AIDS and Behavior (2019) 23:1518–1529
https://doi.org/10.1007/s10461-018-2373-1

ORIGINAL PAPER

Syndemic Classes, Stigma, and Sexual Risk Among Transgender Women in India

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Published online: 18 December 2018

Abstract

Syndemic theory could explain the elevated HIV risk among transgender women (TGW) in India. Using cross-sectional data of 300 TGW in India, we aimed to: identify latent classes of four syndemic conditions (Depression-D, Alcohol use-A, Violence victimization-V, HIV-positive status), test whether syndemic classes mediate the association between stigma and sexual risk, and test whether social support and resilient coping moderate the association between syndemic classes and sexual risk. Four distinct classes emerged: (1) DAV Syndemic, (2) AV Syndemic, (3) DV Syndemic, and (4) No Syndemic. TGW in the DAV Syndemic (OR 9.80, 95% CI 3.45, 27.85, $p < 0.001$) and AV Syndemic classes (OR 2.74, 95% CI 1.19, 6.32, $p < 0.01$) had higher odds of inconsistent condom use in the past month than the No Syndemic class. Social support significantly moderated the effect of DAV Syndemic class on inconsistent condom use. DAV Syndemic was found to be a significant mediator of the effect of transgender identity stigma on sexual risk. HIV prevention programs among TGW need to: (a) incorporate multi-level multi-component interventions to address syndemic conditions, tailored to the nature of syndemic classes; (b) reduce societal stigma against TGW; and (c) improve social support to buffer the impact of syndemics on sexual risk.

Keywords Syndemics · Transgender women · Social support · Resilience · Stigma · HIV/AIDS

Introduction

Transgender women (TGW) across the globe, including India, face disproportionate HIV burden in negative social and structural contexts of pervasive stigma and discrimination [1]. India's National AIDS Control Organization (NACO) has recognized TGW or hijras (indigenous label/identity for transfeminine persons) as a 'high risk group' for HIV. Previous HIV research and program have previously included transgender women under the term 'men who have sex with men'; however, now TGW are recognized as a group that is distinct from men who have sex with men [2, 3]. TGW have a gender identity or expression that differs from their assigned birth sex, and the factors that contribute to HIV vulnerability may be different from men who have sex with men [2]. The national average HIV prevalence among TGW is 7.5% [4], 28 times higher than that among the general population (0.26%) [5], and in certain cities reaching an average as high as 12.1% (Mumbai) and 23.0% (Thane) [4]. NACO's 2015 national survey among TGW showed that consistent condom use in anal sex in the past month ranged between 39.6% and 48.5%—depending on the type of male partners [4]. These high levels of HIV prevalence and inconsistent condom use among TGW persist despite implementing decade-long targeted HIV prevention interventions, which primarily focus on individual level condom promotion and HIV education. One possible explanation for this elevated HIV risk among TGW could be offered by Syndemic theory [6].

Syndemics refer to clustering of certain psychosocial problems or diseases among marginalized populations (e.g., TGW, men who have sex with men, injecting drug

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users), and their synergistic effect on increasing a negative outcome [7, 8]. Several studies from Western countries have demonstrated that presence of syndemics—combination of psychosocial problems such as depression, violence, drug abuse, childhood sexual abuse, sexual compulsivity, and intimate partner violence—additively or synergistically increase sexual risk or risk of acquiring HIV among men who have sex with men [9, 10] as well as TGW [11, 12]. In syndemics, the 'negative outcome' is a relative term. For example, HIV itself can also be a component of syndemics or a syndemic condition as in HIV–malnutrition–food insecurity syndemic in Sub-Saharan Africa [13]. Also, given the mutually enhancing nature of syndemics, while alcohol use before sex can increase HIV risk by non-use of condoms, HIV infection can lead to depression and alcohol use [14, 15]. In this paper, for ease of use, the term syndemic condition is used to denote a psychosocial problem or disease (here HIV status) that has been documented to co-occur with one or more psychosocial problems irrespective of any demonstrated synergy in increasing a negative outcome—given that most studies on syndemics were found to have not used the preferred methods of demonstrating synergy (such as assessing interactions on an additive or multiplicative scale) [16].

Psychosocial Problems and Sexual Risk Among TGW in India

Among the small number of studies that have documented risk factors for HIV infections among TGW in India, most have shown associations between only sexual risk and one syndemic condition. For example, the association of alcohol use [17], or violence victimization [18, 19] with sexual risk. Even though, the term 'syndemics' was not explicitly used, a few qualitative studies have documented how more than one psychosocial health problems such as alcohol use, violence victimization and internalised stigma are associated with HIV-related risk among TGW in India [17, 20, 21]. While co-occurrence of psychosocial problems has been documented, no studies have examined the presence of particular patterns of co-occurrence of psychosocial problems among TGW in India.

Syndemics and Sexual Risk Among TGW in India

To date, only one quantitative study has explicitly focused on syndemics (co-occurrence of depression, alcohol use, violence victimization) and sexual risk among TGW in India [22]. Using a traditional syndemic analytical framework, Chakrapani et al. [23] represented syndemics by summing the number of conditions, and found a positive association between the number of syndemic conditions and sexual risk. This analytic approach assumes that each syndemic condition or psychosocial health problem has an equally weighted and linear effect on the outcome such as sexual risk. Thus, incremental changes in the number of syndemic conditions are assumed to have effects on the outcome that are independent of the type of condition. Starks et al. [24] who previously used a count variable approach, later reanalysed their data using latent factor analysis that demonstrated that the assumption of equal weighted effects on the outcome reduced model fit. Hence, the use of a syndemic count variable (i.e., the number of syndemic conditions) may mask the nuances in the association between syndemics and sexual risk among TGW.

Building off this variable-centered approach (i.e., syndemic count variable), a person-centered approach such as latent class analysis might be able to uncover the nuances in the association between co-occurring psychosocial problems and sexual risk among TGW in India. Instead of counting the number of syndemic conditions, a person-centered approach such as latent class analysis can be utilized to identify unique patterns or classes of syndemic conditions, although latent class analysis may not be appropriate for demonstrating synergy among syndemic conditions [23]. If latent classes based on syndemic conditions emerge, additional investigations can be conducted to determine whether TGW in specific 'syndemic classes' have higher sexual risk. Thus, latent class analysis of syndemic conditions among TGW could be a useful strategy. To our knowledge, no study has used latent class analysis for examining co-occurring psychosocial problems among TGW. At least one study has used latent class analysis to examine the presence of meaningful syndemic classes among a sample of men who have sex with men in the U.S. [24]. Extending previous research, it may be useful to examine whether unique patterns of syndemic conditions (i.e., latent classes) exist among TGW, and also to examine the association between such latent syndemic classes and sexual risk.

Stigmas, Syndemics and Sexual Risk Among TGW in India

A model of syndemics production among men who have sex with men postulates that social marginalisation and gay-related stigma may be the key drivers of syndemics among urban gay men in the U.S. [25]. However, no such model of syndemics production is available for TGW, although the contribution of stigmas related to sexuality, gender non-conformity and HIV in the production of syndemic conditions such as depression, internalised homonegativity and alcohol use is demonstrated in a qualitative study among MSM in India [26]. Similar in line with Stall et al.'s model, available limited evidence suggests that social marginalisation secondary to transgender identity stigma is associated with sexual risk [11, 12]. Furthermore, at least one study among men who have sex with men has

provided evidence for the mediating role of syndemics on the effect of adverse conditions, including gay-related stigma, on sexual risk [27]. Although a study from India has shown that transgender identity stigma was associated with depression, a syndemic condition [28], no studies have examined the role of stigmas (e.g., transgender identity- or HIV-related stigmas), part of adversities, in the production of syndemics. This gap in the knowledge of whether multiple and intersecting stigmas and other adversities (e.g., financial difficulties) faced by TGW lead to syndemics need to be addressed [29].

Resilience Resources and Sexual Risk Among TGW in India

Understanding protective factors, especially resilience resources, is increasingly recognised as crucial given that strengths-based approaches can potentially complement syndemically-oriented interventions among marginalised communities [30, 31]. Social support and resilient coping skills have been identified as resilience resources among several other resources at multiple levels (individual, interpersonal, and community) among marginalised populations, including sexual minority men [32, 33]. Although a study among TGW in India did not find social support or resilient coping as a mediator or moderator of the effect of syndemic conditions on sexual risk, social support was found to be significant predictor of sexual risk (higher social support was associated with lower sexual risk) [22]. However, as mentioned earlier, in that analysis, syndemics was measured as a categorical count variable, which could partly account for the lack of identification of a significant mediation or moderation relationship. Thus, further exploration of the role of resilience resources like social support and resilient coping in the relationship between syndemics (conceptualised better—as syndemic latent classes—in this analysis) and sexual risk would help in designing strengths-based interventions.

The present paper reports the first application of latent class analysis to understand what unique combinations or patterns of syndemic conditions (classes) are present among TGW in India. It further examines which syndemic classes are associated with higher sexual risk; whether syndemic classes mediate the effects of transgender identity stigma and HIV-related stigma on sexual risk; and whether social support and resilient coping moderate the effect of syndemic classes on sexual risk.

Methods

Participants and Procedure

The current analyses used data from a cross-sectional study that explored the influence of stigma on health among 300 TGW in India. Between October 2011 and January 2012, TGW were recruited from six non-governmental organizations (NGOs) located in four Indian states. These NGOs provide HIV-related services (e.g., condom distribution, HIV outreach education) to TGW. From these NGOs, a convenience sample of participants were recruited from the drop-in centres. Participants were also recruited from the hot spots where transgender women sell sex. All recruitment was conducted by word of mouth through peer outreach workers and by distributing flyers in one site. Participants were considered eligible if they were: a) age $\geq$ 18 years; b) able to provide informed consent; and c) self-identified as a transgender woman of any indigenous identity (e.g., hijra, thirunangai, jogta). Trained research interviewers administered a structured survey questionnaire in the native languages (Tamil, Hindi, Marathi, Bengali). Interviews were conducted in private rooms in the NGOs or in a safe, mutually-convenient location. The study protocol was approved by the institutional review board of the Humsafar trust, Mumbai.

Measures

Participant Characteristics

We collected sociodemographic information such as age (in years), personal income (in Indian Rupees or INR), level of education (no formal education, up to secondary education and more than secondary education), marital status, gender identity (self-identifications), and self-reported HIV status (negative, positive or unknown).

Sexual Risk

We assessed consistency in condom use for anal sex in the past month with regular, casual, paying or paid male partners. Participants who reported using condoms every time for anal sex with all partner types were categorized as consistent condom users and thus having low/no risk; others were categorized as engaging in high-risk sexual behavior (hereafter, 'sexual risk'). As about one-tenth of the participants self-reported being HIV-positive, the term 'HIV risk' is not used in this analysis.

Psychosocial Health Conditions (Syndemic Conditions)

Depression was assessed by Beck's Depression Inventory—Fast Screen scale. In this study, we used six (excluding the suicidality item) of the 7 items of this scale because of the ethics committee's concern about potential harm to the participants. The six items that measure the cognitive and affective dimensions of depression include sadness,

pessimism, past failure, loss of pleasure, self-dislike, and self-criticalness. Each of these six items corresponds to a major depressive symptom in the previous two weeks. For example, 'sadness' was assessed by 4 options: "I do not feel sad" (0), "I feel sad much of the time" [1], "I am sad all the time" [2], and "I am so sad or unhappy that I can't stand it" [3]. The scores ranged between 0 and 18 (mean = 5.9, SD = 4.2). Participants with scores > 7 (indicative of moderate/severe depression) were considered to have depression. Cronbach's alpha was 0.83 in this study.

Violence victimization, being a victim of physical or sexual violence in the past year, was assessed with 3 items ('been hit or beaten up [by anyone]', 'physical harassment by police', and 'sexual harassment by police') from a validated 13-item transgender identity stigma scale [34]. Participants were categorised as victimized if they endorsed any one of the three items.

Alcohol use was measured with one item: 'During the past three months, what was the average number of days per week in which you drank alcoholic beverages?' Participants were classified as frequent alcohol users if they reported alcohol use more than once a week (i.e., 'every day, most days of the week, or a few days a week'), as followed in prior studies among sexual minorities [35, 36].

HIV status was self-reported by participants (positive, negative, or unknown). Those who self-reported being HIV-positive were included as HIV-positive in this analysis.

Measures Related to Stigmas and Resilience Resources

Transgender identity stigma was assessed using ten items from the 13-item Transgender Identity Stigma scale, which has been demonstrated to have good reliability and construct validity [34]. As noted earlier, three items on violence were used for the construction of the 'violence victimization' indicator, and hence those items were removed from this scale. The shorter 10-item scale measures the frequency of past-year transgender identity stigma with items such as 'How often did you hear that trans women were not normal?' and 'How often have you felt that your transgender (or hijra or jogta) identity hurt and embarrassed your family?'. Participants responded on a scale ranging from Never [1] to Many Times [4]. The scores thus ranged between 10 and 40.

HIV-related stigma was measured using a modified version of Steward et al's [37] HIV-related Stigma Assessment scale, which has been used among men who have sex with men in India. This scale measured four dimensions of HIV-related stigma: felt normative stigma (prevalence of normative stigma), vicarious stigma (exposure to stories of discrimination), internalized stigma (acceptance of society's negative attitudes towards HIV-positive people) and enacted stigma (overt discrimination). In this study, Cronbach's alpha of these four dimensions ranged between 0.77 and to 0.85.

Social Support was assessed by Multi-dimensional Scale of Perceived Social Support [38]. It has three sub-scales to assess the perceived adequacy of support from family, friends and a significant other. This scale has 12 items and we used a 5-point Likert scale, instead of seven in the original version. The reliability of this scale was high (Cronbach's alpha = 0.89) in this study.

Resilient coping, a process of positive adaptations to high stress [39], was assessed by the Brief Resilient Coping scale. It has 5 items (example item: 'Regardless of what happens to me, I believe I can control my reaction to it') and was measured using a three-point Likert scale. Cronbach's alpha was 0.88.

Data Analyses

We conducted latent class analysis to examine patterns of syndemic conditions among TGW in India. There were four latent class indicators measured as binary variables: (1) depression, (2) violence victimization, (3) alcohol use, and (4) HIV-positive status. TGW with similar probabilities of affirmative responses to the four indicators were placed into the same class. Models were selected based on the following goodness of fit measures: smallest values for Akaike Information Criterion (AIC) [40] and Bayesian Information Criterion (BIC) [41], and entropy > 0.80. Missing data were minimal (one person), and were recoded to the modal response for the violence victimization.

Descriptive statistics (frequencies, means) were conducted for the full sample, and Chi square and ANOVA analyses were conducted to determine if socio-demographics were associated with latent classes. Next, several logistic regression models were conducted. First, a multinomial logistic regression model was conducted to determine whether HIV-related and transgender identity stigma and socio-demographics predicted latent class membership. Further, unadjusted and adjusted models were conducted to examine whether latent class membership predicted sexual risk. Next, a model was conducted to examine the association between latent class membership and sexual risk, with the additional effect of resilient coping and social support. Finally, another logistic regression model was conducted to examine whether the association between latent class membership and sexual risk varied by levels of resilient coping and social support. For this model, two interaction terms were entered: latent class membership*resilient coping and latent class membership*social support. All adjusted models were controlled for age, education, income, and involvement in sex work. Path analyses were performed to investigate whether stigmas directly related to latent class membership,

and if class membership directly related to sexual risk. The mediating effects of syndemic latent classes were tested. The following statistics were used to assess the significance of the results: odds ratios (OR), 95% confidence intervals (CI), and p values < 0.05. Bootstrapping was used to determine the significance of mediation effects. Latent class [42], descriptive statistics, and logistic regression analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC). Path analyses were conducted using Mplus [43].

Results

Sociodemographic Characteristics

Participants' mean age was 29.6 years old (SD = 7.8) and they had an average monthly income of INR 8,071.3 (SD = 6,252.9) [In USD, mean = 134, SD = 104]. The majority of participants had up to a secondary education (63.3%). About three-fourths (76.3%) reported being HIV-negative, 9.3% as HIV-positive, 13.3% were never tested for HIV, and 1% did not respond. The self-identities reported were: hijra = 66.7%, 'transgender' (English term) = 24.7%, and jogta = 8.3%.

LCA Analysis of Patterns of Syndemic Conditions

A four-class solution was considered optimal based on small values for the AIC and BIC and higher entropy compared to the other models (AIC = 38.05, BIC = 108.43, and entropy = 0.84, other models not shown). Class 1—Depression, Alcohol, Violence (DAV) Syndemic (15.3%)—was characterized with high probabilities of depression, violence, and alcohol use. Class 2—No Syndemic (12.3%)—was characterized with moderate probabilities of alcohol use. Class 3—Alcohol and Violence (AV) Syndemic (49.0%)—was characterized with high probabilities of violence and alcohol use. Class 4—Depression and Violence (DV) Syndemic (23.3%)—was characterized with high probabilities of depression and violence. The specific probabilities of each class indicator can be found in Fig. 1.

Bivariate Associations of Socio-Demographics, Stigmas, and Resilient Resources with Syndemic Latent Class

Latent class membership was significantly associated with socio-demographics, transgender identity stigma, social support, and resilient coping (Table 1). Sex work involvement was significantly associated with class membership ($\chi^2 = 9.1$, $p < 0.05$), of which the DAV Syndemic (76.1%) and DV Syndemic classes (76.2%) had the highest proportions of TGW engaged in sex work. HIV status was significantly associated with class membership ($\chi^2 = 50.3$, $p < 0.001$), of which the DV Syndemic class (30.0%) had the highest proportion of TGW living with HIV. Transgender identity stigma was significantly associated with class membership, of which the DAV Syndemic (32.3) and AV Syndemic classes (30.4) had the highest averages of transgender identity stigma ($F = 25.1$, $p < 0.001$). Social support and resilient coping were significantly associated with class membership ($F = 12.6$, $p < 0.001$; $F = 27.1$, $p < 0.001$), of which the No Syndemic class reported the highest average of social support (42.0) and resilient coping (13.9).

Predictors of Syndemic Latent Class Membership

Results from the multinomial logistic regression indicate that TGW with higher scores of transgender identity stigma had a higher odds ratio of being in the DAV

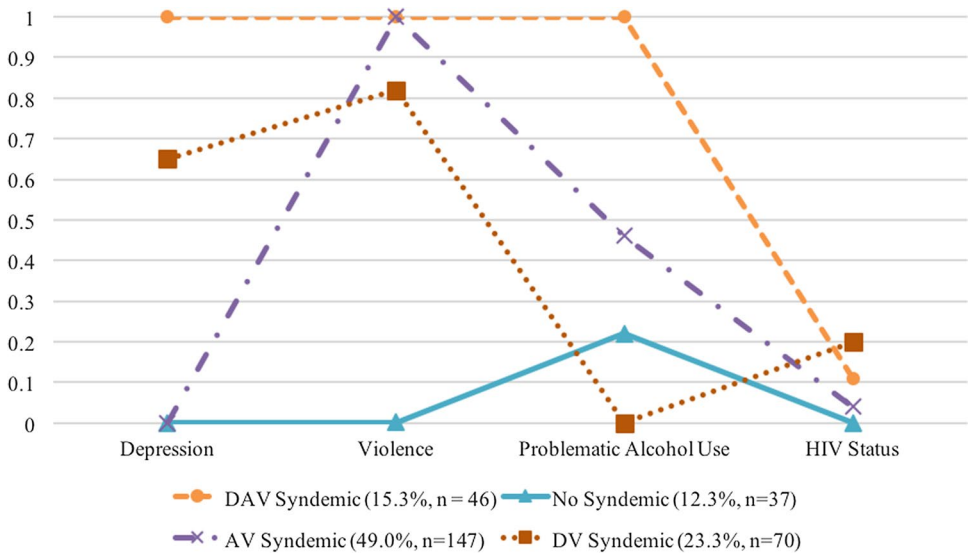

Fig. 1 Four-class solution of syndemic conditions

Table 1 Sample characteristics by latent class membership

	Overall		DAV Syndemic	AV Syndemic	DV Syndemic	No Syndemic	
	N	%	n (%)	n (%)	n (%)	n (%)	χ^2
Education							5.9
No formal education	43	14.3	9 (19.6)	19 (12.9)	13 (18.6)	2 (5.4)	
Up to secondary education	190	63.3	30 (65.2)	94 (63.9)	41 (58.6)	25 (67.6)	
Above secondary education	67	22.3	7 (15.2)	34 (23.1)	16 (22.9)	10 (27.0)	
Transactional sex worker status							9.1*
Yes	212	70.7	35 (76.1)	45 (64.3)	112 (76.2)	20 (54.1)	
No	88	29.3	11 (23.9)	25 (35.7)	35 (23.8)	17 (45.9)	
Moderate/severe depression							265.8***
Yes	107	35.7	46 (100.0)	0 (0)	61 (87.1)	0 (0)	
No	193	64.3	0 (0)	147 (100.0)	9 (12.9)	37 (100.0)	
Violence							227.2***
Yes	251	83.7	46 (100.0)	147 (100.0)	58 (82.9)	0 (0)	
No	49	16.3	0 (0)	0 (0)	12 (17.1)	37 (100.0)	
Alcohol use							124.7***
Yes	112	37.3	46 (100.0)	59 (40.1)	0 (0)	7 (18.9)	
No	188	62.7	0 (0)	88 (59.9)	70 (100.0)	30 (81.1)	
HIV status							50.3***
Yes	28	9.3	5 (10.9)	2 (1.4)	21 (30)	0 (0)	
No	272	90.7	41 (89.1)	145 (98.6)	49 (70.0)	37 (100.0)	
Inconsistent condom use							23.8***
Yes	139	46.3	34 (73.9)	70 (47.6)	26 (37.1)	9 (24.3)	
No	161	53.7	12 (26.1)	77 (52.4)	44 (62.9)	28 (75.7)	
	M	SD	M (SD)	M (SD)	M (SD)	M (SD)	*F*
HIV-related stigma	73.2	22.7	78.7 (24.0)	71.5 (22.3)	73.7 (22.4)	72.1 (22.8)	1.20
Transgender identity stigma	29.6	4.9	32.3 (3.8)	30.4 (3.9)	29.0 (5.1)	24.2 (5.6)	25.1***
Age	29.6	7.8	33.9 (6.7)	28.3 (7.1)	30.7 (9.2)	27.3 (6.5)	8.2***
Income	8071.3	6252.9	8428.2 (6335.4)	8889.4 (6562.4)	6384.9 (4694.2)	7567.6 (7000.2)	2.71*
Social support	38.1	9.2	31.8 (9.8)	39.7 (7.4)	36.9 (10.4)	42.0 (8.6)	12.6***
Resilient coping	12.7	2.9	9.9 (2.8)	13.6 (2.2)	11.9 (3.4)	13.9 (1.8)	27.1***

Syndemic (OR 1.52, 95% CI 1.34, 1.73, $p < 0.001$), AV Syndemic (OR 1.33, 95% CI 1.21, 1.47, $p < 0.001$), and DV Syndemic classes (OR 1.27, 95% CI 1.15, 1.40, $p < 0.001$) over the No Syndemic class than TGW with lower scores of transgender identity stigma (Table 2). Older TGW had a higher odds ratio of being in the DAV Syndemic (OR 1.15, 95% CI 1.07, 1.24, $p < 0.001$) and DV Syndemic classes (OR 1.07, 95% CI 1.01, 1.15, $p < 0.01$) over the No Syndemic class than younger TGW. TGW with no formal education had a higher odds ratio of being in the DV Syndemic class (OR 8.72, 95% CI 1.43, 53.07, $p < 0.01$) over the No Syndemic class than TGW who have up to a secondary education. TGW engaging in sex work had a higher odds ratio of being in the AV Syndemic class (OR 2.85, 95% CI 1.18, 6.90, $p < 0.05$) over the No Syndemic class than TGW not engaging in sex work.

Associations Between Syndemic Classes and Sexual Risk, and Moderating Role of Social Support

TGW in the DAV Syndemic (OR 9.80, 95% CI 3.45, 27.85, $p < 0.001$) and AV Syndemic classes (OR 2.74, 95% CI 1.19, 6.32, $p < 0.01$) had higher odds of inconsistent condom use than TGW in the No Syndemic class (Table 3; Fig. 2). Results from the multivariate logistic regression revealed that the latent class x social support interaction term was significantly associated with sexual risk ($B = -0.20$, $SE = 0.07$, $p < 0.01$). Further examination of the simple effects indicated that among TGW with high social support, the DAV Syndemic class was associated with lower odds of sexual risk (OR 0.84, 95% CI 0.75, 0.95, $p < 0.01$). There was no significant association among TGW with lower scores of social support ($B = -0.29$, $SE = 0.91$, $p = 0.74$).

Table 2 Multinomial logit odds ratios of latent classes of syndemic conditions

Independent variable	DAV syndemic AOR (95% CI)	AV syndemic AOR (95% CI)	DV syndemic AOR (95% CI)
HIV-related stigma	1.01 (0.98, 1.03)	0.99 (0.98, 1.01)	0.99 (0.98, 1.02)
Transgender identity stigma	1.52 (1.34, 1.73)***	1.33 (1.21, 1.47)***	1.27 (1.15, 1.40)***
Age	1.15 (1.07, 1.24)***	1.04 (0.97, 1.11)	1.07 (1.01, 1.15)**
Education			
No formal education	6.48 (0.92, 45.92)	5.33 (0.90, 31.57)	8.72 (1.43, 53.07)**
Above secondary education	0.71 (0.20, 2.58)	0.98 (0.37, 2.60)	1.11 (0.39, 3.16)
Income	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Transactional Sex Status	2.96 (0.96, 9.11)	2.85 (1.18, 6.90)*	1.74 (0.69, 4.24)

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. The Chi square value is 77.87 with a significance level < 0.0001 for the model. Omitted (reference) categories are "No Syndemic" for latent classes of syndemic conditions; and "up to secondary education" for education dummy variable

Table 3 Multivariable logistic regressions of syndemic classes and social support/resilient coping on sexual risk (inconsistent condom use in the past month with any type of male partners) among transgender women, n = 300

	Model 1: syndemic classes alone (with covariates)	Model 2: syndemic classes; and social support and resilient coping
DAV Syndemic	9.80 (3.45, 27.85)***	5.88 (1.94, 17.79)***
AV Syndemic	2.74 (1.19, 6.32)**	2.61 (1.12, 6.09)*
DV Syndemic	1.99 (0.80, 4.96)	1.52 (0.59, 3.93)
No Syndemic	Reference	Reference
Social Support		0.91 (0.82, 1.01)
Resilient coping		0.98 (0.95, 1.01)

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Adjusted for age, education, sex work status, and income

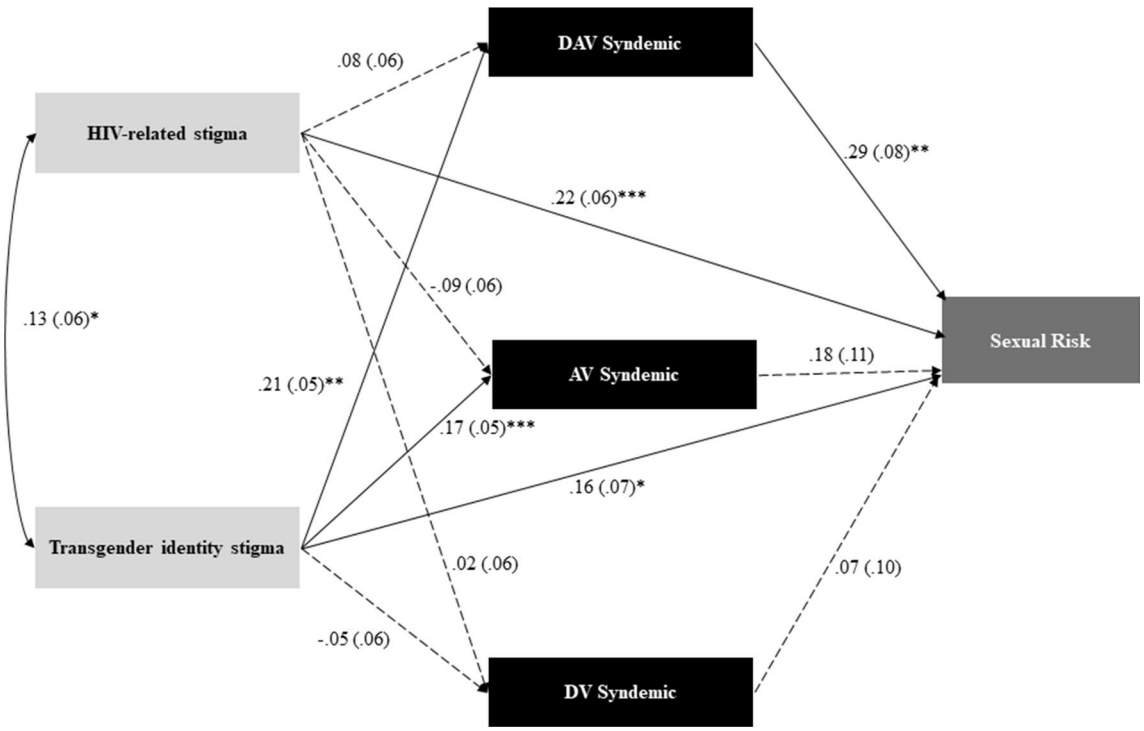

Fig. 2 Syndemic latent classes mediating associations between stigmas and sexual risk. Only significant associations are shown. Standardized values are shown. Solid lines are significant paths. Dashed lines are non-significant paths. Omitted (reference) category is 'No Syndemic' for latent syndemic classes. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Path Analysis of Stigmas, Syndemic Classes, and Sexual Risk

There were several significant effects (Fig. 2). Compared to TGW in the No Syndemic class, higher scores of transgender identity stigma was directly related to membership in the DAV Syndemic class (B = 0.21, $p < 0.001$) and AV Syndemic class (B = 0.17, $p < 0.01$). Higher scores of HIV-related stigma (B = 0.22, $p < 0.001$) and transgender identity stigma (B = 0.16, $p < 0.05$), and membership in the DAV Syndemic class (B = 0.29, $p < 0.01$) were directly related to sexual risk.

Next, we also investigated latent class membership as a mediator between stigmas (transgender identity stigma and HIV-related stigma) and sexual risk. The total indirect effect of transgender identity stigma on sexual risk through latent classes was significant (B [95% CI]: 0.09 [0.04, 0.14], $p < 0.01$). Further, the specific indirect effect of transgender identity stigma on sexual risk through the DAV Syndemic class was significant (B [95% CI]: 0.06 [0.02, 0.10], $p < 0.01$).

Discussion

The present study found unique patterns of syndemic conditions (syndemic classes) that were differentially associated with sexual risk among TGW in India. Furthermore, in path analysis, transgender identity stigma, but not HIV-related stigma, was found to be significantly associated with sexual risk—both directly and indirectly through a syndemic class (DAV Syndemic class). That is, as hypothesized at least one syndemic class (DAV Syndemic class) mediated the effect of transgender identity stigma on sexual risk. This means that a particular combination of syndemic conditions are needed to have a greater negative impact than some other combinations, or a particular combination of syndemic conditions are needed to be called as a true syndemic [27].

As statistical models that use a syndemic categorical variable (that counts the number of psychosocial health problems) or a syndemic composite variable (the sum of individual psychosocial health problems) to predict sexual risk have limitations [16, 23], we chose to identify latent syndemic classes among TGW in India and then used those classes to predict sexual risk. Besides a No Syndemic class, we found at least three syndemic classes—DAV (Depression, Alcohol use, Violence victimization) Syndemic, DV Syndemic and AV Syndemic, in increasing order of class prevalence. When compared to No Syndemic class, two (DAV and AV Syndemic classes) of the three syndemic classes were significantly associated with sexual risk, with DAV Syndemic class having the highest odds of sexual risk. Although the number of syndemic conditions in AV Syndemic and DV Syndemic classes was the same (two), when compared to No Syndemic class, AV Syndemic class had relatively higher odds of sexual risk than DV Syndemic class. This suggests that the two syndemic conditions in these two syndemic classes (AV and DV Syndemics) may interact in different ways that lead to this differential sexual risk. It is not clear what could explain such a difference, but given that AV Syndemic class had a higher proportion of sex workers, and DV Syndemic class had a higher proportion of HIV-positive people, reasons related to these two characteristics could possibly be related to this differential sexual risk.

In general, by the very nature of what syndemics means, syndemic conditions may have causal relationships, with sequential causal relationship being a possibility (i.e., one syndemic condition leading to one or more syndemic conditions) [6, 16]. Studies have shown that TGW in India face violence from police, clients of sex work and intimate partners [18, 20]. These experiences of violence and discrimination, including discrimination by family members, could increase the chances of TGW becoming depressed [28, 44], and subsequently TGW may resort to alcohol use, a maladaptive coping strategy [21]. Similarly, syndemic conditions may have reciprocal causal relationships given that they may mutually reinforce each other. For instance, forced sex without a condom may increase HIV risk directly as well as indirectly through subsequent depression among TGW. On the other hand, depression associated with living with HIV may increase the chances of experiencing violence (if HIV status is inadvertently disclosed), but HIV positive status may also have a complex relationship with sexual risk, such that TGW who know their HIV-positive status may adapt safer sex behaviors or face contextual barriers in practicing safer sex [21]. These mechanisms could account for particular combinations of syndemic conditions as well as differential sexual risk observed among the three syndemic classes in this study. Qualitative and mixed methods studies, especially those use that use techniques like process tracing [45], can further elucidate the processes by which certain syndemic conditions cluster together; and how syndemic conditions in certain syndemic classes interact with one another that may result in differential sexual risk.

Both AV and DAV Syndemics were concentrated among TGW in sex work, and both classes also had the highest average scores of transgender identity stigma. In path analysis, we found that transgender identity stigma, but not HIV-related stigma, was a significant predictor of two syndemic classes (DAV and AV Syndemic classes). It is possible that sex work stigma could be a predictor of syndemic classes, but we did not measure it. Nevertheless, a significant proportion of TGW in sex work bearing the burden of syndemics point out such a possibility. Future studies can include sex work stigma measures and also possibly find out ways by which we can measure the intersections between different

types of stigma (e.g., stigmas related to transgender identity, sex work, presumed or actual HIV status, substance use), which will be a challenge compared to having individual scales to measure each of those stigmas [46, 47].

Transgender identity stigma predicted sexual risk in this study, which is consistent with findings from studies conducted among TGW in the USA [48]. Syndemics has been proposed to be a mediator of the effect of adversities, including gay-related stigma/discrimination, in Stall et al's syndemics production model for urban gay men in the USA [25], and empirical support is available for the mediation role of syndemics [27]. However, we are not aware of any studies that have explicitly tested syndemics as a mediator of the effect of adversities, including stigmas, on HIV-related sexual risk among TGW. In the present study, we found that DAV Syndemic, but not other syndemic classes, was a significant mediator of the effect of transgender identity stigma on sexual risk.

In this study, we examined the role of protective factors or resilience resources—social support and resilient coping skill, and found that social support (but not resilient coping) was a significant moderator of the effect of syndemic classes on sexual risk. For instance, when compared to TGW in No Syndemic class, TGW in DAV Syndemic class had higher odds of sexual risk when the social support was low, but with an increase in social support there was a decrease in sexual risk. The social support scale we used measured support from family members, significant others and transgender friends. Thus, interventions to improve social support by promoting family acceptance (e.g., family counselling) and increasing solidarity among trans community groups could be helpful in decreasing the impact of syndemics on sexual risk. As social support has been shown to decrease the impact of transgender identity stigma on certain psychosocial health problems such as depression [28], interventions to increase social support could also decrease the occurrence of certain syndemic conditions.

Limitations

This study has several limitations. First, the non-probability sampling adapted in this study limits the generalizability of the results to the larger population of TGW; however, recruitment through the NGOs was fruitful in terms of obtaining a diverse sample of TGW (in terms of indigenous trans identities, sex work status, HIV status). Furthermore, if the prevalence of syndemic conditions was this high among participants who were affiliated to NGOs, then those who are not affiliated to NGOs might have even higher burden of syndemic conditions. It has been shown that people with depression and alcohol problems are in general less likely to seek treatment for their conditions [49, 50]. Second, being a cross-sectional study, caution should be exercised in attributing causal relationships. Even though Syndemic theory posits that syndemics predict sexual risk, a negative outcome, it is also possible that engagement in sexual risk behaviors may lead to depression and alcohol use, the conditions that lead to sexual risk. If sexual risk is, however, conceptualized as a syndemic condition as well, then this possibility is consistent with Syndemic theory as syndemic conditions may mutually reinforce each other or mutually causal [51]. Third, given the lack of adequate number of persons who had different types of partners, we could not be able to conduct partner type-specific analyses of inconsistent condom use. Future studies can examine whether and how the syndemic conditions or classes differentially influence sexual risk with different types of male partners of transgender women. Fourth, there are limitations in the measures used. We used only one item to create the 'frequent alcohol use' category, which could have caused misclassification in our latent classes. Violence victimization was measured by three items—sexual and physical violence by police, and physical violence by others. However, it is possible that sexual violence by others was not captured, which could have resulted in underestimation of the magnitude of the association between violence victimization and sexual risk. Fifth, we could not test comprehensive or complex models such as a moderated mediation model in which social support and resilient coping can be moderators of the pathways between stigmas and syndemics, syndemics and sexual risk, and stigmas and sexual risk. However, we at least found that social support was a moderator of the effect of syndemic classes on sexual risk. Sixth, self-reported behaviors, especially sexual risk practices and alcohol use, may be subjected to social desirability bias and thus might have been underreported. However, the research interviewers received adequate training on gaining rapport and in asking sensitive questions and also explicitly informed the participants they would not be judging them based on their responses, all of which could have decreased this bias.

Future research on TGW health with longitudinal studies offline and online, which measures stigmas, syndemic conditions and sexual risk over time, with adequate sample size and probability-based sampling procedures, may help in testing complex models and causal associations. Future studies on syndemics need to measure other conditions that have been described as part of syndemics—sexual compulsivity, internalized transprejudice, childhood sexual abuse, intimate partner violence and polydrug abuse—among transgender women as well as adapt the concepts from gender affirmation framework [29, 52], which seems consistent with Syndemic theory.

Conclusions

Our study has provided empirical support for the presence of unique pattern of syndemic conditions (syndemic classes) among TGW in India, and preliminary evidence for differential sexual risk associated with syndemic classes. The findings also suggest that it is not necessarily the number of syndemic conditions but also certain combinations of syndemic conditions that are associated with higher sexual risk. Findings indicate that, in addition to condom promotion efforts and risk reduction counselling, syndemically-oriented interventions that address syndemic conditions (e.g., depression, alcohol use and violence victimization) may substantially reduce sexual risk [12, 53]. Especially, the presence of particular combinations of syndemic conditions may indicate the magnitude of the potential sexual risk, and may help in identifying high risk individuals. At the trans community level, raising awareness about these psychosocial health problems and educational programs to reduce alcohol use might be helpful. Stigma reduction programs (e.g., media campaigns) need to be initiated among the general population to improve their understanding about transgender people and to raise awareness about how societal discrimination contributes to ill health among transgender people. Although stigma reduction efforts could also improve social support available for TGW, programs that explicitly aim at improving social support, especially family support, and to improve resilient coping skills among TGW could further reduce the impact of syndemics on sexual risk. Future research, by employing longitudinal study designs need to further validate causal associations between stigmas, syndemics and sexual risk, and also to test the effectiveness of combination approaches—integrating syndemically-oriented interventions in biomedical interventions such as HIV pre-exposure prophylaxis and/or in the traditional condom promotion-based HIV prevention interventions.

Acknowledgments Venkatesan Chakrapani was supported, in part, by senior fellowship from the Wellcome Trust/DBT India Alliance. Tiara C. Willie was supported, in part, by grants from the National Institute of Mental Health (T32MH02003118 and F31MH11350801A1). For successful implementation of this study, we thank our study partner agencies: The Humsafar Trust, Social Welfare Association for Men, Lotus Integrated AIDS Awareness Sangam, Mooknayak, Pahal Foundation, and Solidarity and Action Against The HIV Infection in India.

Funding This research study was funded by Indian Council of Medical Research (RHN/Adhoc/21/2010–11).

Compliance with Ethical Standards

Conflict of interest All authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Humsafar Trust, Mumbai, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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