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A study of Female Sex worker's sub-network on STI treatment seeking behavior in Chennai City: A Social Network Approach

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Abstract

Background: Female Sex workers (FSW) are having high-risk sexual behavior with multiple partners and the periodical sexually transmitted infection screening is determined by various factors. **Aims & Objectives**: To explore the presence of sub-networks of FSWs and to identify the trends in information flow on Sexually Transmitted Infection (STI) treatment seeking behavior by using social network analysis (SNA). **Material & Methods**: This was a community-based cross-sectional study and exponential snowball sampling method is used to identify 420 FSWs. Structured questionnaire was used to measure information flow and sub-network characteristics of social relationship, Information & Treatment seeking for STI and Sexual practice. **Results**: Study has listed 94 sub-networks. Here, Sexual practice (Sub-group 28) has highest number of subnetworks compared to other three subnetworks of Social Relationship (Sub-group 25), information on STI (Sub-group 23) and Treatment seeking for STI (Sub-group18). Similarly, other Centrality measures like Triad and Dyad are higher (Each 4 sub-group) in sexual practice domain and this is absent in rest of the three domains. Further, treatment seeking for STI has low Clique (Sub-group 17) compared to other domains. This shows high information flow is present in Sexual Practice compare to treatment seeking for STI (CC-0.986, P-0.000). Among the sub typology home based and street based FSWs are well connected, well informed and most influential than other sub-typology. **Conclusion**: SNA reaches more number of HRGs with less resource. Therefore, SNA could be cost effective to mapping the sub-network and visualize the information path for STI treatment seeking behavior.

Introduction

In prevention of sexually transmitted infection, peer networks are seen as a power structure to empower Female sex workers (FSW), reduce violence and coping with the diffusion of information related prevention of sexually transmitted infection (STI) (1). FSWs are highly vulnerable to contracting STI, disempowered and economically marginalized (2). Considering their STI risk, immediate attention requires to analysis this structural network to understand the positive and negative factors for acquiring risk behaviors.

In India, through decades of intervention, among the sex workers there is a significant level of improvement seen in a comprehensive knowledge of STI and consistency of condom usage has increased with their sexual partners like occasional and regular clients and casual partners (3,4,5,6,7). The recent

National Integrated Biological and Behavioural Surveillance (IBBS) study of National AIDS Control Organisation (NACO) has reported that even with high level awareness (88%) of STI among FSWs, there were 31% self-reported STI has been reported (8). Which shows that even with the presence of high awareness of STI there is a lacuna in practicing safer sex among this population.

On other hand, adhering to periodical STI screening and undergoing an internal examination is a major concern among this population due to various factors. This has resulted that only a small percentage of FSWs adhere to the screening process (9,10). As female sex workers are naturally networked together as a group for soliciting clients and for other Psycho-social support. There is a need to study this networks among FSWs to address this concern. Therefore, we undertook an SNA based study to visualize the female sex worker's subnetwork on STI treatment seeking behavior (11,12).

Aims & Objectives

1. To explore the presence of sub-networks of FSWs.
2. To identify the trends in Information flow on STI treatment seeking behavior by using social networks analysis.

Material & Methods

Hypothesis

- Higher the network density and cohesion, greater the information flow regarding STIs treatment seeking behavior among subnetworks of FSWs.
- With increased information flow, the social support also increases among female sex workers.

Study Design

This was a community-based cross-sectional study among FSWs in Chennai District, Tamil Nadu, India. Study was carried out from April -2016 to December -2016 and covered all identified female sex workers in the entire district of Chennai, which extends in the North Thriuvotriyur, South extends up to Thiruvanmiyur and Velacherry and in the west ends at Virugampakkam a total area of nearly 178 Sq.KMs. The researcher collected the data through a structured Questionnaire. And the details of information flow were assessed based on the following domains like a social relationship, information on STIs, STI treatment seeking and sexual practice.

Sample Size Estimation

NACO has estimated that the total female sex workers Population Size in Chennai District: 11777 (Mapping, 2008) and the earlier study has reported that the STI treatment seeking behavior in Chennai District is 37.6% (13). For calculating the sample size study has taken 5% as margin error, 95% confidence Level this has estimated 350 sample for this study. Considering the low /non-response 20% has taken more as over sample which has come to a total minimum sample size as 420

And the below is the formulae and the description of formulae

$n = (Z2 \times P (1-P))/e2$

Where Z = value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% CI)

P -is expected true proportion − 0.37 (Based on Previous study)

e -is desired precision (half desired CI width).0.05

Sampling Method

Exponential snowball sampling method was used to collect sample of 420 sex workers for this study using this method (14) and the further analysis was carried out as follows,

Network Analysis of Information Flow

Data were entered into Node XL (version 1.0.1.92) is an open source software (15) for analyzing the subnetworks based on Geo distance, Density, Dyad, Triad, and Cliques. These centrality measures identified the subnetworks characteristic on the spread of information flow on STI treatment seeking behavior and also identifies the sub-networks connectivity with other members in the network (16,17). This implies that more number of sub-networks will ease information flow within the sub-network. Further, diffusion of information would be faster and stronger if there an increase in socio-metric values of centrality measures like Density, Cliques and Dyad. Whereas, this information flow would be in reverse manner in Geo-Distance centrality and SPSS used to analysis the correlation coefficient between each domains.

Ethical Consideration

As this study involved human-being we had approached ethical committee to carry out this study and got the ethical committee approval from School of Public Health, SRM University. During the process of the study, informed consent was obtained from

the study population. Respondents were informed about their rights in participating or not participating and the risks of disclosing their sex work status during the process of interaction by the researcher. Financial benefits were not provided to the participants but, information regarding prevention, treatment facilities for sexually transmitted infection were provided and they were given unique identification numbers for confidentiality of individual information and privacy protection.

Results

Socio – Demographical Information

The study population (Table:-1) represents the majority of them were street based (57%) followed by home-based (24%) and Mobile based (15%). Other category like Brothel (2%), Lodge (1%) and Dhaba based (1%) sex workers were very negligible. Age of this population shows a majority of them are between 26 - 45 (89%) and the remaining population from age below 25 (7%) and the age category 46 and above were 4%. Educational status of these FSWs shows more in High school level (51%) and Primary level (36%). 12% of these FSWs weren't into school and only 2% of them are above secondary level schooling. Majority of the marital status of study population are Married (91%), rest of them are Widow (3.3%), Separated (2.4%), Divorced (1%) Unmarried (1.2%) and live in partner (0.5%).

Centrality Measures of Domain

All four domains were analyzed (Table:-2) with centrality measures like finding out the presence of a number of sub-groups, Geo-Distance among the Sub-groups, Density, Dyad, Triad, and Cliques. Here, number of groups play a vital role in information flow, as the group size increases, communication path among FSWs will be shorter in the group and density would also higher. Study has revealed that the Sexual practice has got a high number sub-networks (28-subgroups), followed by Social Relationship (25 Sub groups), Information of STI and the treatment seeking for STI group has got less no of subgroups (18- Sub groups) compare to other. This infers that sexual practice and social relationships are more personal sharing between two to more individuals and treatment Seeking lies with limited subgroups.

Social relationship and information on STI were having Maximum Geo-Distance as 12 and the minimum Geo-Distance shows in sexual practice (Geo distance10). The average Geo-Distance lies in the range of 4.2 to 4.5 here, Information on STI has got high (Geo-Distance 4.5) and the lowest is in Social relationship (Geo-Distance 4.2). This shows that sexual practice activities are tied up very close compared to other domains.

Dyad and Triad shows direct linkage between 2 and 3 FSWs together as a sub-group. Dyad is high in Sexual Practice domain (Sub-groups 4) followed by Social Relationship domain (Sub -groups 3), information on STI domain (Sub-groups 2) and Treatment seeking for STI (Sub-group 1).

In Triad centrality, sexual practice domain alone got four Triad, rest of the domain doesn't even have a single triad. Similar, to Geo-Distance, Dyad and Triad has shown strong among the sexual practice domain and weaker in STI treatment seeking for STI activities, which is natural among FSWs as this would increase their sharing of sexual partners/clients.

The presence of Cliques centrality is focused on the sub-network more than three group of individuals. In this clique social relationship domain was having higher sub-network (Sub-groups 22) followed by information on STI domain (Sub-groups 21), Sexual practice domain (Sub-groups 20) and the least number of cliques is in Treatment seeking for STI domain (Sub-groups 17). This visualize the information flows high in social relationship domain compare to other domain and lesser flow happening in treatment seeking for STI. Sexual practice domain has got high centrality among FSWs in the following area, number of Sub-networks, Triad, Dyad and Cliques. Which is usual among FSWs, as their ultimate goal is to form a sub-network for enabling the solicitation sex to earn more money. This refers that the stronger the network, faster the information flow as resulted in the case of sexual practice domain compare to other domain.

Association between domains

Association between all the four STI treatment seeking domains was analyzed and their P-Value was culled out (Table:-3). Here, the P value is highly significant with all four domains (P-0.00). Which shows higher the social relationship this will increases the access for information on STI, STI treatment seeking behavior and also mobilize the sexual partners/Clients. Similarly, the correlation coefficient is high between STI treatment seeking (CC0.986, P-0.000) and sexual practice (CC 0.980, P-0.000). Followed by information on STI domain has a high correlation coefficient (CC 0.661, P-0.000) with STI treatment seeking domain.

Discussion

This study has mapped, identified the characteristic of sub-networks in each domains using social network analysis based on the above said domain wise activities. This study finding has established that SNA could be tried out for mapping the sub-network and identify the trends of information flow on STI treatment seeking behavior. The result of this sub-network indicates that with 94 sub-networks, we can reach 1446 FSWs for STI prevention activities. Further, these 94 sub-networks could be used to motivate for periodical STI screening for prevention of STI. Even, if any intervention wants to reduce the resource. This study has identified highly influential sub-networks (social relationship and sexual practice sub-network domain). This sub-network FSWs could be used for STI prevention activities. Study has developed a scope for identifying the negatively linked sub-networks which would be helpful for controlling the flow of negative information like myths, stigma-related barriers and thereby they could be monitored and managed positively (18). The initial recruitment of sample population for the personal interview was the major challenge, which needs to be taken care for executing further similar study with the hidden population (19,20,21). Also, this kind of study among the high-risk behavior population is fully dependent on self-reported statements (22). However, this study suggests that this sort of analysis would conceptualize information flow among subnetwork and with the limited resource setting this would help in reaching large a population through less resource for implementing prevention and health promotion activities.

Conclusion

The objective of this study was to explore the presence of sub-networks of FSWs and to identify the trends in Information flow on STI treatment seeking behavior by using social networks analysis. Centrality measure was used to assess the subnetwork in information flow for STI treatment seeking behavior based on the assumption that higher centrality values, greater the information flow rates. The identification process was started initially with 1 FSWs and their immediate contacts of 1446 FSWs through exponential snowball sampling method. The open source software Node XL was used for identifying the centrality to analyzing the information flow. Among this 420 FSWs who has scored high degree value greater than 5 has enriched

information about the community and could be identified as opinion leaders, and therefore they could be used as a motivational Speaker for improving STI screening through strengthening the information flow. As SNA has reached identifying the influential sub-network and individual in the networks in a systematic method. This FSWs in the sub-network could be used as a key mobilizer for STI prevention with a limited resource setting. Thus, SNA approach should be a cost-effective methodology to improve the STI treatment seeking behavior among FSW.

Recommendation

The finding of this study supports that SNA approach could be used for a cost-effective and evidenced methodology to improve the STI treatment seeking behavior among FSW in a limited resource setting.
In addition, SNA supports the feasibility of applying for mapping the existence of sub- network and identifying influential FSWs to conceptualize positive and negative linked FSW's Sub-networks to control the information flow for improve the STI treatment seeking behavior. Among the sub-typology, Home-based and Street-based FSWs are well connected, well informed and most influential than other sub-typology of FSWs groups. Further, service of these Street-based and Home-based FSWs can be used to educate other FSWs on STI treatment seeking behavior among FSWs in Chennai.

Limitation of the study

The main limitation of this kind of study is the inability of mobilizing the new FSWs for a personal interview. Also, there is a chance of getting high non-response rates.

Relevance of the study

The existing STI prevention program depends on the Peer Educators close contact and their mapping also very limited to their easily approachable, accessible and known networks of FSWs (3). This could be a weakness of reaching more number of new and young FSWs for STI screening. Further, this new and young FSWs are more vulnerable to STI due to high client load, lack of awareness and non-exposure to prevention program staff. And even in the presence of barriers, there are various external factors involved in accessing STI screening and adhering the positive behavior. On other hand, this study has traced through indirect method by asking others information related stigma related, low and non-

responsive questions for visualize the information flow for STI treatment seeking behavior among sub-networks using social network analysis. Therefore, application of SNA has helped out in visualizing the existence of information flow and active player for emphasizing STI treatment seeking behavior. And they could be involved to motivate other FSWs and strengthen STI prevention activities. And this influential sub-network members would be motivated to develop an enabling environment for addressing the hindrance in accessing STI screening.

Authors Contribution

KA & MB has contributed and participated in all the stages of the study design, data acquisition and Analysis, drafting, reviewing the article. Interpretation of data, revising and final approval

Acknowledgement

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Tables

TABLE 1 SOCIO- DEMOGRAPHY DETAILS OF FEMALE SEX WORKERS OF THIS STUDY

Description	Category	(n-420)	In %
Typology	Brothel-Based	9	2%
	Dhaba-Based	3	1%
	Home-Based	100	24%
	Lodge-Based	4	1%
	Mobile-Based	63	15%
	Street-Based	241	57%
Age	Below 25	30	7%
	26 to 45	375	89%
	46 and Above	15	4%
Education	Primary School	151	36%
	High School	213	51%
	Secondary and Above	7	2%
	Not Into School	49	12%
Marital Status	Unmarried	5	1.2%
	Married	384	91%
	Separated	10	2.4%
	Divorced	5	1.2%
	Widow	14	3.3%
	Live in partner	2	0.5%

TABLE 2 DESCRIPTION OF SOCIO METRIC VALUES SOCIAL RELATIONSHIP, STI TREATMENT SEEKING AND SEXUAL PRACTICE USING SOCIAL NETWORK ANALYSIS

Domain	No of Group	Max. Geodesic Distance (Diameter)	Average. Geodesic Distance (Diameter)	Density	Dyad	Triad	Clique
Social Relationship	25	12	4.2	0.0021	3	0	22
Information On STI	23	12	4.5	0.0023	2	0	21
Treatment Seeking for STI	18	11	4.3	0.0023	1	0	17
Sexual Practice	28	10	4.3	0.0023	4	4	20

TABLE 3 ASSOCIATION BETWEEN SOCIAL RELATIONSHIP, STI TREATMENT SEEKING AND SEXUAL PRACTICE

Domain	Social Relationship	Information on STI	STI Treatment Seeking	Sexual Practice
Social Relationship	Nil	CC-0.661, P-0.000	CC-0.659, P-0.000	CC-0.645, P-0.000
Information on STI	CC-0.661, P-0.000	Nil	CC-0.986, P-0.000	CC-0.980, P-0.000
STI Treatment Seeking	CC-0.659, P-0.000	CC-0.986, P-0.000	Nil	CC-0.990, P-0.000
Sexual Practice	CC-0.645, P-0.000	CC-0.980, P-0.000	CC-0.990, P-0.000	Nil