

Short Communication

Syphilis in female sex workers: an epidemiological study of the highway system of the state of Pará, northern Brazil

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Abstract

Introduction: Female sex workers (FSWs) are considered a bridge for transmission of pathogens from high-risk to general populations. We assessed the epidemiological status of syphilis in FSWs along the Pará highway system. **Methods:** Two hundred and twenty-two FSWs were interviewed and samples were analyzed using rapid qualitative tests and real-time polymerase chain reaction. **Results:** The prevalence of syphilis was high (36.94%). The high rate of prostitution, use of illicit drugs, and search for financial resources increased *Treponema pallidum* transmission through unprotected sex. **Conclusions:** Several characteristics of FSWs were identified, which reinforce the need for measures guaranteeing their health and protection.

Keywords: Epidemiology, Syphilis. Female sex workers.

Annually, approximately 10 million new cases of syphilis are reported in adults worldwide, of which, almost one third (2.8 million cases) are registered in the Americas¹. The countries of Latin America and the Caribbean are making concerted efforts to control the spread of the disease, particularly congenital syphilis². The increasing infection rate in the Americas is largely due to Brazil, which contributed 85% of all cases reported in the region in 2015. The number of cases in Brazil nearly doubled between 2010 and 2015. The overall prevalence of syphilis in this country is approximately 0.85% and the incidence of congenital syphilis is 4.70 per 1000 live births, the highest rate in Latin America¹. Syphilis is a vertical, blood-related, systemic infectious disease with chronic evolution, which is transmitted through sexual contact. It is caused by *Treponema pallidum*, a pathogen exclusive

to humans^{2,3}. The transmission rates are related to a range of social, biological, cultural, and behavioral factors that influence the occurrence of infections in the population³.

Female sex workers (FSWs) are a group at high risk for the acquisition of sexually transmitted infections (STIs) such as syphilis, due to their social vulnerability and the risks associated with their occupation, including multiple sexual partners, inconsistent use of condoms, and co-infections with other STIs^{2,3}. However, limited epidemiological data are available on syphilis in FSWs in northern Brazil. Two studies conducted in the Brazilian state of Amazonas reported a prevalence of 0.7% and 18.8% in two different municipalities, with a positive association observed between diagnosis in FSWs and both their age and years working in prostitution².

Data from a number of different sources show that the sex trade in Brazil, which may include children and adolescents, is often concentrated in areas associated with major highways, which are characterized by an intense flow of travelers and merchandise. In this context, the present study determined

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the prevalence of syphilis, and the factors associated with this prevalence, in FSWs operating along the highway system of the northern Brazilian state of Pará.

This cross-sectional study was based on biological samples and personal data obtained from FSWs operating at meeting points located along federal (BR-010, BR-316, BR-308) and state (PA-140, PA-136, PA-318) highways in the state of Pará (Figure 1). The sample sites were located in the municipalities of Ananindeua, Capanema, Castanhal, Marituba, Marapanim (district of Marudá), Santa Izabel do Pará, Santa Maria do Pará, São Miguel do Guamá, Terra Alta, and Vigia, areas with intense flows of travelers and merchandise in the state of Pará. A convenience (non-probabilistic) sample and Respondent Driven Sampling (RDS) were used to obtain data from FSWs⁴.

In the RDS, the sample was initiated through non-random selection (first meeting) of small numbers of FSWs, known

as “seeds.” Potential seeds were identified and first contacted through members of the community, such as community leaders or agents, the owners or employees of bars and petrol stations, taxi drivers, and truck drivers. Once a relationship was established with this “seed”, this individual was responsible for identifying and inviting new participants to the study. In each municipality, two or three seeds collaborated for the development of the study, each of which received three recruiting coupons. At the appointed time and place, the FSW met the study team for counselling on STIs, including the distribution of condoms and guidelines for vaccination at the nearest healthcare center, and the collection of biological samples and personal data. During the meetings, the FSWs were encouraged to identify additional sex trade venues and to invite co-workers to meetings with the study team.

The criteria for the inclusion of FSWs in the sample included individuals that: (i) were a minimum of 18 years of age, (ii)

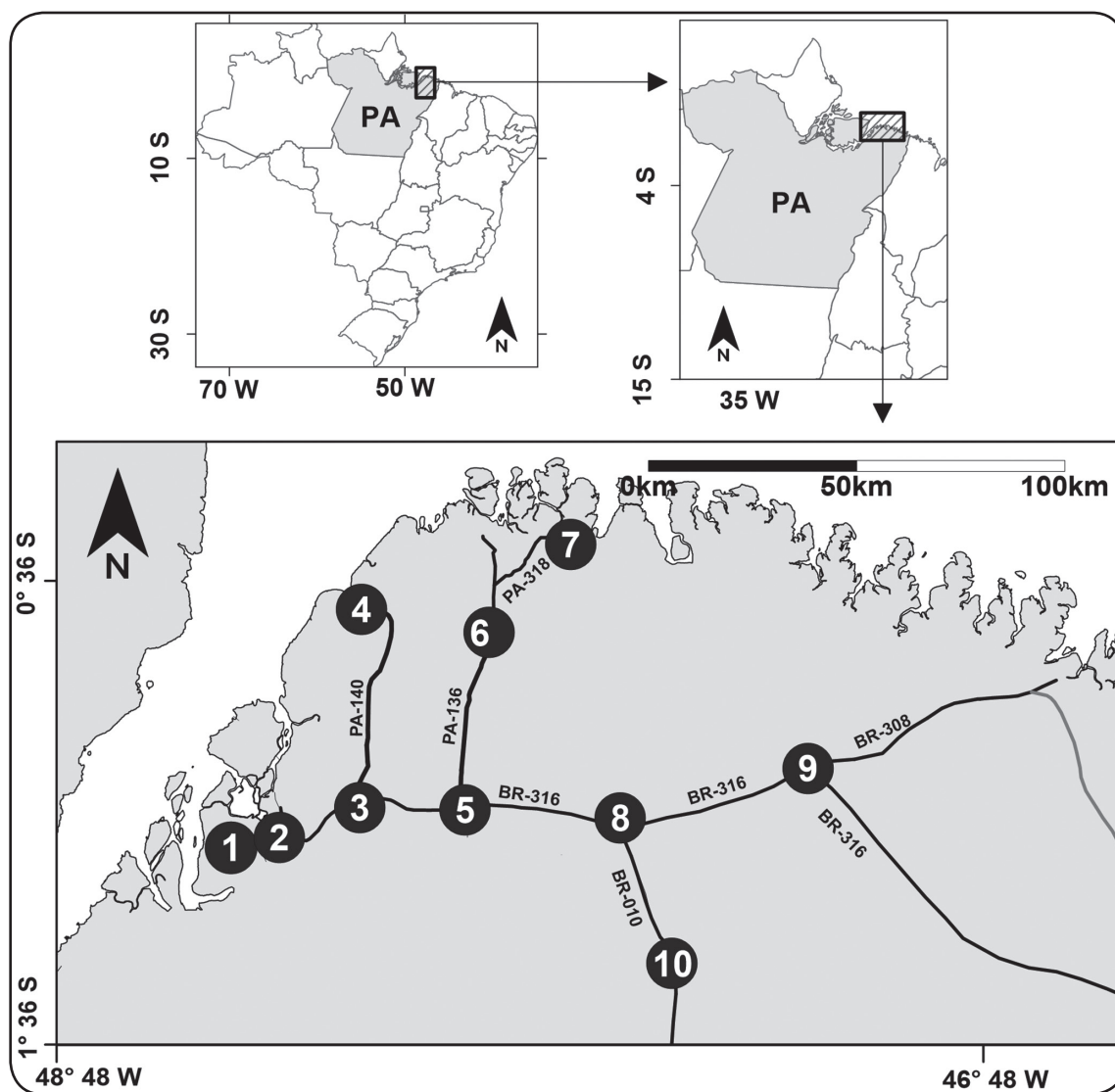


FIGURE 1: Sites at which biological samples and data were collected from female sex workers in the state of Pará, northern Brazil. Points: 1. Ananindeua; 2. Marituba; 3. Santa Izabel do Pará; 4. Vigia; 5. Castanhal; 6. Terra Alta; 7. Marapanim (district of Marudá); 8. Santa Maria do Pará; 9. Capanema; 10. São Miguel do Guamá.

engaged in sex in exchange for payment, and (iii) operated at roadsides in the state's highway system. Individuals under the influence of psychotropic drugs were excluded from the survey. Data were collected between January 2015 and September 2016.

Blood samples were collected at commercial premises located in the vicinity of the meeting places frequented by the FSWs. The samples were analyzed using rapid qualitative tests (RQTs) for syphilis (SD Bioline Syphilis 3.0, Standard Diagnostics Inc., Yongin-si, Kyonggi-do, Korea). The FSWs that presented non-reactive results in the RQT were recorded as uninfected by *T. pallidum*. When a reactive result was obtained, the FSW was directed to a local health clinic for the collection of a specific sample. A sample of the exudate was taken with a swab from FSWs presenting mucosal ulcerations or abrasions. In cases of secondary syphilis with no mucosal lesions but skin lesions, such as macules or papules, the lesions were scraped gently with a swab to obtain serous exudate. The DNA was extracted from the swabs using a Nucleospin blood kit (Macherey-Nagel Eurl, Hoerd, France) according to the manufacturer's instructions. The diagnosis of syphilis was based on the detection of a diagnostic fragment of the *poA* gene of *T. pallidum* using real-time polymerase chain reaction (PCR)⁵.

Personal data were collected using a structured questionnaire applied by the researchers during face-to-face interviews. The questionnaire obtained data on socio-demographic and occupational variables and on high-risk behaviors associated with STIs. Based on the diagnosis of syphilis, the FSWs were divided into two groups: infected and uninfected with *T. pallidum*. Simple and multiple logistic regressions were used to identify the factors associated with *T. pallidum* infection, with the final model evaluated by the Hosmer-Lemeshow test. Statistical analyses were performed using IBM SPSS Statistics for Windows, version 20.0, with a level of significance of 0.05.

A total of 222 FSWs participated in the study, with some variation in the number of individuals included from each municipality; i.e., Ananindeua (n = 32), Capanema (n = 37), Castanhal (n = 34), Marituba (n = 29), Marapanim-Marudá (n = 14), Santa Isabel do Pará (n = 21), Santa Maria do Pará (n = 24), São Miguel do Guamá (n = 11), Terra Alta (n = 7), and Vigia (n = 13). The RDS was run with difficulty in the municipalities of São Miguel do Guamá, Marapanim-Marudá, and Vigia. Only in the municipality of Terra Alta were FSWs accessed for convenience due to difficulties encountered in the development of the RDS.

The majority of FSWs interviewed were less than 30 years of age (71.17%), declared themselves to be heterosexual (90.09%), and were born in Pará (65.76%). Some individuals reported being "in transit" from neighboring states, including Amapá (7.21%), Maranhão (12.61%), Tocantins (8.11%), and Piauí (6.31%). The mean age was approximately 26 ± 4.5 (SD) years, ranging from a minimum of 19 years to a maximum of 46 years. Just over half (52.25%) of the individuals reported knowing children and adolescents involved in local prostitution. The general characteristics of the FSWs – local women, 18 - 30 years of age – were consistent with those of FSWs in other parts of Brazil², Mexico^{2,6}, South Korea⁷, Spain⁸, India⁹, and Argentina¹⁰.

Regarding education, most had not completed elementary school (58.56%). FSWs declared themselves as brown (48.65%), white (26.12%), and black (25.23%). Additionally, 176 (79.28%) FSWs reported being single, seven (6.31%) as married or in a stable relationship, and 32 (14.41%) as separated. Thirty (13.51%) FSWs reported having children and 42 (18.92%) stated that the money from the sale of sexual practice was used to support others. Similar information has also been reported in municipalities located in Argentina¹⁰ and Brazil¹¹. Despite advances in social areas, the prevalence of Brazilians with low schooling and consequently low monthly incomes, especially among blacks and browns, remains high. Studies have reported that unfavorable socioeconomic conditions and the resulting low standards of living may favor early initiation and involvement in the sex trade and may also influence self-care and vulnerability to STIs^{2,12}.

Many of the FSWs (64.86%) reported having been involved in the sex trade for at least three years; the mean period was 4.5 years (uninterrupted), ranging from five months to 31 years. The FSWs reported finding their clients in a number of different locations, including piazzas, shops, bars, restaurants, and gas stations. The majority (80.18%) of FSWs reported working in motels, nearby rooms, or in unsafe locations with poor hygiene.

The FSWs reported that a sexual encounter cost between R\$30 and R\$100, with an average price of approximately R\$45. Generally, a basic sexual program included: kisses, caresses, and vaginal sex. Sexual fantasies, oral sex, and anal sex could be included in the program, with the client paying extra for specific services. The provision of these specific services by FSWs and the lack of payment by client at the end of sexual program was one of the significant perpetrators of violence reported by the FSWs. The monthly income of the FSWs ranged from R\$400 to R\$1300, although most (72.97%) reported a monthly income of approximately one minimum wage (R\$834, on average, or approximately US\$225 in 2015–2016). Many of the FSWs (61.26%) reported verbal or physical abuse, typically associated with arguments over the payment for sexual services.

The frequency of work varied considerably among months, with FSWs reporting increased clientele during the July vacation period, local events, musical shows, and public holidays. Most (57.66%) of the FSWs had no knowledge of the socio-economic profiles of their clients, although some (26.13%) referred to customers from bars, restaurants and gas stations, truck drivers, and the drivers of other vehicles such as buses and taxis. To our knowledge, this is the first study to characterize the economic profiles and working conditions of FSWs in northern Brazil. In general, the data are consistent with those on FSWs from the state of Paraíba, in northeastern Brazil¹¹, including the low prices paid for sexual services and the reduced monthly income, sexual encounters conducted in inappropriate places, reports of violence, and a lack of client data. This worrying scenario highlights the vulnerability of these women.

More than one-third (88, 36.94%) of the 222 FSWs screened presented reactive results for syphilis in the RQT. All women with reactive results provided samples to test for the presence of a nucleic acid fragment of *T. pallidum*. The majority (n = 54)

had lesions in the genital area. Additionally, women with skin ($n = 18$) and cervical ($n = 14$) lesions were also identified. The *T. pallidum* gene fragment was detected by real-time PCR in all reactive samples. This prevalence was much higher than those recorded in most other epidemiological studies of sex workers in different parts of the world. Rates ranged from 5.1–11.1% in the Dominican Republic², 1.3–6.0% in Honduras², 1.1–11.8% in Guatemala², 2.7–15.0% in El Salvador², 2.0–10.0% in Mexico^{2,6}, 2.2–4.1% in Peru², 0.1–45.7% in Argentina^{2,10}, and 16.1–22.4% in India⁹. This is one of the highest values recorded to date in Brazil, including users of illicit drugs^{2,13,14,15}. This is an alert to health authorities and emphasizes the need for the planning and implementation of effective measures for the control and prevention of syphilis, particularly among FSWs.

The diagnosis of syphilis can be complicated when it is based on diverse clinical manifestations, dark-field microscopy, and serology⁵. The use of rapid and reliable tests to serve as screening and confirmation of trials at all stages of syphilis is necessary. Rapid serological procedures offer a potential option, with assured rapid availability of results (usually in less than 20 minutes) and ease of use by health professionals, which allows on-site testing¹⁶. Additionally, the *T. pallidum* real-time PCR is easy to perform in most present-day microbiological laboratory settings, especially to confirm cases of primary syphilis and to exclude false-positive cases^{17,18}. Thus, the diagnostic strategy of the present study included the use of RQTs for syphilis screening at all stages, and PCR for confirmation of syphilis cases or exclusion

of false positives. The provision of rapid, accurate, and specific laboratory tests enabled the appropriate treatment and prevention of the progression of syphilis, as well as reducing the exposure time of the sexual partners of FSWs. Such facts were presented and discussed during the meetings with the FSWs and likely enabled the return of all the FSWs for the collection of samples for the specific and accurate test of syphilis. This strategy may be an option for control actions to be developed in this vulnerable group but requires trained personnel and specific equipment.

The univariate analysis identified four factors associated with *T. pallidum* infection (**Table 1**); this finding was reinforced by the multivariate analysis, which identified the same four factors; namely illicit drug use ($p = 0.01$; adjusted odds ratio [aOR] = 29.91; 95% confidence interval [95% CI] = 9.71–72.80), unprotected sex ($p < 0.01$; aOR = 72.88; 95% CI = 19.80–113.22), more than five years of sex work ($p < 0.01$; aOR = 61.27; 95% CI = 14.63–138.15), and the exemption of condoms for clients paying extra ($p < 0.01$; aOR = 78.40; 95% CI = 17.64–133.81). The Hosmer-Lemeshow goodness-of-fit test indicated a good fit for the final model ($\chi^2_{HL} = 3.56, p = 0.61$). These four factors are commonly identified in epidemiological studies of FSWs^{2,6,7,19}. This finding underscores the need for increased investment in health programs directed specifically at FSWs. Condom use during sexual intercourse is an essential behavior to stop the transmission of pathogens and prevent the emergence of new cases of STIs. Behavior change can be influenced by the provision of information and condoms,

TABLE 1: Socio-demographic and epidemiological characteristics associated with syphilis in 222 female sex workers operating along the highway system of Pará, northern Brazil.

Characteristic	N (%)	n syphilis + (%)	OR (95% CI)
Age \leq 30 years	158 (71.17)	52 (63.41)	0.56 (0.24 - 1.29)
Heterosexual	200 (90.09)	76 (92.68)	0.61 (0.15 - 2.45)
Single + separate	208 (93.69)	78 (95.12)	1.52 (0.29 - 8.24)
Up to seven years of study (including illiteracy)	130 (58.56)	52 (63.41)	1.38 (0.62 - 3.04)
Up to one minimum wage per month*	162 (72.97)	66 (80.48)	1.89 (0.75 - 4.76)
Possible transmission routes			
Blood transfusion	20 (9.00)	4 (4.88)	0.39 (0.08 - 1.97)
Surgery	30 (13.51)	10 (12.20)	0.83 (0.27 - 2.63)
Tattoo	122 (54.95)	42 (51.22)	0.79 (0.36 - 1.71)
Use of illicit drugs (injectable/inhaled)	82 (36.94)	68 (82.93)	43.71 (14.15 - 85.00)
Shared use of punch-sharp materials	102 (45.95)	38 (46.34)	1.03 (0.47 - 2.22)
Sexual relations without protection**	84 (37.84)	72 (87.80)	76.80 (21.89 - 179.43)
More than five clients**	100 (45.05)	38 (46.34)	0.73 (0.34 - 1.57)
More than five years involved in prostitution	54 (24.32)	50 (60.98)	53.13 (11.39 - 147.76)
Changes in genitalia in the last 12 months	138 (62.16)	48 (58.54)	0.78 (0.36 - 1.73)
Dispenses condoms during intercourse when:			
Meeting a known client	54 (24.32)	26 (31.71)	1.86 (0.77 - 4.48)
Serving many clients in a day	68 (30.63)	32 (39.02)	1.85 (0.81 - 4.22)
Client pays more for sexual program	88 (39.64)	74 (90.24)	83.25 (22.83 - 203.59)

Notes: *Average minimum wage from 2015 to 2016 = R\$ 834.00, approximately US\$ 225.00. **Behavior in the previous seven days.

but that is not enough to change attitudes. It is necessary that these women have prospects for improving life while valuing and respecting their individuality²⁰. Therefore, the number of syphilis infections can be reduced through simple actions such as early diagnosis and adequate and humane treatment; social programs that reinforce women's rights, self-esteem and care; and the provision condoms, lubricants, disposable syringes, and educational material in appropriate languages.

The present study has several limitations. The sample population may not necessarily be representative of FSWs operating on the highway system of Pará. We had difficulty in running RDS in four municipalities and instead performed convenience sampling in one municipality. Thus, the data obtained in this study were not adjusted as commonly occurs in epidemiological studies using RDS. However, given the current scarcity on data regarding the prevalence of syphilis in FSWs, the findings of this study provide important insights into the local epidemiological scenario, which should be used for the development of syphilis control and prevention strategies for FSWs as well as the general population.

Ethical Considerations

All participants signed a form indicating their informed and clarified consent before completing a questionnaire that provided personal information on socio-economic variables and behaviors associated with the risk of infection with *T. pallidum*. All participants received the results of their laboratory tests. Participants with syphilis were directed to local health centers for counselling and treatment. This study was approved by the Ethics in Research Committee of the *Núcleo de Medicina Tropical* at the *Universidade Federal do Pará* in Belém, Brazil.

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Conflict of Interest: The authors declare that there is no conflict of interest.

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