Prevalence And Risk Factors Of Sexually Transmitted Infection Symptoms Among Women In Far-Western, Nepal

BY

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THESIS

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DEDICATION

I dedicate this thesis to the most important women in my life, my mom and her two sisters. These three women are the ones who have always inspired me with their strength and perseverance.

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CDC	Centers for Disease Control and Prevention
CSWs	Commercial Sex Workers
GUD	Genital Ulcer Disease
HSV	Herpes Simplex Virus
IBBS	Integrated Biological and Behavioral Surveillance Surveys
IDUs	Injection Drug Users
INGO	International/Non-Government Organization
LAPS	Lower Abdominal Pain Syndrome
NCASC	National Center for AIDS and STD Control
NDHS	National Demographic and Health Survey
PI	Primary Investigator
PR	Prevalence Ratio
RA	Research Assistant
STI	Sexually Transmitted Infection
VCT	Voluntary Counseling and Testing
VDC	Village Development Committee
VDS	Vaginal Discharge Syndrome
WHO	World Health Organization

SUMMARY

Control of sexually transmitted infections (STIs) is recognized as a method for HIV prevention in Nepal, but the burden of STIs among wives of migrant workers is not known despite wives of migrants being one of the most at-risk group for HIV. The main objectives of this study were to: (1) measure the prevalence of STIs in women in Bajura, Nepal; (2) explore the relationship between STIs in women and their husband's migration status; and (3) identify the risk factors of STIs in women.

A cross-sectional study was carried out using a standardized survey and the World Health Organization (WHO) syndromic guidelines to measure the prevalence of STI symptoms. Data were collected from 426 married women aged 16–35 from 10 randomly selected village development committees (VDCs) in Bajura. Prevalence of self-reported STI symptoms were common: 17.2% vaginal discharge syndrome (VDS), 14.4% lower abdominal pain syndrome (LAPS), 8.9% genital ulcer disease (GUD), 12.7% vaginal bleeding, 22.8% pain or burning on urination, and 20.8% genital itching. The adjusted prevalence of VDS and LAPS were 74% and 72% higher among women with migrant husbands compared to women with residential husbands. There was not a strong statistical evidence for a higher prevalence of GUD among women with migrant worker husbands (PR=1.53; 95% CI: 0.80, 2.91). Other sociodemographic risk factors associated with increased prevalence of STI symptoms were age, education, and caste. Further, the association between migrant worker husbands and prevalence of VDS and LAPS were modified by engaging in unwilling sexual intercourse and women's education level.

This study indicates that the burden of STI symptoms/syndromes is considerably high among women in Bajura, Nepal, and these syndromes are higher among women who have migrant worker husbands. This is one of the first studies to describe the potential STI epidemic

among women in Bajura and provides evidence that supports urgent need for investigation to verify these symptoms and determine etiology—whether STI-related or caused by other factors.

I. INTRODUCTION

A. Sexually Transmitted Infection-Causing Pathogens

There are more than 30 pathogens that cause STIs; however, the most common STIs can be grouped as bacterial, viral, or parasitic. The most common bacterial pathogens that cause STIs are *Neisseria gonorrhoeae* (gonorrhea), *Chlamydia trachomatis* (chlamydia), *Treponema pallidum* (syphilis), and *Haemophilus ducreyi* (chancroid) (World Health Organization, 2008). Trichomoniasis, one of the most commonly found STIs in the world, is caused by *Trichomonas vaginalis*, a parasite (Eng & Butler, 1997). The most prevalent viral STIs include HIV, human papillomavirus, hepatitis B virus, and herpes simplex virus (HSV). In developing countries, the use of syndromic management limits the number of STIs that can be directly identified and controlled. Syndromic management is limited to the treatment of vaginal discharge, penile discharge, and genital ulcers, which addresses the pathogens causing chlamydia, gonorrhea, trichomoniasis, chancroid, syphilis, and genital herpes.

B. Morbidity and Mortality

Along with the direct physical discomfort and loss of productivity, STIs impose psychosocial consequences such as stigma and fear of violence (WHO, 2008). If left untreated, STIs result in many complications that impact reproductive and child health. Complications in males from gonorrhea and chlamydia are not frequent because most men are symptomatic (Markle, Conti, & Kad, 2013; Nelson & Williams, 2013). However, prevalence of asymptomatic infections for males can range from 1.4% to 86.4% for gonorrhea and from 5% to 98.2% for chlamydia (Handsfield, Lipman, Harnisch, Tronca, & Holmes, 1974; Podgore, Holmes, &

Alexander, 1982; Thomas et al., 2002; Christina et al., 2005; Bozicevic et al., 2006). When left untreated, gonorrhea and chlamydia infections can lead to epididymitis, proctitis, and disseminated gonococcal disease (Eng & Butler 1997; Markle et al., 2013; Nelson & Williams, 2013).

In contrast, between 19.2% and 92.6%, 16% and 92.9%, and 4.5% and 80% of females may be asymptomatic for gonorrhea, chlamydia, and trichomoniasis, respectively (Thomas et al., 2002; Bozicevic et al., 2006; Detels et al., 2011). Since women are largely asymptomatic, they bear a larger burden of STIs because of the sequelae associated with untreated STIs. Complications from gonorrhea and chlamydia in females result in genital tract infection, pelvic inflammatory disease, ectopic pregnancy, and infertility (Markle et al., 2013; Nelson & Williams, 2013). Pelvic inflammatory disease is seen in about 30% of women with untreated chlamydia infection (Nelson & Williams, 2013).

In addition, gonorrhea, chlamydia, and trichomoniasis in pregnant women can result in premature rupture of membranes, and premature delivery (Eng & Butler, 1997; Andrews et al., 2000; Silver, Guy, Kaldor, Jamil, & Rumbold, 2014). These infections can also spread to the newborn during delivery and cause conjunctivitis, pneumonia, and gonococcal opthalmia (Mullick, Watson-Jones, Beksinska, & Mabey, 2005). Gonococcal opthalmia is primarily found in developing countries and it is estimated that 42% of infants exposed to an infected cervical canal develop it (Mullick et al., 2005; Nelson & Williams, 2013). It is the adverse effects of STIs on newborns and infants that make such infections in pregnant women particularly important.

Although curable, syphilis is a systemic disease, which at its late phase manifests as neurosyphilis, cardiovascular syphilis, and gummatous syphilis. Untreated primary and secondary syphilis in pregnant women can lead to adverse outcomes such as fetal loss, neonatal

death, and low birth weight (Eng & Butler 1997; Markle et al., 2013). Furthermore, both non-ulcerative STIs and ulcerative STIs such as syphilis, chancroid, and HSV are very important because of their role in facilitating HIV transmission and acquisition (Fleming & Wasserheit, 1999).

C. **Diagnosis**

Laboratory diagnostics have evolved from the traditional method of clinician-obtained cervical and urethral swabs to culture the pathogens to being able to diagnose gonorrhea and chlamydia with self-obtained urine or vaginal swabs. Nucleic Acid Amplification Tests (NAATs), such as polymerase chain reactions and transcription mediated amplification are the recommended tests to detect gonorrhea and chlamydia because NAATs have very high sensitivity and specificity and can be performed on noninvasive specimens that are self-collected (Cook, Østergaard, Braithwaite, & Ness, 2005; CDC, 2014). Although the diagnostic technologies have evolved, laboratory diagnostic methods in developing countries constrain available resources because they require special facilities and trained health care personnel to collect the specimen and identify the pathogen. Therefore, in resource-limited settings, where laboratory tests are not feasible, diagnosis and treatment relies on WHO-recommended syndromic management of STIs.

Syndromic management is based on algorithms of common clinical symptoms and syndromes such as urethral and abnormal vaginal discharge, LAP, and GUD (WHO, 2003). In response to the presented symptoms, treatments or combination of treatments are prescribed for the organism that is the most common causative agent of the particular symptom. Syndromic

approach does not vary around the world, but treatment of STI symptoms is usually tailored according to the local epidemiology, etiologic, and antimicrobial sensitivity of STIs and has been used effectively to control and prevent STIs all over the world (WHO, 2003).

Syndromic management is cost-effective, has high cure rates, and provides point of care treatment; nevertheless, it is limited because it is not as sensitive and specific as a laboratory diagnosis. Many studies have assessed the sensitivity and specificity of syndromic algorithm with varying results. A review of efficacy studies demonstrates the sensitivity of the algorithm for urethral discharge to be 87% to 99% and cure rates to be 92% to 99%, but the specificity was very low (Bosu, 1999; Pettifor, Walsh, Wilkins, & Raghunathan, 2000). Similar results were found among male STI clinic patients in India (Choudhry, Ramachandran, Das, Bhattacharya, & Mogha, 2010). The sensitivity and specificity of GUD also varies according to the population where it is used because it can be caused by syphilis, HSV, or chancroid; therefore, the syndromic approach has to be implemented and revised periodically according to the changing epidemiology in the local areas (Pettifor et al., 2000; Wang, Yang, Zhong, & Wang, 2003; Prabhakar et al., 2012).

Vaginal discharge has been shown to be a poor predictor of cervical infections, with the sensitivity ranging from 29.3% in low-risk women to 93.3% in high-risk women (Pettifor et al., 2000). Sensitivity of vaginal discharge for both vaginitis and cervicitis was found to be 58.9% and specificity was 55.1% among women in rural India (Prabha, Sasikala, & Bala, 2012). In a sample of 4,090 women from health clinics in India, 71.4% received syndromic diagnosis of STIs, but only 32.2% had confirmed etiologic diagnosis (Ray et al., 2009). In contrast, in STI clinic patients in China the sensitivity and specificity of vaginal discharge was found to be 90.8%

and 46.9%, respectively (Wang et al., 2003). The low specificity of the syndromic approach can lead to overtreatment if used inappropriately (Bosu, 1999; Ray et al., 2009).

Although vaginal discharge is a poor predictor of cervical infections caused by gonorrhea and chlamydia, it may be a good predictor of vaginal infections such as bacterial vaginosis, trichomoniasis, and candidiasis (WHO, 2008). Unsurprisingly, syndromic management performs poorly for asymptomatic women with treatable STIs such as gonorrhea, chlamydia, and trichomoniasis. Despite the poor sensitivity and specificity of the syndromic approach, it is a highly effective tool for use in resource-limited settings. The complications that are prevented by treating STIs and the cost associated with untreated STIs sequelae far outweigh the disadvantages of the syndromic approach. In addition, the positive predictive value of the algorithms vary in different epidemiologic settings and populations. Therefore, this approach works best when used according to the knowledge of the local STI epidemiology.

D. Epidemiology of Sexually Transmitted Infections

1. Burden of Sexually Transmitted Infections

In the United States, the Centers for Disease Control (CDC) (2013), estimates that 20 million new STIs occur each year, with chlamydia and gonorrhea being the first and second most commonly reported STIs, respectively. The highest prevalence of STIs in the United States is found in individuals between the ages of 15 and 24; and STIs disproportionately affect racial minorities and females. Chlamydia infection among women (634.3/100,000) in the United States is significantly higher than in males (262.6/100,000). However, more females were screened for chlamydia than males and this difference could be in part due to the difference in clinical

guidelines and reporting (Kenrad & Williams, 2013). Racial minorities also continue to bear a disproportionate burden of STIs, with rates of gonorrhea being 15 times higher and congenital syphilis 14 times higher in blacks compared to whites (CDC, 2013).

In comparison to the United States STIs are not monitored as well in other areas of the world, especially in the developing countries. The WHO estimates 499 million new cases of curable STIs (gonorrhea, chlamydia, syphilis, trichomoniasis) occur each year among people ages 15–49 (WHO, 2008). The prevalence of each STI varies from region to region. Trichomoniasis (187 million) has the highest prevalence globally. In Southeast Asia it is estimated that the prevalence of trichomoniasis, syphilis, gonorrhea, and chlamydia are 28.7 million, 12.3 million, 9.3 million and 8.0 million, respectively. After the African region, Southeast Asia has the second highest prevalence of syphilis.

Research on STIs and HIV in Nepal is limited to core groups such as injection drug users (IDUs), and commercial sex workers (CSWs); therefore, data on prevalence of STIs in the general population are sparse. Although limited by their generalizability, several studies demonstrate a range of STI prevalence in different areas of Nepal. Using a syndromic algorithm, a clinic-based study in urban Nepal found that 15.7% of the voluntary counselling and testing (VCT) clients had genital ulcer syndrome and 25% had genital discharge syndrome (Karn, Amatya, Aryal, KC, & Timalsina, 2012). In contrast, a clinic-based study in Far-Western Nepal, where 70% of 900 participant's husbands were migrants to India, has found a prevalence of 4.5% for syphilis, 5.8% for trichomoniasis, and 1.6% for gonorrhea and/or chlamydia among women (Smith-Estelle & Gruskin, 2003). These clinic-based studies are subject to sampling bias because those who were recruited for the study are patients who were referred for VCT or were actively

seeking VCT services, which means the sample may only include people who are already at high risk for STIs. The sampling bias also limits the generalizability of the study results.

A population-based study among 1,177 postpartum women in a rural area of Eastern Nepal found the prevalence of chlamydia to be 1.0% and of gonorrhea to be 2.3% using ligase chain reaction test (Christian et al., 2004). Although this study has a very large sample, it is also not generalizable to the entire population because of the cultural and sociodemographic differences between this area and other areas of Nepal. Despite being limited by the self-reported symptoms of STIs, the National Demographic and Health Survey (NDHS) provides the best picture of the countrywide prevalence of STIs in Nepal. According to the NDHS, 13% of women and 3% of men reported having had an STI or experiencing STI symptoms in the 12 months prior to the survey (Ministry of Health and Population, 2012).

Regional data from South Asia also provide insight into the general burden of STIs in the region and among different populations. A representative sample of males and females in the general population in India found the prevalence of gonorrhea to be 3.8%; of trichomoniasis, 5.2%; and of chlamydia, 1.3% (Thomas et al., 2002). Similarly, another study found the prevalence of chlamydia to be 1.1% among a general population aged 15–45 in India (Joyee et al., 2004). A cross-sectional study of females from urban slums demonstrated a prevalence of 29% for chlamydia, 2.8%–4% for trichomoniasis, 4%–4.7% for syphilis, and 0.93% for gonorrhea (Garg et al., 2002; Bhalla et al., 2007). A study among male clients of CSWs in 12 cities across three states in India found that prevalence of syphilis ranged from 3.1% to 10.1%, chlamydia 0% to 4.5%, and gonorrhea 0.1% to 1.5% (Subramanian et al., 2008).

A retrospective study also found an increase in the cases of syphilis from 15.8% to 24.2% from 1990 to 2004 in an urban clinic (Ray et al., 2006). Another clinic-based study in Southern

India among women reporting vaginal discharge symptoms at gynecological clinics reported a prevalence was 1.2% for gonorrhea, 2.7% for chlamydia, and 24.3% for trichomoniasis. The same study found that among men who reported urethral discharge symptom at STI clinics, the prevalence was 24.7% for gonorrhea, 10.5% for chlamydia, and 8.5% trichomoniasis (Becker et al., 2010).

2. Circular migration as a risk factor of Sexually Transmitted Infections

The epidemiology of STIs varies between and within countries, but can be categorized into developed and developing countries in terms of the broad behavioral and social factors that affect their epidemiology. From a biological standpoint, lack of awareness of STI infection and prior STIs increase the risk of STI transmission. Individual-level risk factors of STIs include: early age at sexual debut, multiple sexual partners, inconsistent/absence of condom use, substance abuse, type of sexual intercourse, sex with CSWs, involuntary sexual intercourse, lack of education, and perceived risk. Behavioral risk factors of STIs are determined by the social, cultural, and, economic factors that play into the epidemiology of STIs. In the developed countries such as the United States STI risk is directly linked to drug use, and core groups that are disproportionately affected are usually geographically defined low-income areas and racial minorities (CDC, 2013). Furthermore, the STI surveillance data show that young women under the ages of 25 are at greatest risk for gonorrhea and chlamydia (CDC, 2013). In the developing countries, core groups that are at high risk for STIs are CSWs, mobile populations such as long-distance truck drivers and migrant workers, clients of sex workers, and IDUs (UNAIDS, 2008; United Nations, 2013a; WHO, 2008).

In the widespread epidemic of HIV/AIDS in Africa, mobile populations such as workers migrating for work in the mining industry were considered a core group fueling the spread of

HIV and other STIs (Hunt, 1989; Decosas, Kane, Anarfi, Sodji, & Wagner, 1995; Chirwa, 1997; Lurie, Harrison, Wilkinson, & Karim, 1997; Lurie et al., 2003). The UNAIDS (2008) also recognizes labor migrants as a vulnerable population for acquisition and transmission of HIV/STIs. With the increase in rural-to-urban migration in most developing countries, there is a growing body of literature documenting migration and its role in the spread of HIV/STIs in many different areas of the world (Poudel et al., 2003; Hu, Liu, Li, Stanton, & Chen, 2006; Saggurti, Schensul, Verma, 2009; Sevoyan & Agadjanian, 2010). The causal pathway through which migration increases the risk of HIV/STI transmission has yet to be understood because longitudinal studies are lacking. However, many behavioral and sociocultural factors that influence migrants risk behaviors have been identified from cross-sectional studies.

Migration can be placed into two broad categories, forced migration, which includes internally displaced individuals, refugees, and trafficked victims, or voluntary migration, which includes individuals that migrate by their own will, such as labor migrants (Wolffers, Verghis, & Marin, 2003). Further discussion uses the term migrants to refer to voluntary male labor migrants. Labor migrants usually originate from socioeconomically depressed areas and migrate for employment. They are primarily involved in physically demanding work, work long hours, receive low wages, and live in substandard conditions (Wolffers et al., 2003). Due to logistical and financial constraints, they are also forced to leave their families in their area of origin, and therefore, lack social support. At destination, various aspects of a migrant's lifestyle such as being away from cultural and social norms, long periods of separation from spouse, lack of social support, loneliness, and frustration are associated with high-risk sexual behavior (Chirwa, 1997; Hope, 2001; Wolffers et al., 2003; Lin et al., 2005; Hu et al., 2006).

Multiple studies assert that higher proportions of migrant males are engaged in risky sexual behaviors such as extramarital sex, sex with CSWs, multiple sexual partners, and inconsistent condom use compared to non-migrants (Chirwa, 1997; Lurie et al., 1997; Poudel et al., 2004; Hu et al., 2006; Mercer, Khanam, Gurley, & Azim, 2007; Saggurti et al., 2009; Saggurti et al., 2011). Saggurti et al. (2011) report that compared to nonmigrants, active migrants were 2.1 times and 4.0 times more likely to have sex with a paid partner in the two districts in India where this study was conducted. In Bangladesh, the odds of extramarital sex among migrant men increased with the increasing time of separation from spouse, and less than one-third of men who reported sex with a sex worker had ever used a condom with a sex worker (Mercer et al., 2007). Similarly, Hu et al. (2006) found the prevalence of extramarital sex was significantly higher among migrants compared to nonmigrants, 12% and 6%, respectively.

Epidemiologically, one of the most important aspects of migrant's individual-risk behavior is purchasing sex from CSWs because CSWs are a core high-risk group for STIs/HIV worldwide (WHO, 2008). Several authors have found that sex with CSWs is common in areas where migrants work, and sex can be inexpensive in developing countries, especially in urban areas where migrant workers are found (Poudel et al., 2004; Bam, Thapa, Newman, Bhatt, & Bhatt, 2013). Although migration status of the subjects is not identified, a study among the clients of CSWs in 12 cities across three states in India sheds light into the characteristics of the clients of CSWs and how the clients function as a bridge between general population and a high-risk group to transmit STIs (Subramanian et al., 2008). Among the 4,821 subjects recruited in this study, 57% of the clients of CSWs were married, and consistent condom use with CSWs was only reported by 28% (Subramanian et al., 2008).

Prevalence of STI/HIV has also consistently been significantly higher in migrants compared to nonmigrants (Mercer et al., 2007; Lurie et al., 2003; Poudel et al., 2003; Saggurti et al., 2012). A study across seven districts in India with high out-migration rate found that odds of being HIV positive was 4.4 times higher in males with history of migration and odds of a woman being HIV positive was 2.2 times higher for those with a migrant husband (Saggurti et al., 2012). Similarly, another study in South Africa reported that the odds of being HIV positive was 2.4 times higher among migrants (Lurie et al., 2003). In addition, consistent condom use was reported to be very low while engaging in high-risk sex with CSWs or with casual partners (Poudel et al., 2003; Mercer et al., 2007; Saggurti et al., 2011). Purchasing sex from a CSW already puts migrant men at risk for STI acquisition, and when coupled with inconsistent condom use their risk increases further. Studies in Bangladesh and China also show that when migrants are away from their spouses for longer periods of time, they are more likely to have multiple sexual partners and seek sex with CSWs (Hu et al., 2006; Mercer et al., 2007; Roy, Anderson, Evans, Rahman, 2010).

In a study in China, migrants were more likely than nonmigrants to have unprotected sex, multiple partners, and use alcohol during sex (Yang, Derlega, & Luo, 2007). Studies in India, Nepal, and Bangladesh have all demonstrated significant association between alcohol consumption and high-risk sexual behavior among migrants (Poudel et al., 2004; Roy et al., 2010; Verma, Saggurti, Singh, & Swain, 2010). Some investigators assert that in addition to the mobility/migrant status, alcohol is a risk factor for high-risk sexual behavior (Gupta, Vaidehi, & Majumder, 2010). In a sample of 11,014 subjects in India, more than half of the CSWs and their clients were found to consume alcohol before sex, and alcohol consumption was significantly associated with inconsistent condom use during paid and unpaid sex (Verma et al., 2010).

In addition to the high-risk sexual behavior among migrant men at their migration destination, they continue to have sex with multiple sexual partners including casual and paid-partners at their places of origin (Saggurti et al., 2011). Migrants' increased financial status can also determine their sexual-risk behavior at their places of origin. In Malawi, migrant men used gifts and wealth that they brought to the village to court women and engaged in sex with multiple partners (Chirwa, 1997). Similarly, in Nepal, migrants were equated with higher financial status; therefore, men succeeded in attracting younger women to engage in sex despite having a spouse (Poudel et al., 2004).

A study among married women with migrant husbands and residential husbands in China found that women with migrant husbands had a significantly higher rate of HIV infection (4.3% versus 1.7%) compared to women with a residential husband (Qin et al., 2009). A similar study in rural India found that women with migrant husbands had 2.3 times increased odds of HIV infection (Saggurti et al., 2012). Another study in rural Armenia reported that a three-year period prevalence of at least one STD symptom was 2.5 times higher in women married to migrants compared to women married to nonmigrants (Sevoyan & Agadjanian, 2010). Similarly, other studies have demonstrated that women are vulnerable to HIV/STDs because migrant men return to their village and do not use condoms with their spouses while they continue to engage in extramarital sex (Poudel et al., 2004; Mercer et al., 2007; Roy et al., 2010; Saggurti et al., 2011). However, it is important to note that women may also be involved in extramarital sexual relations in the absence of their husbands, which can also increase their risk of STIs (Lurie et al., 2003; Mercer et al., 2007; Nepal, 2007).

Migrants participate in extramarital sex with CSWs and casual nonpaying partners in migration destinations and in their place of origin, which is usually coupled with inconsistent

condom use at both locations (Lurie et al., 2003; Poudel et al., 2004; Li et al., 2007; Verma et al., 2010; Saggurti et al., 2011). Therefore, migrants are an important group to consider in the epidemiology of HIV/STIs because they function as a bridge population to spread STIs from high-risk groups (CSWs) to the general population (Lurie et al., 1997; Mercer et al., 2007; Qin et al., 2009; Roy et al., 2010). Transmission of HIV/STIs from bridge populations have led to concentrated epidemics of HIV in woman in rural areas of India and Nepal.

E. **Male Labor Migration and Risk of HIV/ Sexually Transmitted Infections in Nepal**

Similar to many other developing countries, STI surveillance is almost nonexistent in Nepal aside from some occasional prevalence studies carried out by hospitals or International Nongovernmental Organizations (I/NGOs). Although STIs are a public health problem, competing health issues, lack of resources, and infrastructure prevents the government of Nepal from prioritizing STIs. While STIs are not prioritized, there is an effort to halt the spread of HIV/AIDS, therefore, HIV data will be used as a proxy measure for STIs.

According to the National Center for AIDS and STD Control (NCASC), the national prevalence of HIV in Nepal is low at 0.3%, but Nepal has a concentrated epidemic of HIV in high-risk groups, which are identified as IDUs, men who have sex with men, CSWs, and male labor migrants (National Center for AIDS and STD Control [NCASC], 2012). According to the 2011 estimates, labor migrant workers and women in the general population are one of the highest-risk group, accounting for 27% and 27.3% of all HIV infections, respectively (NCASC, 2012). However, these data must be interpreted with caution because a formal surveillance system for HIV does not exist and these estimates are based on data from urban areas of the

country. The largest source of data for national estimates comes from Integrated Biological and Behavioral Surveillance Surveys (IBBS) conducted among high-risk groups.

Nevertheless, high rates of HIV/STI are demonstrated by several studies that looked at migrant workers and the rates align with the national estimates. A clinic-based study in the capital city found 4.4% seroprevalence of HIV among all types of migrants and HIV prevalence was higher, 8.5% in external migrants to India (Gurubajracharya & Gurubajracharya, 2004). However, this study site is subject to referral bias and the data may not be representative of the general migrant population from rural areas of the country. In a rural area in Far-Western Nepal, HIV prevalence was found to be significantly higher in migrant workers compared to nonmigrants, 10.3% and 2.5%, respectively (Poudel et al., 2003).

In contrast, syphilis prevalence was found to be high in both migrants and nonmigrants, 24.7% and 15.0%, respectively (Poudel et al., 2003). It was also demonstrated that migrants were involved with multiple sexual partners at their destination and at their villages, thereby, rendering non-spousal village women vulnerable to HIV/STIs as well (Poudel et al., 2004). The results from this study must also be interpreted with caution because it had a very small sample size, which led to insignificant associations and wide confidence intervals. In addition, the results are not generalizable to even the population of the district where the study was conducted because the primary sample included high-risk individuals that were identified by key informants.

Despite ongoing HIV/AIDS awareness and prevention efforts by many NGOs/INGOs, recent prevalence study from mid and Far-Western Nepal reported 0.8% and 4.3% HIV seroprevalence among migrant men in 2008 and 2010, respectively (New Era, 2008b, Success Research Option, 2010). More than one-third (37.6%) of migrant men also presented with STI

symptoms such as urethral discharge, ulcers and sores around the genital area, burning/pain during micturition, and enlargement of inguinal lymph nodes during the IBBS (Success Research Option, 2010). Furthermore, an IBBS conducted among 600 wives of migrants between the ages of 16 and 60 in four districts in Far-Western Nepal, provides insight into the burden of HIV and STIs in this population. The 2010 IBBS report found HIV prevalence of 0.8% among wives of migrants, a large decrease from the 2008 survey, which reported HIV prevalence of 3.3% (New Era, 2008a; New Era, 2010). The point prevalence of having at least one STI symptom (white/pus vaginal discharge, burning sensation during urination, pain during urination, and ulcers or sores around genital area) was 12.2% and the 12-month period prevalence was 21.5% (New Era, 2010).

The IBBS is the primary source of HIV/STI surveillance data in Nepal and is representative of the general population of wives of migrant workers in Far-Western Nepal because the IBBS employs probability proportional to size cluster-sampling method. However, the IBBS survey is limited because it does not provide a comparison between wives of migrants and nonmigrants from the same community. This comparison is important because qualitative data from focus group discussions among migrant workers in the Far-Western Nepal found that migrants are involved in extramarital relations in their villages and in India (Poudel et al., 2004). Furthermore, districts such as Bajura that were not connected to the roads during the IBBS must also be included in future research because they may represent similar epidemiology of HIV/STI as seen in other migrant communities. The HIV and STI burden may be exacerbated in these areas due to geographically limited access to education and health care.

Primarily fueled by the lack of economic opportunity in the country and the decade-long civil conflict, migration is the norm especially for men across Nepal (Nepal, 2007). Generally,

the migrants that are of interest to public health have been the ones that work in India because these migrants travel to high-HIV-prevalence areas in India (Bombay and Delhi) and engage in high-risk sexual behavior at their destination and at home with their wives (Poudel et al., 2003; Poudel et al., 2004; New Era, 2008b; UNAIDS, 2008). In Far-Western Nepal, labor migration to India has been the norm for generations because this area consists of the most remote and impoverished districts in all of Nepal (Nepal, 2007; New Era, 2008b; UN, 2013a). In addition, it is not difficult to migrate to India because there is an open border and visas or work permits are not required to migrate and work in India (Nepal, 2007).

Male labor migrants from this area are "circular migrants," meaning they travel for employment and return home to visit their families several times a year (Lurie et al., 1997). Circular migration increases risk of HIV/STIs in migrants and their spouses at home because migrants are involved in extramarital sex with CSWs and bridge the transmission of HIV/STIs from high-risk populations to the general population (migrants' sexual partners) (Lurie et al., 1997; Smith-Estelle & Gruskin, 2003; Nepal, 2007; New Era, 2008b).

Although migrant workers and their wives are considered a high-risk population by the NCASC and the United Nations, there are very few studies that have explored the sociocultural and behavioral aspects of migration that increase the risk of HIV/STIs for migrants and their wives (Smith-Estelle & Gruskin, 2003; New Era, 2008a; New Era, 2010). Furthermore, authors from a large study conducted among 900 married women, ages 15–49, in one migrant community in Nepal found having a husband who migrated to India was significantly associated with being diagnosed with at least one STI in women (Smith-Estelle & Gruskin, 2003). The findings from this study are also consistent with the literature available on migrant workers'

spouses in other areas of the world (Qin et al., 2009; Sevoyan & Agadjanian, 2010; Saggurti et al., 2012).

Among wives of migrant workers, consistently using a condom during sexual intercourse with a husband was very low at 10.5% and condom use during last sex was only 17.2% (New Era, 2010). Although the 12-month period prevalence of STI symptoms among wives of migrants in Far-Western Nepal was 21.5%, only 48% of these women had sought treatment for their STI symptoms (New Era, 2010). There are efforts by many NGOs to induce sexual behavior change by promoting condom use. However, Smith-Estelle and Gurskin (2003) assert that because of the gender-based discrimination in Nepal, which impacts access to education, women lack the knowledge of STI/HIV and condom use, and are in a vulnerable position to negotiate condom use and initiate sexual behavior change with their husbands.

A structured interview and focus group discussion among 120 women from rural nonmigrant communities in Nepal underscores the lack of knowledge of STIs, which leads women to delay seeking healthcare (Poudel-Tandukar et al., 2003). According to a study that examined representative data from the NDHS, married women who are involved in decision-making or have higher educational attainment within their household are more likely to negotiate condom use and refuse sex (Atteraya et al., 2014). Furthermore, an intervention program conducted among women from the capital city, who had more than a high school education, found that knowledge of HIV and sexual health is low among educated women because of the stigma attached to talking about sexual health (Kaufmann et al., 2012).

In addition, there is also a stigma attached to STIs, and women may be blamed for STIs even though they acquired them from their husbands (Rizvi & Luby, 2004). Therefore, unequal

gender roles may make women more powerless against unprotected sex and reduce their ability to negotiate condom use because of economic dependence on their husbands and fear of violence (Smith-Estelle & Gruskin, 2003; Poudel-Tandukar et al.,2003; Rizvi & Luby, 2004). Having a migrant husband also has a toll on the overall health of the women because they face increased workload, food insecurity, and lack funds to seek medical care when necessary (Smith-Estelle & Gruskin, 2003). In addition, lack of health-seeking behavior can have tremendous consequences on the women's reproductive health and their unborn children because of the complications associated with untreated STIs.

According to the NCASC, prevention programs have already been initiated in many migrant communities. However, whether behavioral change and condom use has increased is not apparent from the IBBS because HIV and STI prevalence is still considerably high (Success Research Option, 2010). A recent focus group discussion and in-depth interview among migrant workers from Far-Western Nepal found that lack of knowledge of HIV/STIs and inconsistent/unwillingness to using condoms during sexual intercourse with CSWs in India was prevalent among almost all of the participants (Bam et al., 2013).

It is evident from the few surveys in Nepal among migrant workers' wives and studies in other areas of the world that women in migrant communities are vulnerable to HIV/STIs from their spouses (Mercer et al., 2007; Poudel et al., 2004; New Era, 2010; Sevoyan & Agadjanian, 2010; Saggurti et al., 2012). Rural women are vulnerable to STI/HIV infections because of their husbands' migration status and gender-based discriminations imbedded in the Nepalese culture that impact access to education and result in economic dependence, and limited rights (Smith-Estelle & Gruskin, 2003; New Era, 2010). However, very few studies have explored the sociocultural and behavioral factors that increase the STI risk for the wives of migrant workers in

Nepal. This gap in the literature among women in migrant communities in Nepal must be filled to better understand women's behavioral risk factors and sociocultural vulnerabilities that put them at risk for STIs.

II. PURPOSE

Although risks of STIs are dependent on individual behaviors, socioeconomic factors such as poverty and migration also play into the epidemiology of STIs. With the increase in rural-to-urban migration in most developing countries, there is a growing body of literature documenting migrant workers as a high-risk population in acquiring and spreading HIV/STIs in many different areas of the world (Poudel et al., 2003; Hu et al., 2006; Saggurti et al., 2009; Sevoyan & Agadjanian, 2010). In particular, circular migrants are an important group to consider in the epidemiology of HIV/STIs because they function as a bridge population to spread STIs from high-risk groups (CSWs) to the general population (Lurie et al., 1997; Mercer et al., 2007; Qin et al., 2009; Roy et al., 2010). Research on migrants' spouses from different parts of the world—Africa, Asia, and Western Europe —has also demonstrated that women are vulnerable to HIV/STIs from their spouses and non-spousal migrant partners (Poudel et al., 2004; Mercer et al., 2007; New Era, 2008a; Sevoyan & Agadjanian, 2010; Saggurti et al., 2012). Transmission of HIV/STIs from migrants to their spouses in rural areas of Nepal has led to concentrated epidemics of HIV in migrant communities (NCASC, 2012; UN, 2013a).

Similar to many other developing countries, STI surveillance is almost nonexistent in Nepal, aside from some occasional prevalence studies carried out by hospitals or INGOs. Although STIs are a public health problem, competing health issues, lack of resources, and infrastructure prevents the government of Nepal from prioritizing STIs. Further, STI control is recognized as a method for HIV prevention by the NCASC, but the burden of STIs among most at-risk groups for HIV, such as wives of migrant workers, is not known (NCASC, 2009).

Moreover, there are very few studies that have explored the sociocultural and behavioral-risk factors of STIs among women in migrant communities in Nepal. Since migrant workers'

wives are one of the highest-risk groups for HIV, surveillance of STIs in this community is essential to control STIs and prevent HIV. It is important to understand the burden of STIs because it increases the risk of HIV transmission and inflicts tremendous health, social, and economic consequences. Therefore, it is imperative to measure the burden of STIs in the migrant communities in order to understand the magnitude of the problem and assess if there is need for STI care in this population. Prevalence study will also aid to direct prevention and control efforts to the communities.

The purpose of this study was to measure the burden of STI symptoms in women in Bajura, Far-Western Nepal. Furthermore, the study explored the association between prevalence of STI symptoms in women and their husbands' migration status. The study also identified sexual risk behaviors of women and their spouses, examined STI knowledge and safe sex behaviors, and explored access to health care. Spouses of migrant workers have been identified as a high-risk group for HIV/AIDS, but STIs have similar risk factors as HIV; therefore, it was hypothesized that the burden of STIs is high in this group. The main objectives of this study were to: (1) measure the prevalence of STIs in women in Bajura, Nepal; (2) explore the relationship between STIs in women and their husbands' migration status; and (3) identify the risk factors of STIs in women.

III. Methods

A. Study Design

This was a cross-sectional study that was conducted in Bajura district, Nepal, using a standardized survey to measure prevalence of STI symptoms in women. A cross-sectional survey was the most cost-effective and logistically feasible study design to understand the burden of STI symptoms in this population. Although etiologic testing is the gold standard to measure prevalence, it was not feasible in Bajura district due to the difficult geography, lack of economic and human resources, and infrastructures such as laboratory facilities and lab technicians. Although etiologic testing was not feasible, the proposed study was warranted in this district due to the potentially high risk for STI and HIV in Bajura, which is considered a high-risk district for HIV/AIDS (UN, 2013a), and where labor migration of males to India is common. Despite Bajura being a migrant community and at high risk for HIV/STIs, no research has been conducted in Bajura to assess STI symptom burden in women, primarily due to the inaccessible topography of this district.

B. Study Population and Sample Size

Bajura district is located in the Far-Western hill area of Nepal and is comprised of 27 VDCs. There were approximately 24,778 women between the ages of 15 and 39 who were eligible to participate (Central Bureau of Statistics, 2012). Data collection took place from July through August 2014 and the study recruited 426 women from 10 VDCs.

According to the Nepal Census, 6,044 men are missing, who were estimated as the migrants that originated from Bajura. For the purpose of calculating the sample size they were used as the proxy for all wives of migrant workers (Central Bureau of Statistics, 2012). There are

approximately 33,459 ever-married women in Bajura (Central Bureau of Statistics, 2012). Therefore, considering migrant husbands to be the exposure, the ratio of unexposed/exposed was estimated as: 27,415(total wives minus exposed wives)/6,044 (exposed wives), which is 4.54. Previous surveys show the 12-month period prevalence of STI symptoms to be 8.9% in all women and 21% in wives of migrant workers in Far-Western Nepal (New Era, 2010; Ministry of Health and Population, 2012).

Using these estimates, the sample size was calculated with OpenEpi Software Version 3, which applied Kelsey et al. (1989) formula for cross-sectional study to determine a sample size with 80% power and two-sided significance level of 0.05 (OpenEpi, 2013). We estimated needing to enroll 358 women to detect a 12% absolute difference in STI symptom prevalence between women with migrant and residential husbands. We inflated the estimate by 10% to include 400 women to account for possible incomplete surveys, which may result in missing outcome or exposure variables. Of the 400 women we aimed to enroll, it was expected that with simple random sampling, 73 (18.3%) will be those with migrant husbands and 327 will be those with residential husbands. To achieve a sufficient number of women with migrant husbands, and to account for the possibility of a low proportion of women with migrant husbands, we aimed to enroll up to 25% (500) above the target sample size of 400.

1. **Inclusion criteria**

To participate in the study, women needed to be currently married and between the ages of 16 and 35. Women under 18 are included in this study because 62% of women's age at first marriage is 15–19 years in Nepal (Nepal Census). This means that these younger women are at risk for STIs because they are engaging in sexual intercourse. Furthermore, a survey among wives of migrant workers in Far-Western Nepal found that age at first marriage ranged

from 8 to 26 years with 71% getting married between 15 and 19 years of age (New Era, 2010). Therefore, excluding this group would not be equitable and the results would not be representative of married women. Eligible women were also permanent residents of the VDC and the ward where potential subjects were recruited.

2. **Exclusion criteria**

Women who were separated, divorced, or widowed were not included in the study. While these women were still at risk for STIs and HIV, the overall hypothesis is that STI symptom burden is related to male partners' migrant status. Culturally, unmarried women in this setting are unlikely to have sexual partners.

C. Data Collection

Data were collected using a standardized quantitative survey that included questions on sociodemographic characteristics, detailed history of reproductive health and STI symptoms, sexual risk behavior, STI knowledge, knowledge of condom use, husband's migration history, and history of husband's STI symptoms. The consent procedure and the face-to-face interview were administered in Nepali and completed by the primary investigator (PI) and native Nepali female research assistants (RAs).

1. **Sampling procedure**

To minimize selection bias and reduce the time and economic cost of the study, a multistage sampling method was employed. First, 10 VDCs (primary sampling unit) were selected by simple random sample from the 27 VDCs. From each of these 10 selected VDCs, four wards were randomly selected by simple random sample from the nine wards that are in each VDC, which resulted in 40 wards (secondary sampling unit). All households at the

ward level were considered in the sampling frame. Since houses were present in clusters, the investigators started recruitment from one end of the cluster and approached women from every 2nd, 3rd, 4th, 5th house until the desired sample size was reached at each ward. The order of the houses to approach (for example, the 2nd house, then 3rd house, then 4th) was determined by generating a list of 20 random numbers, with the numbers ranging from two to five.

The PI and/or the RA visited each household and identified whether the women from these households were eligible to participate in the study using the inclusion criteria. If there were no eligible women in the selected household or if no women were present or if the potential subject(s) refused to participate, the women from the next house indicated by the sampling method were approached. If one household had more than one eligible married woman, one of them was selected through simple random selection and requested to participate in the study. If she refused, then the next eligible woman was invited to participate. Simple random sampling was selected throughout for its ease of implementation in the field.

2. **Quality assurance**

Four RAs were hired after conducting interviews of possible candidates identified by CARE Nepal. The RAs were females from Bajura with a 12th grade or higher education, and had previously worked on HIV/STI projects. The RAs received a two-day intensive training from the PI, which included training on ethical principles and protection of human subjects according to the National Ethical Guidelines for Health Research in Nepal, information on the epidemiology of STIs, the study protocol, consent procedure, and administration of the questionnaire. The training also involved mock-interviews and role-play to practice approaching subjects, learn rapport-building techniques, and handle potential problems/emotional discomfort that might arise during the interview.

To maintain quality assurance and control, the RAs and the PI traveled to each of the 10 VDCs together. In that way, the PI was able to continuously support and provide feedback to the RA to improve data-collection strategy and to reducing missing/inconsistent data. At the end of each interview all the answers were cross-checked for completion by the PI and the RA. Data entry and cleaning was carried out by the PI at the end of the survey period.

3. Ethical approval

A signed consent form was obtained for the subjects before starting the interview and interviews were conducted in a private space identified by the subject. Every subject was provided with Information Education Communication materials used by CARE Nepal to ensure that subjects have access to information regarding STIs/HIV and safe sex practices. The subjects were also provided with condoms. This study was approved by the Nepal Health Research Council and by the Office for the Protection of Research Subjects at University of Illinois at Chicago.

D. Data Analysis

1. Dependent variable

The dependent variable of interest in this study was self-reported STI symptoms in women. With dichotomous (yes/no) response, women were asked if they currently had, or in the past 12 months (as separate questions) had: (1) vaginal discharge with change in color or increase in amount; (2) foul odor discharge; (3) genital itching; (4) painful and/or painless genital ulcer; (5) pain or burning on urination; (6) vaginal bleeding (not menses); and (7) lower abdominal pain. For comparability to the literature these symptoms were categorized according to the WHO syndromic management guideline and Nepal's National STI Management

Guidelines (NCASC, 2009; WHO 2003). Three syndromes—VDS, LAPS, and genital ulcer were the primary outcome of interests that were analyzed because identification and treatment of these syndromes are specifically iterated in the WHO and Nepal's STI guidelines. Vaginal discharge syndrome was categorized as present for those who reported foul odor discharge, discharge with change in color or increase in amount, or both. Lower abdominal pain syndrome was categorized as anyone who reported VDS and lower abdominal pain. Genital ulcer disease syndrome included self-reported painless and/or painful genital ulcers.

2. **Independent variable**

The primary exposure of interest was migration status of a woman's spouse. Husband's migration status was measured as a dichotomous (Yes/No) variable using the question "Is your husband a migrant worker?" Migrant worker husband was defined as a person who has been outside of Nepal for at least three months within the past 12 months (Poudel et al., 2003).

3. **Covariates**

Demographic variables such as age, education, caste, and family type were considered for potential confounding and effect modification. Age of women and husbands were measured as a continuous variable, but categorized (16–20, 21–25, 26–30, 31–35) to estimate the prevalence ratio (PR). Age was categorized according to the trend present in the univariate distribution. Education for both women and husband was measured as a continuous variable from zero to 16 years of schooling, and was categorized into no education, primary (grades 1–5), secondary (6–10), and 11 plus. Caste is categorized into upper and lower where upper caste includes Brahman, Chetree, and Thakuri and lower caste includes all others. Family type was

measured as joint if the woman resides with in-laws and as neutral if the women resides with her husband and children only.

Reproductive factors, husband's sociodemographic and behavioral characteristics, and condom use were also considered as potential confounders and effect modifiers. Husband's behavioral characteristics included engaging in sexual intercourse while intoxicated, and unwilling sexual intercourse. Unwilling sexual intercourse is a composite variable where women reported having sexual intercourse with husband unwillingly; having intercourse because they were afraid of the husband; or because the husband got angry if the woman refused sex. Condom use was a composite variable created by combining those who reported using condoms during sexual intercourse with husband and during the last sexual intercourse with husband.

Women's age at coitarche was measured as a continuous variable and categorized for analysis (≤15, 16–17, 18–20, 21-plus) according to the distribution seen in the univariate analysis. Twelve different family planning methods were specifically assessed, and were categorized for analysis as none, hormonal (Depoprovera shot, pills, and implant), nonhormonal (copper intrauterine device and condom), sterilization (male or female sterilization), and others (withdrawal and fertility pattern methods).

4. **Statistical analysis**

a. **Univariate analysis**

Univariate distributions were generated to examine the frequency of outcome, exposure, all of the covariates, and to examine missing values. Categorization of continuous variables and collapsing of categorical variables were informed by the univariate analysis.

b. **Bivariate analysis**

Bivariate analysis was conducted to examine the distribution and general differences of each exposure variable by outcome using chi square-test. In addition, crude PR and 95% CIs of each of the three STI syndromes and their association with migration status and the covariates were generated using Chochran-Mantel-Haenszel Statistic with the relative risk option. This single factor stratified analysis assessed for effect modification and confounding of the relationship between STI syndrome and migrant husband by covariates. Variables were selected to test for potential confounding and effect modification based on previous literature and conceptual model.

The Breslow Day Test for Homogeneity p-value <0.20 was used to consider a covariate as an effect modifier. In addition, stratum-specific qualitative differences were also considered to identify covariates as possible effect modifiers. Covariates that modified the PR by 10% or more were defined as a confounder.

c. **Regression analysis**

Although Log Binomial Regression is the ideal method because the prevalence of STI symptoms is not rare (>5%) the data did not converge. Therefore, modified Poisson Regression with robust error variances was used to generate PR and 95% CI. Backward selection strategy was used to determine the significant effect modifiers and confounders of the association between STI symptoms and migrant worker husband. Initial full model started with all covariates that were associated with STI symptoms from the bivariate analysis, and at each step covariates were retained in model if the variables had Wald chi-square p-value <.05. Covariates were retained in the model as confounders if the variable changed the PR by 10% or

more. When the final adjusted model was obtained, the effect modifiers that were significant in the bivariate analysis were added as product terms into the adjusted model. Covariates were retained in the model as effect modifiers if the Wald chi-square p-value for the interaction term was <.10. Data were analyzed using SAS Software Version 9.4 (SAS Institute Inc., Cary, North Carolina, USA.).

IV. RESULTS

A. Sociodemographic and Behavioral Characteristics of Respondents

The total sample size for this study was 426 women. Overall, the median age of women was 26 (17.8% of women were aged 16–20), 45.0% of women did not have any education, and 31.3% were from the lower caste groups. The median age at coitarche was 18 (30.5% between the ages of 16 and 17), and 24.8% used hormonal contraceptives. Nearly one-third (31.3%) of women had husbands who were migrant workers. The median age of husbands was 29 (36.2% of husbands were above age 31), and 20.1% did not have any education. Most women (80.5%) reported that they do not use condoms during sexual intercourse with their husband. Nearly one-quarter (24.1%) engaged in sexual intercourse when the husband was intoxicated, and 30.3% engaged in sexual intercourse with husband unwillingly. When asked what the chances of acquiring STIs from their husband was, 64.9% of women reported that there was no chance at all and 15.9% reported that there was a moderate-to-high chance. Sociodemographic characteristics of women and their husbands, sexual and reproductive health characteristics, and prevalence of STI syndromes and symptoms are presented in Table I.

B. Prevalence and Risk Factors of Sexually Transmitted Infection Symptoms and Syndromes

Current STI symptoms were common: 17.2% VDS, 14.4% LAPS, 8.9% GUD, 12.7% vaginal bleeding, 22.8% pain or burning on urination, and 20.8% genital itching. The VDS and LAPS were highly correlated because most women who reported VDS also reported lower

abdominal pain. However, not all women who reported lower abdominal pain reported VDS. The current STI symptoms among women is not correlated with their husbands' STI symptoms.

The correlation between STI symptoms among women and husband and the husband's migration status is presented in Table II. The 12-month period prevalence (data not shown) of these STI symptoms was also high and similar to point prevalence except for GUD, which was much lower (2.3%). The 12-month period prevalence of STI symptoms among husbands as reported by wives (data not shown) was also common: 9.6% urethral discharge, 14.2% urethral pain, 24.1% urethral burn, and 8.4% GUD.

TABLE I

DISTRIBUTION OF INDEPENDENT VARIABLES IN THE POPULATION AND THE DISTRIBUTION OF INDEPENDENT VARIABLES BY REPORTED STI SYMPTOMS

Independent Variables	Distribution in Population N (% of sample)	Vaginal Discharge Syndrome[a] %	Lower Abdominal Pain Syndrome[b] %	Genital Ulcer %	Vaginal Bleeding %	Pain or Burning on Urination %	Genital Itching %
Overall	426 (100)	17.2	14.42	8.9	12.7	22.8	20.8
Migrant worker husband							
No	292 (68.7)	48.0*	47.5*	55.3*	55.6*	46.4*	45.5
Yes	133 (31.3)	52.0	52.5	44.7	44.4	53.6	54.5*
Age in years							
16–20	76 (17.8)	2.7*	1.6*	5.3*	14.8*	7.2*	7.9*
21–25	120 (28.2)	20.6	23.0	13.1	11.1	25.8	20.5
26–30	127 (29.8)	35.6	41.0	39.5	38.9	34.0	37.5
31–35	103 (24.2)	41.1	34.4	42.1	35.2	33.0	34.1
Highest education							
None	190 (45.0)	71.2*	68.9*	76.3*	66.0*	63.9*	65.9*
1–5	64 (15.2)	12.3	13.1	5.3	13.2	17.5	14.8
6–10	103 (24.4)	15.1	16.4	15.8	15.1	12.4	15.9
11 +	65 (15.4)	1.4	1.6	2.6	5.7	6.2	3.4
Caste							
Upper	285 (68.7)	53.6*	49.1*	61.1	54.7	42.5*	62.3
Lower	130 (31.3)	46.4	50.9	38.9	45.3*	57.5	37.7
Family type							
Joint	226 (56.5)	39.1*	41.4*	42.9**	50.9	42.5	32.9*
Neutral	174 (43.5)	60.9	58.6	57.1	49.1	57.5**	67.1
Age coitarche in years							
≤15	80 (18.7)	24.7	24.6	31.6*	33.3*	24.7**	21.5*
16–17	130 (30.5)	35.6	36.1	29.0	20.4	37.1	42.1
18–20	190 (44.6)	35.6	34.4	34.2	42.6	34.0	32.2
21- plus	26 (6.1)	4.1	4.9	5.3	3.7	4.1	3.4

*p<.05; **p<.10 (Pearson's chi-square)

[a] Vaginal discharge with change in color, foul odor, or increase in amount.

[b] Lower abdominal pain with vaginal discharge.

DISTRIBUTION OF INDEPENDENT VARIABLES IN THE POPULATION AND THE DISTRIBUTION OF INDEPENDENT VARIABLES BY REPORTED STI SYMPTOMS

Independent Variables	Distribution in Population N (% of sample)	Vaginal Discharge Syndrome[a] %	Lower Abdominal Pain Syndrome[b] %	Genital Ulcer %	Vaginal Bleeding %	Pain or Burning on Urination %	Genital Itching %
Family planning method[c]							
None	179 (42.6)	30.1*	26.2*	42.1	37.7	45.4	39.8
Hormonal	104 (24.8)	24.7	26.2	26.3	28.3	22.7	23.9
Nonhormonal	81 (19.3)	20.6	24.6	18.4	17.0	14.4	19.3
Sterilization and other	56 (13.3)	24.7	23.0	13.2	17.0	17.5	17.1
Husband's age in years							
16–20	19 (4.5)	1.4*	1.7*	0.0*	5.6	1.1*	2.3*
21–25	125 (29.6)	11.1	13.3	15.8	18.9	22.1	14.9
26–30	126 (29.8)	31.9	35.0	21.0	28.3	31.6	32.2
31+	153 (36.2)	55.6	50.0	63.2	47.2	45.2	50.6
Husband's highest education							
None	85 (20.1)	33.3*	33.3*	31.6*	30.2*	30.5*	29.9*
1–5	66 (15.6)	22.2	26.7	21.1	17.0	19.0	24.1
6–10	137 (32.5)	33.3	30.0	44.7	43.4	36.8	34.5
11–12	77 (18.3)	2.8	3.3	0.0	5.7	7.4	4.6
College	57 (13.5)	8.4	6.7	2.6	3.8	6.3	6.9
Ever use a condoms with husband							
No	341 (80.0)	72.6**	70.5*	78.9	74.1	80.4	77.3
Yes	85 (20.0)	27.4	29.5	21.1	25.9	19.6	22.7

*p<.05 **p<.10 (Pearson's chi-square)

[a] Vaginal discharge with change in color, foul odor, or increase in amount

[b] Lower abdominal pain with vaginal discharge

[c] Hormonal contraception—Depo-provera, birth control pills, and implants, nonhormonal—intrauterine device and condoms, sterilization—male or female

DISTRIBUTION OF INDEPENDENT VARIABLES IN THE POPULATION AND THE DISTRIBUTION OF INDEPENDENT VARIABLES BY REPORTED STI SYMPTOMS

Independent Variables	Distribution in Population N (% of sample)	Vaginal Discharge Syndrome[a] %	Lower Abdominal Pain Syndrome[b] %	Genital Ulcer %	Vaginal Bleeding %	Pain or Burning on Urination %	Genital Itching %
Ever have sex while intoxicated							
No	319 (76.0)	60.3*	57.4*	73.7	72.2	65.0*	61.4*
Yes	101 (24.0)	39.7	42.6	26.3	27.8	35.0	38.6
Unwilling sexual intercourse with husband							
No	297 (69.7)	57.5*	57.4*	50.0*	57.4*	54.6*	52.3*
Yes	129 (30.3)	42.5	42.6	50.0	42.6	45.4	47.7
Chance of acquiring STIs[d]							
No chance	270 (64.9)	30.6*	28.3*	36.1*	35.9*	40.4*	30.6*
Little chance	56 (13.5)	23.6	21.7	13.9	9.4	19.2	22.4
Moderate to high chance	66 (15.9)	41.7	46.7	47.2	50.9	38.3	43.5
Don't know	24 (5.8)	4.2	3.3	2.8	3.8	2.1	3.5

*p<.05 **p<.10 (Pearson's chi-square)

[a] Vaginal discharge with change in color, foul odor, or increase in amount

[b] Lower abdominal pain with vaginal discharge

[d] Women's perception of how likely it is to acquire STIs from there husband

TABLE II

CORRELATION OF STI SYMPTOMS/SYNDROMES AMONG WOMEN, THEIR HUSBAND, AND HUSBAND'S MIGRANT STATUS

Variables	VDS	LAPS	GUD	UD	UP	UB	GUD male	MWH
VDS	1.000							
LAPS	0.897	1.000						
GUD	0.360	0.367	1.000					
Urethral discharge	0.487	0.548	0.314	1.000				
Urethral pain	0.338	0.343	0.449	0.471	1.000			
Urethral burn	0.489	0.507	0.381	0.633	0.677	1.000		
GUD male	0.357	0.380	0.380	0.390	0.446	0.429	1.000	
Migrant Worker Husband	0.216	0.199	0.094	0.277	0.166	0.259	0.089	1.000

VDS—vaginal discharge syndrome; LAPS—lower abdominal pain syndrome; GUD—genital ulcer disease; UD—urethral discharge; UP—urethral pain; UB—urethral burn; MWH—migrant worker husband

1. **Risk factors of vaginal discharge syndrome**

Table III shows the crude and adjusted relationship between VDS and all independent variables. Among women who reported VDS, 52.1% also reported having a migrant husband, 41.1% were between the ages of 31 and 35, and 71.2% did not have any education. More than half (55.6%) of husbands of women reporting VDS were aged 31 or higher and 33.3% did not have any education. Nearly three-fourths (72.6%) of women with VDS reported that they did not use a condom. The crude relative prevalence of VDS was 2.39 (95% CI: 1.59, 3.61) times higher among women with migrant husbands compared to residential husbands. Relative prevalence of VDS was 3.37 (95% CI: 1.96, 5.82) times higher among women who were 31–35 years old compared to those who were 16–25 years old. Prevalence of VDS was 2.07 (95% CI: 1.37, 3.12) times higher among women who had sexual intercourse with their husband when the husband was intoxicated and 1.71 (95% CI: 1.13, 2.59) times higher among those who engaged in sexual intercourse unwillingly. Prevalence of VDS increased as husband's age increased and the prevalence of VDS decreased with the husband's increasing education level.

The final multivariate adjusted model for VDS included husband's migrant status, woman's age, education, caste, family planning method, and condom use. The relative prevalence of VDS among women with migrant husbands is attenuated to 1.74 (95% CI: 1.14, 2.67) when adjusted for women's age, education level, caste, family planning method, and condom use. Women with secondary or higher education had 62% (95% CI: 0.19, 0.78) lower prevalence of VDS compared to those without any education when adjusted for migrant status, women's age, caste, contraception use, and condom use. Prevalence of VDS increased as women's age increased, PR for those who were aged 26–30 was 2.06 (95% CI: 1.11, 3.84) compared to those who were aged 16–25.

TABLE III

DISTRIBUTION OF VAGINAL DISCHARGE SYNDROME BY INDEPENDENT VARIABLES WITH CRUDE AND MULTIVARIATE ADJUSTED PREVALENCE RATIO OF THE ASSOCIATION BETWEEN VAGINAL DISCHARGE SYNDROME AND INDEPENDENT VARIABLES.

Covariates		Vaginal Discharge Syndrome		Chi-Squared P-value	Crude PR (95% CI)	Adjusted PR (95% CI) N=402
		Yes N=73, n (%)	No (Ref) N=351, n (%)			
Migrant worker husband						
	No	35 (48.0)	256 (73.1)	<.01	Ref	Ref
	Yes	38 (52.0)	94 (26.9)		2.39 (1.59, 3.61)	1.74 (1.14, 2.67)
Age in years						
	16–25	17 (23.3)	178 (50.7)		Ref	Ref
	26–30	26 (35.6)	101 (28.8)	<.01	2.35 (1.33, 4.15)	2.06 (1.11, 3.84)
	31–35	30 (41.1)	72 (20.5)		3.37 (1.96, 5.82)	2.87 (1.54, 5.37)
Highest education						
	None	52 (71.2)	137 (39.5)		Ref	
	1–5	9 (12.3)	55 (15.9)	<.01	0.51 (0.27, 0.98)	0.67 (0.36, 1.27)
	6-plus	12 (16.5)	155 (44.6)		0.26 (0.14, 0.47)	0.38 (0.19, 0.78)
Caste						
	Upper	37 (53.6)	248 (72.1)	<.01	Ref	Ref
	Lower	32 (46.4)	96 (27.9)		1.93 (1.26, 2.94)	1.80 (1.20, 2.70)
Family type						
	Joint	27 (39.1)	198 (60.2)	<.01	Ref	NA, not in final model
	Neutral	42 (60.9)	131 (39.8)		2.02 (1.30, 3.14)	
Age coitarche in years						
				0.11		
	≤15	18 (24.7)	62 (17.7)		Ref	NA, not in final model
	16–17	26 (35.6)	103 (29.3)		0.90 (0.53, 1.53)	
	18 +	29 (39.7)	186 (53.0)		0.60 (0.35, 1.02)	

*Not all cells sum to N due to missing data.

PR—Prevalence ratio; CI—Confidence Interval; Ref—Reference category

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DISTRIBUTION OF VAGINAL DISCHARGE SYNDROME BY INDEPENDENT VARIABLES WITH CRUDE AND MULTIVARIATE ADJUSTED PREVALENCE RATIO OF THE ASSOCIATION BETWEEN VAGINAL DISCHARGE SYNDROME AND INDEPENDENT VARIABLES.

Covariates	Vaginal Discharge Syndrome		Chi-Squared	Crude PR (95% CI)	Adjusted PR (95% CI) N=402
	Yes N=73, n (%)	No (Ref) N=351, n (%)			
Family planning method [a]			<.01		
None	22 (30.1)	156 (45.2)		Ref	Ref
Hormonal	18 (24.7)	85 (24.6)		1.41 (0.80, 2.51)	1.39 (0.77, 2.51)
Nonhormonal	15 (20.5)	66 (19.1)		1.50 (0.82, 2.73)	1.89 (0.99, 3.60)
Sterilization and other	18 (24.7)	38 (11.0)		2.60 (1.51, 4.49)	2.22 (1.30, 3.76)
Husband's age in years			<.01		
16–25	9 (12.5)	134(38.4)		Ref	
26–30	23 (31.9)	103 (29.5)		2.90 (1.39, 6.03)	NA, not in final model
31-plus	40 (55.6)	112 (32.1)		4.18 (2.11, 8.30)	
Husband's highest education			<.01		
None	24 (33.3)	60 (17.2)		Ref	
1–5	16 (22.2)	50 (14.4)		0.85 (0.49, 1.46)	NA, not in final model
6–10	24 (33.3)	113 (32.5)		0.61 (0.37, 1.01)	
11 +	8 (11.1)	125 (35.9)		0.21 (0.10, 0.45)	
Ever use a condoms with husband			0.08		
No	53 (72.6)	286 (81.5)		Ref	Ref
Yes	20 (27.4)	65 (18.5)		1.51 (0.95, 2.37)	2.34 (1.49, 3.69)
Ever have sex while intoxicated			<.01		
No	44 (60.3)	273 (79.1)		Ref	NA, not in final model
Yes	29 (39.7)	72 (20.9)		2.07 (1.37, 3.12)	
Unwilling sexual intercourse with husband			0.01		
No	42 (57.5)	254 (72.4)		Ref	NA, not in final model
Yes	31 (42.5)	97 (27.6)		1.71 (1.13, 2.59)	

*Not all cells sum to N due to missing data.

PR—Prevalence ratio; CI—Confidence Interval; Ref—Reference category

[a] Hormonal contraception—Depo-provera, birth control pills, and implants, nonhormonal—intrauterine device and condoms, sterilization—male or female

Also, in the adjusted model, women who were from lower castes had 1.80 (95% CI: 1.20, 2.70) times higher prevalence of VDS compared to those from higher castes. Women who reported that they or their husband were sterilized had a 2.22 (95% CI: 1.30, 3.76) times higher prevalence of VDS compared to women who did not use any family planning methods. Using condoms did not seem to be protective; women who used condoms had 2.34 (95% CI: 1.49, 3.69) times higher prevalence of VDS compared to those who used condoms.

Engaging in unwilling sexual intercourse with husband and women's education were both significant effect modifiers of the relationship between VDS and migrant status in the multivariate adjusted model. The results of the single factor stratified analysis is presented in Table IV and Table V. After stratifying by unwilling sexual intercourse with husband, the relationship between VDS and migrant status was only significant among those who did not report unwilling sexual intercourse. Among those who did not report unwilling sexual intercourse and had a migrant husband, the relative prevalence of VDS was 2.34 (95% CI: 1.32, 4.16) compared to those who had a migrant husband, compared to PR of 1.04 (95% CI: 0.57, 1.87) for those who reported having unwilling sexual intercourse. After stratifying by women's education level (none, 1–5, and 6-plus), the relationship between VDS and migrant status was stronger as education level increased. However, due to wide confidence intervals, the relationship between migrant status and VDS was modeled among those who had no education versus those with any education. For those who had no education and had a migrant husband, the prevalence of VDS was increased by 30% (95% CI: 0.82, 2.08) compared to those who did not have a migrant husband, compared to PR of 4.16 (95% CI: 1.75, 9.87) for those who had any education.

TABLE IV

MULTIVARIATE ADJUSTED PREVALENCE RATIO AND 95% CI OF VAGINAL DISCHARGE SYNDROME AND MIGRANT WORKER HUSBAND-ASSOCIATION STRATIFIED BY UNWILLING SEXUAL INTERCOURSE WITH HUSBAND

Unwilling sexual intercourse with husband (n)	Migrant Worker Husband (n)	PR (95% CI)
Yes (128)	No (62)	Ref
	Yes (66)	1.04 (0.57, 1.87)
No (297)	No (230)	Ref
	Yes (67)	2.34 (1.32, 4.16)

*Wald chi-square p-value for the interaction term <.07
Adjusted for age, education, caste, condom use, and family planning methods

TABLE V

MULTIVARIATE ADJUSTED PREVALENCE RATIO AND 95% CI OF VAGINAL DISCHARGE SYNDROME AND MIGRANT WORKER HUSBAND-ASSOCIATION STRATIFIED BY WOMAN'S EDUCATION LEVEL

Woman's highest education level* (n)	Migrant Worker Husband (n)	PR (95% CI)
None (189)	No (113)	Ref
	Yes (76)	1.31 (0.82, 2.09)
Any education (232)	No (175)	Ref
	Yes (57)	4.16 (1.75, 9.87)

* Wald chi-square p-value for the interaction term <.01
Adjusted for age, caste, condom use, and family planning methods

2. **Risk factors of lower abdominal pain syndrome**

Table VI shows the crude and adjusted relationship between LAPS and all independent variables. More than half (52.5%) of women who reported LAPS had migrant worker husbands, 41.0% were aged 26–30, and 68.9% did not have any education. Half (50.0%) of husbands of women with LAPS were 31 years of age or older and 70.5% did not use condoms. The crude relative prevalence of LAPS was 2.42 (95% CI: 1.53, 3.84) times higher among women with migrant husbands compared to those with residential husbands. Relative prevalence of LAPS among women increased as husband's age increased and decreased with increased education level of husband. Those with 6–10 years of education had 45% (95% CI: 0.31, 0.98) reduced prevalence compared to husbands with no education. Women who engaged in sex when their husbands were intoxicated had 2.32 (95% CI: 1.47, 3.66) times higher prevalence of LAPS compared to women who did not engage in sex when their husbands were intoxicated.

The final multivariate adjusted model for LAPS included husband's migrant status, women's age, education, caste, family planning method, and condom use. Compared to the crude model, relative prevalence of LAPS among women with migrant husbands is attenuated to 1.72 (95% CI: 1.06, 2.79) when adjusted for all other factors in the model. In the adjusted model women aged 26–30 had 2.41 (95% CI: 1.25, 4.66) times higher prevalence of LAPS compared to women aged 16–25. The prevalence of LAPS was 61% (95% CI: 0.18, 0.86) lower among women who had six or more years of education compared to women without any education. Lower caste women had 2.14 (95% CI: 1.35, 3.41) times higher prevalence of LAPS compared to higher caste women. Women who reported that they use condoms/IUD or their husband was sterilized had a 2.68 (95% CI: 1.32, 5.42) and 2.22 (95% CI: 1.30, 3.76) times higher prevalence

of VDS, respectively, compared to women who did not use any family planning methods. Using condoms was not protective against LAPS (PR=2.44; 95% CI: 1.47, 4.06).

Women's education level and unwilling sexual intercourse with husband were found to be significant effect modifiers of the relationship between migration status and LAPS. Results of the stratified analysis are presented in Table VII and Table VIII. After stratifying the adjusted final model by unwilling sexual intercourse, the relationship between migration status and LAPS was only significant among those who did not report unwilling sexual intercourse. Among those who did not report unwilling sexual intercourse and had a migrant worker husband, the relative prevalence of LAPS was 2.60 (95% CI: 1.36, 4.96) times higher compared to women who had a residential husband, compared to PR of 0.84 (95% CI: 0.44, 1.61) for those who reported unwilling sexual intercourse. When stratified by women's education level, the categories were collapsed into no education versus any education because the PR among those with primary or secondary education were similar (data not shown). Women who received any education and had a migrant worker husband had 4.18 (95% CI: 1.63, 10.74) times higher prevalence of LAPS compared to women with a residential husband, compared to PR of 1.24 (95% CI: 0.72, 2.14) for women without any education.

TABLE VI

DISTRIBUTION OF LOWER ABDOMINAL PAIN SYNDROME BY INDEPENDENT VARIABLES WITH CRUDE AND MULTIVARIATE ADJUSTED PREVALENCE RATIO OF THE ASSOCIATION BETWEEN LOWER ABDOMINAL PAIN SYNDROME AND INDEPENDENT VARIABLES.

Covariates		Lower Abdominal Pain Syndrome		Chi-Squared P-value	Crude PR (95% CI)	Adjusted PR (95% CI) N=402
		Yes N=61 n (%)	No (Ref) N=362 n (%)			
Migrant worker husband				<.01		
	No	29 (47.5)	261 (72.3)		Ref	Ref
	Yes	32 (52.5)	100 (27.7)		2.42 (1.53, 3.84)	1.72 (1.06, 2.79)
Age in years				<.01		
	16–25	15 (24.6)	179 (49.4)		Ref	Ref
	26–30	25 (41.0)	102 (28.2)		2.56 (1.40, 4.64)	2.41 (1.25, 4.66)
	31–35	21 (34.4)	81 (22.4)		2.66 (1.44, 4.94)	2.49 (1.24, 5.02)
Highest education				<.01		
	None	42 (68.9)	147 (41.1)		Ref	Ref
	1–5	8 (13.1)	56 (15.6)		0.56 (0.28, 1.13)	0.71 (0.34, 1.47)
	6-plus	11 (18.0)	155 (43.3)		0.30 (0.16, 0.56)	0.39 (0.18, 0.86)
Caste				<.01		
	Upper	28 (49.1)	257 (72.2)		Ref	Ref
	Lower	29 (52.9)	99 (27.8)		2.31 (1.43, 3.71)	2.14 (1.35, 3.41)
Family type				0.01		
	Joint	24 (41.4)	200 (59.0)		Ref	NA, not in final model
	Neutral	34 (58.6)	139 (41.0)		1.84 (1.13, 2.97)	
Age coitarche in years				0.15		
	≤15	15(24.6)	65 (18.0)		Ref	
	16–17	22 (36.1)	106 (29.3)		1.67 (0.90, 2.63)	NA, not in final model
	18 +	24 (39.3)	191 (52.7)		1.53 (0.93, 3.04)	

*Not all cells sum to N due to missing data.

PR—Prevalence ratio; CI—Confidence Interval; Ref—Reference category

DISTRIBUTION OF LOWER ABDOMINAL PAIN SYNDROME BY INDEPENDENT VARIABLES WITH CRUDE AND MULTIVARIATE ADJUSTED PREVALENCE RATIO OF THE ASSOCIATION BETWEEN LOWER ABDOMINAL PAIN SYNDROME AND INDEPENDENT VARIABLES

Covariates	Lower Abdominal Pain Syndrome		Chi-Squared P-value	Crude PR (95% CI)	Adjusted PR (95% CI) N=402
	Yes N=61 n (%)	No (Ref) N=362 n (%)			
Family planning Method[a]			0.01		
None	16 (26.2)	162 (45.5)		Ref	Ref
Hormonal	16 (26.2)	87 (24.4)		1.73 (0.90, 3.31)	1.78 (0.91,3.48)
Nonhormonal	15 (24.6)	65 (18.3)		2.09 (1.09, 4.01)	2.68 (1.32, 5.42)
Sterilization and other	14 (23.0)	42 (11.8)		2.78 (1.45, 5.33)	2.55 (1.33, 4.89)
Husband's age in years			<.01		
16–25	9 (15.0)	133 (36.9)		Ref	
26–30	21 (35.0)	105 (29.2)		2.63 (1.25, 5.23)	NA, not in final model
31-plus	30 (50.0)	122 (33.9)		3.11 (1.53, 6.33)	
Husband's highest education			<.01		
None	20 (33.3)	64 (17.8)		Ref	
1–5	16 (26.7)	50 (13.9)		1.02 (0.57, 1.81)	NA, not in final model
6–10	18 (30.0)	119 (33.2)		0.55 (0.31, 0.98)	
11 +	6 (10.0)	126 (35.1)		0.19 (0.08, 0.46)	
Ever use a condoms with husband			<.05		
No	43 (70.5)	296 (81.8)		Ref	Ref
Yes	18 (29.5)	66 (18.2)		1.69 (1.03, 2.77)	2.44 (1.47, 4.06)
Ever have sex while intoxicated			<.01		
No	35 (57.4)	289 (78.9)		Ref	NA, not in final model
Yes	26 (42.6)	75 (21.1)		2.32 (1.47, 3.66)	
Unwilling sexual intercourse with husband			<.05		
No	35 (57.4)	260 (71.8)		Ref	NA, not in final model
Yes	26 (42.6)	102 (28.2)		1.71 (1.08, 2.72)	

*Not all cells sum to N due to missing data.

PR—Prevalence ratio; CI—Confidence Interval; Ref—Reference category

[a] Hormonal contraception—Depo-provera, birth control pills, and implants, nonhormonal—intrauterine device and condoms, sterilization—male or female

Table VII

MULTIVARIATE ADJUSTED PREVALENCE RATIO AND 95% CI OF LOWER ABDOMINAL PAIN SYNDROME AND MIGRANT WORKER HUSBAND-ASSOCIATION STRATIFIED BY UNWILLING SEXUAL INTERCOURSE WITH HUSBAND

Unwilling sexual intercourse with husband * (n)	Migrant Worker Husband (n)	Prevalence Ratio (95% CI)
Yes (128)	No (62)	Ref
	Yes (66)	0.84 (0.44, 1.61)
No (297)	No (230)	Ref
	Yes (67)	2.60 (1.36, 4.96)

* Wald chi-square p-value for the interaction term <.05
Adjusted for age, caste, education, condom use, and family planning methods

TABLE VIII

ADJUSTED PREVALENCE RATIO AND 95% CI OF LOWER ABDOMINAL PAIN SYNDROME AND MIGRANT WORKER HUSBAND-ASSOCIATION STRATIFIED BY WOMAN'S EDUCATION LEVEL

Woman's highest education level* (n)	Migrant Worker Husband (n)	Prevalence Ratio (95% CI)
None (189)	No (113)	Ref
	Yes (76)	1.24 (0.72, 2.14)
Any (232)	No (175)	Ref
	Yes (57)	4.18 (1.63, 10.74)

* Wald chi-square p-value for the interaction term <.05
Adjusted for age, caste, condom use, and family planning methods

3. **Risk factors of genital ulcer disease syndrome**

Table IX shows the crude and adjusted relationship between GUD and all independent variables. Among women who reported GUD, 44.7% had a migrant worker husband, 76.3% had no education, 38.9% were of a lower caste, 78.9% did not use condoms, and 26.3% engaged in sexual intercourse when husband was intoxicated. The crude prevalence of GUD was 78% (95% CI: 0.97, 3.26) higher among women with migrant worker husbands but this association was not statistically significant. Women aged 26–30 had 3.31 (95% CI: 1.39, 7.89) times higher prevalence of GUD compared to women aged 16–25.

Women who reported unwilling sexual intercourse with husband had 2.30 (95% CI: 1.26, 4.20) times higher prevalence of GUD compared to those who did not report unwilling sexual intercourse. The final multivariate adjusted model for GUD included women's education and husband's age as confounders. In the adjusted model, women with a migrant husband had 1.53 (95% CI: 0.80, 2.91) times higher prevalence compared to women with a residential husband. Women who had received any education had 64% (95% CI: 0.16, 0.86) lower relative prevalence of GUD compared to women without any education when adjusted for migrant status and husband's age. Women with husband aged 31 or higher had 2.01 (95% CI: 1.00, 4.06) times higher prevalence of GUD compared to women with husband's who were aged 30 or lower.

TABLE IX

DISTRIBUTION OF SELF-REPORTED GENITAL ULCER DISEASE BY INDEPENDENT VARIABLES AND CRUDE WITH MULTIVARIATE ADJUSTED PREVALENCE RATIO OF THE ASSOCIATION BETWEEN GENITAL ULCER DISEASE AND INDEPENDENT VARIABLES

Covariates		Genital Ulcer Disease		Chi-Squared P-value	Crude PRR (95% CI)	Adjusted PRR (95% CI) N=418
		Yes N=38 n (%)	No (Ref) N=388 n (%)			
Migrant worker husband				0.06		
	No	21 (55.3)	271 (70.0)		Ref	Ref
	Yes	17 (44.7)	116 (30.0)		1.78 (0.97, 3.26)	1.53 (0.80, 2.91)
Age in years				<.01		
	16–25	7 (18.4)	189 (48.7)		Ref	NA, not in final model
	26–30	15 (39.5)	112 (28.9)		3.31 (1.39, 7.89)	
	31–35	16 (42.1)	87 (22.4)		4.35 (1.85, 10.23)	
Highest education				<.01		
	None	29 (76.3)	161 (41.9)		Ref	Ref
	Any	9 (23.7)	223 (58.1)		0.25 (0.12, 0.52)	0.36 (0.16, 0.86)
Caste				0.31		
	Upper	22 (61.1)	263 (69.4)		Ref	NA, not in final model
	Lower	14 (38.9)	116 (30.6)		1.40(0.74, 2.64)	
Family type				0.09		
	Joint	15 (42.9)	211 (57.8)		Ref	NA, not in final model
	Neutral	20 (57.1)	154 (42.2)		1.73 (0.91, 3.28)	
Age coitarche in years				0.09		
	≤15	12 (31.6)	68 (17.5)		Ref	NA, not in final model
	16–17	11 (29.0)	119 (30.7)		0.56 (0.26, 1.22)	
	18 +	15 (39.4)	201 (51.8)		0.46 (0.23, 0.95)	

*Not all cells sum to N due to missing data.

PR—Prevalence ratio; CI—Confidence Interval; Ref—Reference category

DISTRIBUTION OF SELF-REPORTED GENITAL ULCER DISEASE BY INDEPENDENT VARIABLES AND CRUDE WITH MULTIVARIATE ADJUSTED PREVALENCE RATIO OF THE ASSOCIATION BETWEEN GENITAL ULCER DISEASE AND INDEPENDENT VARIABLES

Covariates	Genital Ulcer Disease		Chi-Squared P-value	Crude PRR (95% CI)	Adjusted PRR (95% CI) N=418
	Yes N=38 n (%)	No (Ref) N=388 n (%)			
Family planning method			0.99		
None	16 (42.1)	163 (42.7)		Ref	NA, not in final model
Hormonal	10 (26.3)	94 (24.6)		1.08 (0.51, 2.28)	
Nonhormonal	7 (18.4)	74 (19.4)		0.97 (0.41, 2.26)	
Sterilization and other	5 (13.2)	51 (13.3)		1.00 (0.38, 2.60)	
Husband's age in years			<.01		
16–30	14 (36.8)	256 (66.5)		Ref	Ref
31–plus	24 (63.2)	129 (33.5)		3.03 (1.61, 5.67)	2.01 (1.00, 4.06)
Husband's highest education					
None	12 (31.6)	73 (19.0)	<.08	Ref	NA, not in final model
1–5	8 (21.0)	58 (15.1)		0.86 (0.37, 1.98)	
6–plus	18(47.4)	233 (65.9)		0.47 (0.24, 0.94)	
Ever use a condoms with husband			0.86		
No	30 (78.9)	311 (80.1)		Ref	NA, not in final model
Yes	8 (21.1)	77 (19.9)		1.07 (0.51, 2.25)	
Ever have sex while intoxicated			0.73		
No	28 (73.4)	291 (76.2)		Ref	NA, not in final model
Yes	10 (26.3)	91(23.8)		1.13 (0.57, 2.24)	
Unwilling sexual intercourse with husband					
No	19 (50.0)	278 (71.6)		Ref	NA, not in final model
Yes	19 (50.0)	110 (28.4)	<.01	2.30 (1.26, 4.20)	

*Not all cells sum to N due to missing data.

PR—Prevalence ratio; CI—Confidence Interval; Ref—Reference category

[a] Hormonal contraception—Depo-provera, birth control pills, and implants, nonhormonal— intrauterine device and condoms, sterilization— male or female

V. DISCUSSION

This study measured the prevalence of STI symptoms and evaluated the association between self-reported STI symptoms and husband's migrant work status among women aged 16–35 from 10 different villages across Bajura district, Nepal. This study demonstrated that both point and period prevalence of self-reported STI syndromes such as VDS, LAPS, and GUD were high among women, and symptoms of GUD and urethral discharge/pain/burning were also high among their husbands. The point prevalence of VDS in our study was substantially higher compared to prevalence of 8.8% reported by the 2010 IBBS, which was conducted among wives of migrant workers. Similarly, the 12-month period prevalence of VDS in our study was also much higher than the figure from the NDHS (9.3%) among women in the hills of Far-Western Nepal (Ministry of Health and Population, 2012). However, the period prevalence of 16.5% for VDS among wives of migrant workers was comparable to our results (New Era, 2010). In addition, the prevalence of GUD in our study was extremely high compared to NDHS (0.7%) and IBBS (2.2%) (Ministry of Health and Population, 2012; New Era, 2010).

Although the WHO syndromic algorithm used in this study was limited by low sensitivity and specificity for detection of STIs, the self-reported point prevalence of VDS (17.2%), LAPS (14.4%), and GUD (8.9%) was suggestive of a high burden of STIs and/or reproductive tract infections among women in Bajura. There are very few studies available to compare the current findings in terms of what this burden of STI syndromes really means. However, an etiologic study among Nepalese women attending gynecological clinics with complaints of VDS found that 91% of the patients had abnormal clinical signs during physical examination, of whom approximately 96% also had an abnormal laboratory tests for bacterial vaginosis, candidiasis, trichomoniasis, and gonorrhea (Rizvi and Luby, 2004). We cannot ascertain that all the women

who reported the various STI symptoms and syndromes did actually have STI-causing pathogens. However, considering the implications of untreated STIs on women's reproductive health and the large burden of self-reported STI symptoms found in this study, it is imperative to explore this subject further to identify the burden of the etiologic causes of STIs and/or reproductive tract infections among these women.

As hypothesized, this study found that the prevalence of VDS and LAPS among women was significantly associated with migration status of their husbands. This finding was consistent with studies from other areas of Nepal and around the world that have repeatedly demonstrated higher prevalence of STIs among wives of migrant workers (Qin et al., 2009; Saggurti et al., 2012; Sevoyan & Agadjanian, 2010). Also, among married women aged 15–49 in a similar migrant community in Nepal, having a husband who migrated to India was significantly associated with being diagnosed with at least one etiologically diagnosed STI (Smith-Estelle & Gruskin, 2003).

Several studies among migrant workers in Nepal have demonstrated that a vast majority of migrant workers do not use condoms and participate in sex with CSWs at their migration destination, which may explain the relatively high prevalence of STI symptoms among women with migrant husbands in this study (Poudel et al., 2003; Poudel et al., 2004; New Era, 2008b; Bam et al., 2013). We also observed a strong significant association between migration status and prevalence of VDS and LAPS among women who did not report unwilling sexual intercourse, which had a PR of 2.34 (95% CI: 1.32, 4.16) and PR of 2.60 (95% CI: 1.36, 4.96), respectively. The heterogeneity observed here provides further evidence that if women have husbands that do not force sex or get angry they are still at higher risk for STIs due to their husbands' migrant work.

Despite the higher prevalence of LAPS and VDS observed among women with migrant husbands, less than half of the women who reported with VDS or LAPS believed there was a moderate-to-high chance of acquiring STIs from their husbands. Considering that only one woman reported extramarital sex in this study (data not shown), and in the context of findings from other studies of women's STI/HIV risk and husbands' migrant work status, the increased prevalence of STI symptoms was mostly likely due to the husbands' extramarital sex at migration destination. Considering the strong associations observed in this study, the findings call for more STI/HIV prevention and awareness programs for male labor migrant workers and their wives in these communities.

After stratifying by women's educational level, the relationship between husband's migration status and VDS (PR=4.16; 95% CI: 1.75, 9.87) and LAPS 4.18 (95% CI: 1.63, 10.74) was very strong among women who received any education. This was an unexpected finding because from past literature we know that increased education leads to decreased risk of STIs (Sevoyan & Agadjanian, 2010; Saggurti et al., 2012; Hargreaves et al., 2008). However, with the various programs that have been implemented to raise awareness of HIV/STIs among migrant communities, women who have some educational background may be more likely to report symptoms due to increased knowledge of STI symptoms and awareness that it should not be stigmatized compared to women who are not educated (CARE Nepal, 2013), thereby leading to the four-times-higher prevalence of VDS and LAPS among educated women who have migrant husbands.

The self-reported GUD prevalence was also 53% higher among women who had migrant husbands; however, this association was not statistically significant (95% CI: 0.80, 2.91). This result was consistent with findings from a study that conducted laboratory diagnosis for syphilis

in Far-Western Nepal. Poudel et al. (2003) found that syphilis prevalence among 137 men was high (22.0%) but not significantly different among migrants and nonmigrants, 24.7% and 15.0%, respectively. Although we did not assess the women's attitudes about syphilis or GUD, a qualitative study by Poudel et al. (2004) found that men were not concerned by syphilis and indicated that it was not an unexpected event. This may indicate that syphilis is common in this area, but until etiologic diagnosis is made it will be unclear whether the cause of self-reported GUD in this study is syphilis or HSV-2. The overall prevalence of self-reported GUD of 8.9% suggests an urgent need for women in this area to be screened and treated in order to prevent the associated sequelae. The role of ulcerative STIs in facilitating HIV acquisition and transmission is well-established (Fleming & Wasserheit, 1999; Freeman et al., 2006; Johnson & Lewis, 2008). This is of utmost importance in this setting because according to the NCASC (2012), migrant workers and women in the general population are the most at-risk group for HIV in Nepal.

This study also identified other important sociodemographic and behavioral-risk factors of VDS, LAPS, and GUD. Prevalence of VDS and LAPS increased with increasing age of women. This is consistent with other studies that have also found an association between increased age of women and STI/HIV prevalence (Smith-Estelle & Gruskin, 2003; New Era, 2010). Analogous to the literature is also the finding that women whose husbands were aged 31 or higher had a two-fold increased prevalence of GUD compared to women whose husbands were aged 30 or younger. This finding may also be explained by the fact that women who are older also have older husbands, which means these men have been migrant workers for a longer period than husbands of younger women. Men in Far-Western Nepal start migrating to India for work at a young age and it has been reported that among Far-Western men there is an increased risk of HIV with increased migration duration (Poudel et al., 2003; Success Research Option,

2010; Bam et al., 2013). Similar results for migrants and wives of migrants was also reported in studies from Armenia and India (Sevoyan & Agadjanian, 2010; Saggurti et al., 2012).

Women's caste was also significantly associated with increased prevalence of VDS and LAPS, where women of lower caste had a PR of 1.80 for VDS and PR of 2.14 for LAPS compared to women of higher caste. Bam et al. (2013) suggests that 85% of Dalit (lower caste) migrant workers in their study reported engaging in sex with CSWs compared to 32.8% of all labor migrants found in the IBBS (Success Research Option, 2010). The same study also found that Dalit migrants were less knowledgeable about HIV, safe sex behavior, and VCT services compared to the general migrant population. Other large surveys among migrants do not desegregate data by caste; therefore, comparison to existing literature is difficult (Success Research Option, 2010; New Era, 2010). Caste-based discrimination is widely present in Far-Western Nepal's villages, and social segregation is still practiced because of fear of contamination by lower caste people (Bam et al., 2013; UN, 2013b). This may hinder lower-caste women's participation in awareness programs or educational attainment in school, which may put them at a disadvantage in terms of understanding the safe sex promotion messages (UN, 2013b). Further research needs to be conducted to understand how to overcome the unique vulnerabilities of lower-caste women for STI/HIV.

This study also found that increased education level among women was associated with lower prevalence of VDS, LAPS, and GUD. It is evident from literature that women's and girl's education is associated with better health status with regard to many diseases, including reduced risk of STIs (Sevoyan & Agadjanian, 2010; Saggurti et al., 2012; Hargreaves et al., 2008; de Walque, 2007). Although education among women is increasing, gender-based discrimination still hinders women's access to education (Simith-Estelle & Gruskin, 2003), as exemplified by

the fact that 45% of women in this study had never attended school. While educational attainment is slowly improving, current interventions should be tailored to reach women of all educational levels in these communities (De Walque, 2007)

An unexpected finding of this study was that women who used family planning methods—specifically for self or husband sterilization—also had a relatively higher prevalence of VDS and LAPS. However, among women who reported LAPS, this association was significant for women who reported using condoms or IUD and sterilization and marginally significant among women using hormonal contraceptives. Another study of women from migrant communities in Far-Western Nepal also reported a significant association between male or female sterilization and woman having at least one STI (Smith-Estelle & Gruskin, 2003). Studies examining the association of hormonal contraceptives with an increased risk of STIs have found mixed results and this association could be a result of difference in sexual behavior among those using contraception (Polis & Curtis, 2013; Mohllajee, Curtis, Martins, & Pefterson, 2006). Exploring this relationship is beyond the scope of this study but, considering that family planning method was retained in our multivariate adjusted model for both VDS and LAPS, it may be of interest for future studies to look at the sexual-risk behavior difference among women using different contraceptive methods.

Surprisingly, this study found that condom use was not protective for VDS and LAPS when adjusted for husband's migration status and other variables. However, this may be a result of social desirability bias where women who reported STI symptoms also reported condom use. This finding may also be subject to information bias because one of the questions asked, "Do you use a condom when you have sex with your husband?" to which women may have answered

yes if they have ever used a condom even if it was only once in their lifetime, thereby leading to the apparent association between using condoms and higher prevalence of STI symptoms.

The findings from this study provided important insight into the risk factors of STI symptoms among women in rural Nepal; however, the results must be interpreted with regard to the study limitations. Symptoms of STI and risk behaviors were self-reported, which is subject to misclassification. Further, symptoms were assessed using the WHO syndromic guidelines, which has sensitivity and specificity for detection of STI. However, considering the fact that syndromic management is the preferred and only method used to identify and treat STIs in rural Nepal, the approach taken by this study was warranted and findings are directly relevant. Finally, results may be specific to Bajura, limiting generalizability to other neighboring districts with similar migration culture.

Despite the limitations, this is one of the first studies to describe the potential STI epidemic among women in Bajura and to show the association between a husband's migrant work status and STIs. Further, this study has important implications for the government, INGOs, and other stakeholders involved in STI/HIV control in migrant communities. Although the high prevalence of self-reported STI syndromes does not necessarily mean the burden of STIs is high among women in Bajura, it provides data to support investigation that verifies these symptoms and determines etiology—whether STI-related or caused by other factors.

VI. CONCLUSION

This study indicates that the burden of STI symptoms/syndromes is considerably high among women in Bajura Nepal, and these syndromes are higher among women who have migrant worker husbands. Worldwide, many studies have established the relationship between male out-migration and risk of STI/HIV for their spouse; however, a very limited number of such studies exist in Nepal. Although further etiologic research is necessary to fully establish the relationship between male migration and STIs in women in rural Nepal, this study provides an important first step. The high burden of STI symptoms calls for an urgent need to explore this further and treat these women in order to prevent STI-associated reproductive morbidities and other sequelae.

In addition, this study provides significant risk-factor information to inform programs dedicated toward migrants and STI/HIV control in these areas. The STI/HIV prevention and control programs should continue to target migrant workers and their nonmigrant wives. Other factors, such as education, caste, and age may play an important role in determining STI risk and should be incorporated in prevention. Future programs should address the deeply rooted caste system that may hinder uptake of and efficacy of these programs.

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VITA

NAME **Sweta K. Basnet**

EDUCATION

University of Illinois at Chicago, School of Public Health Expected May 2015

Master of Science, Epidemiology/Global Health

Grand Valley State University, Allendale, MI 2012

Bachelor of Science, Anthropology and Bachelor of Science, Biomedical Science

Kingston University, Kingston Upon Thames, United Kingdom (Study Abroad) 2010

EXPERIENCE

Research Assistant—Project HEAL, UIC School of Medicine, Chicago Sept. 2014–Current

- Designed program evaluation plans including data collection instruments and plans for data management and analysis
- Contributed to grant proposals through creating logic models and work plans
- Performed data management, statistical analysis, and interpretation using SAS
- Prepared abstracts for conference presentations

Primary Investigator—Thesis Research Jan. 2014–Current

- Designed an epidemiologic research protocol to measure the prevalence of sexually transmitted infection (STI) symptoms among women in Far-Western Nepal to explore the association between STI symptoms and spouse migration status.
- Obtained IRB and Ministry of Health and Population approval
- Conducted and wrote a comprehensive literature review
- Designed a standardized survey to measure prevalence of STI symptoms

- Developed an extensive research assistant training manual for survey administration
- Trained research assistants to conduct community-based in-person interviews and strategies for recruitment and building rapport
- Traveled through 10 different villages to recruit subjects using random sampling methods
- Analyzed data using SAS

Graduate Assistant—School of Public Health, UIC, Chicago Jan.–May 2014

- Developed and delivered weekly lectures on various epidemiologic concepts to first year graduate students

Graduate Teaching Assistant—School of Public Health, UIC, Chicago Jan.–May 2014

- Explained epidemiology concepts and provide academic assistance to first year graduate students

Monitoring and Evaluation Intern—CARE Nepal, Dhangadhi, Nepal Jan.–Feb. 2013

- Compiled, analyzed, and interpreted field reports to prepare for donor reports
- Developed culturally competent educational materials for HIV/AIDS awareness
- Identified project achievements during the monitoring and evaluation field visits
- Conducted key informant interviews and translated case stories to present to donors
- Facilitated training sessions for community mobilizers on data collection and reporting methods

Research Assistant—CIWEC Travel Medicine Center, Kathmandu, Nepal Oct.–Dec. 2012

- Built rapport to recruit subjects and conducted interviews and answered questions
- Utilized Microsoft Excel to organize survey and lab results
- Maintained communication with the lab, patients, doctors and other study personnel

Primary Investigator / Field Experience Aug. 2011–April 2012

- Conducted an applied medical anthropology study to assess the health status of the homeless population in Grand Rapids, Michigan
- Prepared a research proposal and obtained IRB approval
- Designed a mixed-methods survey to measure health status
- Interviewed homeless individuals and participated in their daily living activities
- Analyzed data using SPSS and NVivo

Independent Research (undergraduate independent study) June 2009–Dec. 2009

- Applied ethnographic methods to explore health strategies in a pluralistic medical setting
- Data collection by participant observation and key informant interviews in rural Nepal

PRESENTATIONS / CONFERENCES

American Public Health Association Annual Meeting, Boston, MA Nov. 2013

Homeless health and access to healthcare in urban settings—social epidemiology

Central States Anthropological Society Meeting, Toledo, OH March 2012

Health status of the homeless—what lies in the hearts of our citizens

Central States Anthropological Society Meeting, Madison, WI April 2010

Medical pluralism and health strategies in rural Nepal

COMMUNITY VOLUNTEER EXPERIENCE

Project Downtown, Grand Rapids, MI Feb. 2011– June 2011

Tutor Refugee Students, Grand Rapids, MI Jan. 2011–June 2011

Saint Mary's Health Care - Grand Rapids, MI Jan. 2010–June 2011

In House Hospice, Grand Rapids, MI Jan. 2010–Aug. 2011

Primary Health Care Center, Sanischare, Jhapa, Nepal June 2009–Aug. 2009

PROFESSIONAL AFFILIATIONS / STUDENT ORGANIZATIONS

Global Health Student Interest Group, Co-Chair Current

American Public Health Association, Member Current

FACE AIDS, Chapter President 2008–2010

LGBT Resource Center, Advisory Board 2009

Desi Student Union, President 2009–2010

AWARDS AND HONORS

Douglas Passaro Global Horizons Award 2014

Central States Anthropological Society's Best Undergraduate Paper Award 2012

Walton Boston Koch Scholarship 2011

Campus Leadership Award 2009/2010

Sustainability Champion for Social Justice 2009

Bert Price Scholarship 2007–2011