic periods but, most of the time, HSV-2 infections go unrecognised, and in 50–90% of transmission events the source contact is unaware of their own infection.^{3, 4, 6–9} Thus, in an effort to reduce the risk of HSV-2 transmission, it is necessary to understand current sexual behaviour during asymptomatic and symptomatic periods. Reduced sexual activity has been associated with reduced HSV-2 acquisition rates¹⁰; however, there are few data describing the factors associated with engaging in sexual activity during symptomatic periods. The objective of this study was to describe differences in sexual behaviour and condom use during

asymptomatic and symptomatic periods of GH, and also to determine factors associated with engaging in sex during symptomatic periods in an effort to inform education initiatives.

METHODS

Study design and population

Full details about the methodology of this cross sectional study have been presented elsewhere.¹¹ In summary, from February 1998 to July 2001, a cross sectional questionnaire was undertaken by individuals infected with HSV-2 and self identified with having a history of symptomatic GH during screening for inclusion into a worldwide, multicentre, randomised trial of valaciclovir for the prevention of HSV-2 transmission in heterosexual, monogamous couples.⁵ Their partners had no history of symptomatic GH. On confirmatory testing, however, 35% of these partners were HSV-2 seropositive, however, no further data on these partners were used in this specific study. HSV-1 and HSV-2 serostatus was ascertained by western blot analysis.

Questionnaire design and definition of variables

The self completed written questionnaire had three main sections detailing demographic and behavioural factors, and knowledge of GH. Individuals were asked whether or not they engaged in vaginal, oral, or anal intercourse and how

Abbreviations: aOR, adjusted odds ratio; GH, genital herpes; HSV-2, herpes simplex virus type 2; IUD, intrauterine device; STDs, sexually transmitted diseases

Table 1 Demographic characteristics of study population, by gender

	Male (n = 476)	Female (n = 717)
Age		
Median (IQR*) years	36 (28–42)	33 (30–44)
Ethnicity, n/N (%)		
White	406/469 (87)	635/709 (90)
Non-white†	63/469 (13)	74/709 (10)
Region, n/N (%)		
North America	213/476 (45)	375/717 (52)
Latin America	33/476 (7)	26/717 (4)
Europe	230/476 (48)	316/717 (44)
Education level, n/N (%)		
College/university: attended	278/470 (59)	435/707 (62)
College/university: not attended	192/470 (41)	272/707 (38)
Employment status, n/N (%)		
Paid employment	373/469 (80)	482/706 (68)
Student, house parent, other	80/469 (17)	181/706 (26)
Unemployed	16/469 (3)	43/706 (6)
Sexual contacts per month		
Median (IQR)	7 (3–12)	6 (4–12)
Number of recurrences of genital herpes per year		
Median (IQR)	5 (3–8)	5 (3–7)

Denominators vary because of missing data.

*IQR, interquartile range.

†Black, Hispanic, Asian, or other.

this varied depending on the presence of GH symptoms. For example, the questions were phrased: “When you are not having an outbreak of genital herpes do you have vaginal intercourse with your partner?” The questions were posed in general and did not distinguish between the most recent asymptomatic or symptomatic period or over the course of the relationship. The symptomatic period was defined to include both prodromal and genital outbreak periods. The frequency of condom use was investigated and collected from one of the following three responses: “always,” “sometimes,” or “never.” We carried out analyses both with and without combining “sometimes” and “never” use of condoms. The “sometimes” and “never” categories were subsequently combined to represent “irregular” condom use in the analyses. As there was little impact on inferences of collapsing the groups, we chose to present only results from the combined group.

Demographic variables included age, sex, ethnicity (white, black, Hispanic, Asian, other), education level (whether or not the individual attended college/university), and work status (employed, unemployed, student, house parent, other). This questionnaire was administered in 17 countries and for analysis these were grouped into three regions: North America, Latin America, and Europe. Non-sexual risk behaviours included were current and past use of alcohol, cigarettes, and other drugs. Details of sexual behaviours included duration of the present sexual partnership and frequency of sexual acts with this partner per month. In the third section, responses to a series of statements ascertained knowledge and awareness of GH transmission, prevention, and treatment.

Ethical approval

Each centre received ethical approval for the study from their local ethics committee and each individual provided written informed consent before completing the structured questionnaires.

Statistical analysis

Descriptive analyses were carried out to document the proportion of people engaging in vaginal, oral, and anal sex during asymptomatic and symptomatic periods and the extent to which they used condoms during these two periods. To compare between the two proportions, χ^2 tests were

conducted using Epi-Info, version 6. Univariate analyses in SAS (version 8.1) were conducted to assess the difference in demographic and behavioural factors associated with the outcome of interest—that is, engaging in sex (vaginal, oral, anal) during symptomatic periods. Based on results from these univariate analyses, a logistic regression model using a backward elimination method was run. All variables significant at $p < 0.25$ at the univariate level were considered for the multivariate analysis. The cut-off level for inclusion/exclusion in the final multivariate model was set at 10%. From this final model, variables were considered significant if $p < 0.05$.

Furthermore, as an additional exploratory analysis, we categorised people into four groups based on sexual practices and condom use during asymptomatic and symptomatic periods. These groups broadly represent a risk continuum from highest risk to lowest risk (group 1 to group 4). This analysis was restricted to sexual behaviours and condom use during vaginal sex only because the sample sizes in some of the groups for anal and oral sex were too small for meaningful comparisons. Those not reporting vaginal sex or condom use from either period were excluded from analyses (sample size for analyses = 1146). The groups (with sample sizes) are as follows:

- Group 1: Engage in sex during both periods with irregular condom use during symptomatic periods (97/1146; 25.0%)
- Group 2: Engage in sex during both periods and always use condoms during symptomatic periods (163/1146; 13.6%)
- Group 3: Engage in sex during asymptomatic period only with irregular condom use (abstain during symptomatic period) (540/1146; 45.3%)
- Group 4: Engage in sex during asymptomatic period only and always use condoms (abstain during symptomatic period) (146/1146; 12.2%)

To explore characteristics discriminating between the four groups, we used multinomial logistic regression (PROC CATMOD of SAS 8.2) with group as response variable, and considered group 4 as the reference group.

In addition, we also described within person changes in sexual behaviour between asymptomatic and symptomatic

Table 2 Comparison of sexual practices during asymptomatic and symptomatic periods

	Asymptomatic n/N (%)	Symptomatic n/N (%)
Sexual practice		
Vaginal	1170/1188 (98)	473/1187 (40)
Oral	901/1188 (76)	342/1185 (29)
Anal	291/1187 (25)	126/1182 (11)
Condom use*		
Vaginal		
Always	226/1150 (20)	163/462 (35)
Irregular†	924/1150 (80)	299/462 (65)
Oral		
Always	21/873 (2)	22/327 (7)
Irregular†	852/873 (98)	305/327 (93)
Anal		
Always	30/289 (10)	19/125 (15)
Irregular†	259/289 (90)	106/125 (85)

*Among those engaging in vaginal, oral, or anal sex.

†Irregular condom use refers to sometimes or never using condoms.

Table 3 Changes in sexual practices and condom use from asymptomatic to symptomatic period

Asymptomatic period	Symptomatic period			Total
	Abstain from sex n (%)	Always use condom n (%)	Irregular condom use n (%)	
Abstain from sex, n (%)	9 (100.0)	0 (0.0)	0 (0.0)	9
Always use condom, n (%)	85 (67.5)	31 (24.6)	10 (7.9)	126
Irregular condom use, n (%)	535 (51.0)	112 (10.7)	402 (38.3)	1049
Total	629	143	412	1184

periods by cross tabulating sexual practice and condom use during the two periods.

For the knowledge section of the questionnaire, a scoring system was developed; the answers to each question were scored as follows: +1 for a correct answer, -1 for an incorrect answer, and 0 where the individual responded "don't know." The scores for each question were tallied to give a cumulative score. This score represents a summary of GH awareness for each individual used in the logistic regression model.

RESULTS

The demographic characteristics of our study population (individuals infected with HSV-2 and self identified with having a history of symptomatic GH; n = 1193) are presented in table 1. Sixty per cent of individuals with a history of GH were female. The median age was 36 years for males and 33 years for females. The majority (88%) of this population was white. Over half of the individuals had college or university level education and the majority (72%) were employed. There was a median of five recurrences of GH per year.

Sexual practices

The median reported number of sexual acts per month with their current partner was seven for males and six for females and ranged between three and 12. Table 2 compares sexual practices reported during asymptomatic and symptomatic periods. During asymptomatic periods, 98% of individuals reported engaging in vaginal intercourse, 76% in oral intercourse, and 25% in anal intercourse. All individuals had symptomatic GH (an inclusion criterion for the study) and the majority recognised signs and symptoms of their prodromal period (87%). During symptomatic periods, sexual activity was reported as follows: 40% of individuals reported

engaging in vaginal intercourse, 29% in oral intercourse, and 11% in anal intercourse.

Condom use

In general, condom use during both asymptomatic and symptomatic periods was low (table 2). During asymptomatic periods, 20% of individuals reported "always" using condoms during vaginal sex, 2% during oral sex, and 10% during anal sex. The remainder reported irregular use of condoms. Even though condom use was low overall, sexually active individuals reported higher levels of "always" using condoms during symptomatic periods compared with asymptomatic periods for vaginal (35% v 20%, p<0.001), oral (7% v 2%, p<0.001), and anal (15% v 10%, p = 0.131) intercourse.

Table 4 Knowledge characteristics of individuals infected with genital herpes

Statement	Agree (%)
You can get genital herpes via sexual intercourse with someone with genital herpes	97
Genital herpes is not a curable disease	66
Medications for genital herpes can prevent outbreaks of genital herpes	91
Medications for genital herpes can speed the healing of lesions	96
Condoms can help prevent the spread of genital herpes between partners	92
Genital herpes is infectious/contagious after a lesion has completely healed	67
Genital herpes is infectious/contagious between outbreaks of genital herpes	53
I think that I am well informed about genital herpes	85

Table 3 reports changes in sexual practices and condom use from asymptomatic to symptomatic period. We found that 88.6% (1053/1188) of individuals engaged in “unsafe” sex during asymptomatic periods, and of these 38% (402/1049) continued to engage in “unsafe” sex during symptomatic periods (52% abstained and 9% always used condoms). We defined “unsafe” sex as any sex act (that is, vaginal, anal, or oral) with irregular condom use.

The proportion of individuals who were potentially at lower risk of HSV-2 transmission to their sexual partner can be determined from those who either abstained from sex or “always” used condoms. During asymptomatic periods this was 21% during vaginal, 26% during oral, and 78% during anal sex. During symptomatic periods this proportion was higher during vaginal (74%) ($p < 0.001$), oral (73%) ($p < 0.001$), and anal (91%) ($p < 0.001$) sex.

Knowledge and awareness of GH

Knowledge and awareness of GH transmission, prevention, and treatment were assessed through a series of statements (table 4). The majority of individuals were aware that GH is sexually transmitted (97%) and 66% answered that it is not a curable disease. Over 90% answered that medications can help to control outbreaks and speed the healing of lesions, and that condoms could help prevent the spread of GH between partners. Individuals were less aware that transmission is still possible after a lesion has completely healed (67%) and between outbreaks (53%). Overall, 85% thought they were well informed about GH. There was no evidence to suggest that knowledge of possible transmission during asymptomatic periods is associated with condom use during asymptomatic periods ($p = 0.123$).

Multivariable logistic regression analysis

Table 5 lists significant factors associated with engaging in sex during symptomatic periods identified through logistic regression modelling. The current use of an intrauterine device (IUD; aOR = 2.96, 95% CI = 1.46 to 6.02) was one of the strongest variables associated with engaging in sexual practices during symptoms of GH. Those from Latin America (aOR = 2.16, 95% CI = 1.91 to 3.91) and Europe (aOR = 1.67, 95% CI = 1.21 to 2.28) were more likely than individuals from North America to engage in sexual activity during symptomatic periods. In addition, history of a previous STD (aOR = 1.42, 95% CI = 1.08 to 1.88), each additional sexual act per month (aOR = 1.09, 95% CI = 1.06 to 1.11), and each additional GH recurrence (aOR = 1.08, 95% CI = 1.03 to 1.12) were all associated with an increase in the odds of engaging in sex during symptomatic periods.

Results from the “risk groups” multinomial analyses, using the “least risky” group (that is, group 4) as the referent group, are described below. Knowledge and understanding of GH (that is, higher knowledge scores) were associated with group 4 (the “least risky” group) compared with the other

three groups ($p = 0.035$). In addition, those with higher education were more likely to be in group 4 and thus more likely to protect themselves during both asymptomatic and symptomatic periods compared to those who have unprotected vaginal sex acts during symptomatic periods (that is, those in group 1; highest risk, $p = 0.012$). Conversely, longer relationships were associated with engaging in unprotected vaginal sex acts during symptomatic periods compared with those protecting themselves in both asymptomatic (via condoms) and symptomatic (via abstaining) periods ($p = 0.008$).

DISCUSSION

This study provided a unique opportunity to examine the sexual practices of individuals who self identified with having a history of GH in monogamous partnerships. We also described the demographic and behavioural factors associated with engaging in sex during symptomatic periods, when risk of transmission may be highest. These data provide a clear illustration of how GH affects sexual behaviour among infected individuals and their partners.

The majority of these individuals engaged in unprotected sex, in particular vaginal sex, during asymptomatic periods. During symptomatic periods, we observed that most abstain from sex; however, during asymptomatic periods, most individuals engage in vaginal sex and 80% use condoms irregularly. Thus, we can infer that there may be a perception of lower or even no risk while there are no active lesions.

It has been established that transmission can occur when symptoms are not present because HSV-2 can be reactivated in the absence of lesions.¹² In the knowledge section of the questionnaire, 67% of individuals were aware that GH is infectious even when lesions have completely healed. Given that approximately only 20% of people reported always using condoms during asymptomatic periods, a substantial proportion of individuals must have suspected they were infectious but did not always use condoms.

During symptomatic periods, a smaller proportion engaged in sex with proportionately higher condom use. Almost 75% of individuals with GH abstained from sex or “always” used condoms during symptomatic periods, and thus the majority of partners would have been at reduced risk of acquiring HSV-2 during these periods. However, during asymptomatic periods the proportion of individuals using condoms regularly and abstaining from sex was 21%. Further opportunities for prevention perhaps need to focus on reducing the risk of transmission during both symptomatic and asymptomatic periods.

Risk factors associated with engaging in sex during symptomatic periods

A variety of factors were associated with engaging in sex during symptomatic periods. In particular, couples whose female partners use an IUD were more likely to engage in sex

Table 5 Significant risk factors associated with individuals engaging in sex during symptomatic periods from multivariable analyses

Variable	Adjusted odds ratio (95% CI)	p Value
Female partner currently using IUD*	2.96 (1.46 to 6.02)	0.01
Geographic region (compared with US)		
Latin America	2.16 (1.19 to 3.91)	0.01
Europe	1.67 (1.21 to 2.28)	0.01
History of previous STD†	1.42 (1.08 to 1.89)	0.04
For each additional sexual acts per month	1.09 (1.06 to 1.11)	<0.001
For each additional GH recurrences per year	1.08 (1.03 to 1.12)	0.004

*IUD, intrauterine device. †STD, sexually transmitted disease.

during symptomatic periods. The IUD is not effective in reducing transmission or acquisition of HSV-2. Further analyses revealed that IUD use was not associated with individuals in longer, stable relationships, or in those of older age; however, individuals currently using an IUD were less likely to also use condoms. Individuals with GH need to be advised that condoms, in addition to a preferred method of contraception, are an important tool to reduce HSV-2 transmission.

Individuals from Latin America and Europe were significantly more likely to engage in sex during symptomatic periods compared with those from North America. This may reflect differences in cultural attitudes towards sexual activity and the perceived impact of GH on the lives of those infected. Understanding regional differences of sexual practices may warrant further study.

Individuals who reported a higher number of sexual contacts per month and those with a previous STD (other than GH) were more likely to engage in intercourse during symptomatic periods. Individuals with an STD may represent a group at higher risk who are more likely to engage in risky behaviours. Individuals who engage in sexual activity during symptomatic periods also reported a higher number of GH recurrences per year. Because of the increased number of GH recurrences, individuals have less opportunity to engage in sex during asymptomatic periods.

Study limitations

There are some limitations of this study relating to the cross sectional study design; in particular, we must be careful in making any causal inferences. Individuals recruited into this study were interested in participating in a study to reduce HSV-2 transmission to their partner, suggesting that these individuals were interested in prevention strategies. For this reason, it is expected that this population would be different from others and may be less inclined to high risk behaviours given their interest in prevention.

Factors affecting behaviours during asymptomatic and symptomatic periods have been recorded among individuals with known genital herpes. We might expect that these factors may differ for individuals unaware of their infection status.

Symptoms of GH sometimes go unrecognised and so some symptomatic periods may actually be misclassified as asymptomatic periods. However, one of the main objectives of this study was to evaluate behaviour change between periods with and without recognised symptoms; thus, the impact of this potential misclassification on our inferences may be limited. Sensitive data about sexual practices were collected through self reported questionnaires; validity and reliability may not be optimal and responses are subject to recall bias. The questionnaire did not query past or current use of antiherpetic medications so we are unable to determine whether drug use had an impact on sexual behaviour. Furthermore, the duration of symptomatic periods is shorter in length compared with asymptomatic periods. As a result, individuals with GH are likely to have less sexual activity during symptomatic periods, since there is less opportunity to engage in sex compared with asymptomatic periods.

Conclusion

The perception of the risk of HSV-2 transmission and attitudes towards living with the virus may have a role in sexual behaviour. Although there clearly are benefits from adhering to prevention efforts to reduce transmission of HSV-2 to partners, there may be perceived inconveniences that accompany it, particularly for those in long term

Key messages

- In a study describing sexual behaviours of individuals with symptomatic genital herpes, the majority either abstained from sexual intercourse or "always" used condoms during symptomatic periods of genital herpes
- However, condom use was relatively low during asymptomatic periods in comparison with symptomatic periods
- These data highlight the need for further education on prevention of genital herpes, particularly for symptomatic periods

relationships.^{13 14} There was some evidence from our data to support this.

However, for others, the stigma and embarrassment associated with GH can impair psychosocial development.^{15 16} Patients with GH commonly report that passing the infection on to their partners is one of their primary fears.¹⁵ However, effective counselling, particularly to newly diagnosed patients, about sexual behaviour modification, as well as symptom recognition, may help to reduce the transmission of the virus to susceptible partners. Since a large proportion of people reduced risk during symptomatic periods, our results perhaps emphasise the importance of recognising symptoms such that people are better able to modify behaviours and potentially reduce risk.

Currently, GH prevention messages focus on abstaining from sex during symptomatic periods and using condoms at all times, particularly during symptomatic periods.¹⁷⁻¹⁹ Data presented here indicate that a large proportion abstain from sex during symptomatic periods. However, condoms were used irregularly. A focus of prevention must continue to highlight the importance of regular and consistent condom use during both symptomatic and asymptomatic periods.

*THE VALACICLOVIR HSV TRANSMISSION STUDY GROUP

Celso T Sodre (Brazil); Barbara Romanowski, Stephen L Sacks, Sylvie Trottier, Francisco J Diaz-Mitoma, Michel G Lasseonde, Celine Bouchard (Canada); Walter Gubelin, Antonia Guglielmetti (Chile); Jaime Diaz, Nicholas Rubiano (Columbia); Airi Poder, Kersti Kivimagi (Estonia); Anna-Liisa Simpanen, Jorma Paavonen (Finland); Jean P Ortonne, Patrice Morel (France); Olga Mourelou, Emmanuel Cardamakis (Greece); Mordehai Dolitzky, Jacob Bornstein (Israel); Baly Dainys, Alvydas Laiskonis (Lithuania); Victor H Pulido Olivares (Mexico); Irina Cairo (Netherlands); Victoria Arama, Calin Giurcaneanu, Sanda Popescu, Victoria Balasoiu, Mihai Capalna, Virginia Tarlea (Romania); Leonid Stratchounsky, Anna Koubanova, Larissa Martchenko, Tatyana Semenova (Russia); Jose A Varela (Spain); Anders Strand (Sweden); Sebastian Faro, Marcus Conant, Margaret A Drehabl, Robert Nett, Steven I Marlowe, Bryan Pogue, Terrance Kurtz, Timothy W Schacker, Karl R Beutner, Stephen K Tying, Jeffrey Rosen, Kenneth H Fife, David A Whiting, Jerry Stern, Gilbert Salazar, Gumaro Garza, Terri Warren, Adriana Marques, Rebecca Brady, Stephen Stone, David C Hart, Elaine Thomas, William D Koltun, Sidney Funk, Geoffrey M Adkins, Don Gartman, Margaret A Landwermeyer, Richard A Beyerlein, Ronald P Spencer (USA).

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CONTRIBUTORS

The study was initiated by DMR and SFC, who were also responsible for developing the survey instrument and critical revision of the manuscript; RKR, JMP, and NJR were responsible for statistical analyses, data interpretation, and manuscript writing; TW and SS provided critical revision of the manuscript.

Authors' affiliations

R K Rana, J M Pimenta, N J Robinson, Worldwide Epidemiology, GlaxoSmithKline Research and Development, Greenford, UK
D M Rosenberg, Worldwide Epidemiology, Asia-Pacific GlaxoSmithKline Research and Development, Singapore
T Warren, Westover Heights Clinic, Portland, OR, USA
S Sekhin, Department of Obstetrics and Gynaecology, Smolensk State Medical Academy, Smolensk, Russia
S F Cook, Worldwide Epidemiology, GlaxoSmithKline Research and Development, Research Triangle Park, NC, USA

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GLOBAL VIEWS

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