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## The interrelationship of men's self-reports of sexual risk behavior and symptoms and laboratory-confirmed STI-status in India

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### Abstract

This paper describes the interrelationship among men's self-reports of symptoms, unsafe sexual behaviour and biologically tested STIs. Data is drawn from the baseline survey of six-year (2001–2007) research and intervention project on men's sexual health and HIV/STI risk reduction conducted in three urban poor communities in Mumbai, India. The survey collected a wide range of demographic, attitudinal, knowledge and behavioral data. In addition, men were tested for common sexually transmitted infections by selecting a systematic random sub-sample of 816 men (assuming 20% non-response). Data in this paper are based on 641 men who had completed the survey interview and for whom the testing of blood and urine samples was conducted. Results suggest that the self-reported STI-like symptoms and unsafe sexual behaviour taken together as a predictor of confirmed STIs improves the sensitivity to a significantly ( $\chi^2 = 2.83$ ,  $p < 0.05$ ) as compared to the sensitivity of self-reported STI-like symptoms or unsafe sexual behaviour alone as a predictor of confirmed STIs. In addition, the consistency of self-report was found to vary among socio-demographic and behaviorally defined sub-groups. These results provide preliminary support for the importance of population-based surveys, which collect all the three types of data for a full understanding of sexual risk and sexually transmitted infections and for identification of sub-groups within communities that vary in their ability to identify STI symptoms.

### Keywords

Sensitivity; STI-like symptoms; unsafe sexual behaviour; sexually transmitted infections; India

### Introduction

The use of population-based, behavioral surveys that include biological testing is generally recognized as an important tool in establishing prevalence and for identifying risk factors

that can be the basis for prevention efforts. Despite their importance, population-based surveys assessing the prevalence of sexually transmitted infections (STIs) are rarely undertaken, particularly in developing countries. Barriers to these comprehensive surveys include high cost, the lack of availability of gold standard tests, insufficient laboratory capacity, lack of trained staff, and limited acceptance by community residents. A global systematic review of community-based surveys carried out in low income countries with laboratory-confirmation of STI prevalence found only eleven such surveys for women, five for men and two for both men and women (Elias et al., 2003).

One approach that researchers have taken to the difficulties associated with biological testing in the general population is to depend on self-reports of sexual risk behavior and STI-like symptoms. The reliability of self-reports have come under serious criticism (Aral and Peterman, 2002). Respondents are seen as over- or under-estimating their sexual behaviors and survey instruments fail to collect information on the specifics of the nature, frequency, and timing of sexual behavior. Self-reports of symptoms are confounded by asymptomatic presentation of STIs, a lack of knowledge of STI symptoms and stigma associated with reporting STI symptoms (Aral, 2004; Aral and Peterman, 2002). Peterman (2002) argues that reported behavior is not a good surrogate measure for sexually transmitted diseases (STD) risk. Bhatia and Cleland (1995) are critical of a lack of participation of local populations in the construction and design of survey instruments resulting in a culturally inappropriate selection of items.

There are three primary bodies of data that are of concern in population-based studies: (1) laboratory and/or clinically confirmed sexually transmitted infections based; (2) respondent self-reports of unsafe sexual behavior and (3) respondent reports of sexual/reproductive symptoms/morbidity. Only a few studies have established a relationship between self-reported symptoms and laboratory diagnosis of morbidity (Parikh et. al., 1989; Brabin et. al., 1995; Younis et. al., 1993), while many other studies (Bhatia and Cleland, 1995; Datta et. al., 1980; Prual et. al., 1998; Aral and Peterman, 2002; Aral, 2004) have raised concerns in general about the lack of association among the three major sources of data on sexually transmitted diseases generated from population based surveys. The logistical and resource issues associated with these comprehensive surveys, combined with the lack of correlation among these bodies of data call into question the utility of population-based, laboratory-confirmed, behavioral and STI prevalence surveys.

Efforts to assess the population-based prevalence of reproductive morbidity among women through self reports (Bang et. al., 1989; Bhatia & Cleland, 2000; Zurayk et. al., 1995; Kaufman et. al., 1999) have raised questions related to their validity and consistency of reported morbidity. A study conducted in South India on 3600 women showed that urban, educated women reported a greater number of symptoms with less biologically-defined morbidity than their rural counter parts (Bhatia and Cleland, 1995; Bhatia, 1995). Additionally, men's reports may be less consistent than women's (Eggleston et. al., 2000) with the ever present possibility of exaggeration of the extent of sexual encounters by unmarried men (Cleland et. al., 2004). Some of these researchers (Sadana, 2000; Peterman, 2002; Cleland et. al., 2004) have pointed out a need for study of the relationship between self-reported behaviour and biologically-defined morbidity among men and the

characteristics of individuals who are more likely to accurately report their behavior, before a safe, reliable estimate can be made on prevalence and risk.

The research reported on in this paper has utilized all three bodies of STI-related data, using gold standard tests and surveys involving self-reports of sexual behavior and STI-like symptoms in three urban poor communities in Mumbai, India. The paper examines the sensitivity of self-reports with regards to the laboratory-confirmed results and identifies those groups of individuals where the STI test results match with self-reports of sexual risk behavior and symptoms. Data is drawn from an experimental study of men living in economically marginal communities in Mumbai, India and seeks to add to the literature on the sensitivity and specificity of these data and the validity of their interrelationships.

## Materials & Methods

This paper reports on research conducted as a part of a six-year, Indo-US collaborative project, known as “RISHTA” (meaning, “relationship” in Hindi/Urdu and an acronym standing for “Research and Intervention in Sexual Health: Theory to Action”) to reduce unsafe sexual risk among married men in economically marginal communities in Mumbai, India. The RISHTA study was conducted between September 2001 and August 2007 in three large urban poor communities. These communities collectively consist of 80,000 households and a total population of approximately 700,000. The majority of residents (66%) are migrants from rural India. The overall design of the RISHTA project has been described in detail elsewhere (Schensul et al., 2007; Schensul et al., 2004; Saggurti et al., 2009).

The data for this paper was drawn from a baseline survey conducted from May through September, 2003. A random sample of 2,408 married men from the three communities in the age range of 21–40 years were selected for administration of a survey instrument that collected a wide range of demographic, attitudinal, knowledge and behavioral data. In addition, men were tested for common sexually transmitted infections by selecting a systematic random sub-sample of 816 men (assuming 20% non-response). Data in this paper are based on 641 men who had completed the survey interview and for whom the testing of blood and urine samples was conducted.

The participating individuals were asked to provide intravenous blood (5ml) as well as a first-void urine sample in various locations (community halls, political party offices, schools, temples) located in the study communities. At the blood and urine collection site, first-void urine and 5ml venous blood samples were collected by a trained phlebotomist. Blood serum was tested for syphilis using RPR and TPHA. Serum was also tested for the presence of IgM and IgG antibodies to HSV2 (Viracell, Santase Granada, Spain). Urine samples were tested to detect *C. trachomatis* and *N. gonorrhoea* infection using Multiplex Amplicor PCR assay (Roche Diagnostic Systems, Branchburg, New Jersey, USA).

In the survey, each man was asked about his extra marital penetrative sexual experiences in the last one year as well as condom use in his last sex and in the last three months. Men who had extramarital sex with either a female or male (commercial or noncommercial) and had not used a condom were considered to be in the category of “unsafe sexual behavior.”

Respondents were asked about the presence/absence of twelve symptoms characteristic of common STIs for which testing was conducted. These symptoms included: pus discharge, white discharge, blood discharge from penis, lower abdominal pain, a burning sensation during urination, pain in the penis, ulcers in the genital area, swollen glands in groin, sores on the penis, and nodules on the genital organs.

Sensitivity, specificity and predictive values were calculated to compare men's self-reports and laboratory diagnosis. In an effort to understand the possibility of differing levels of reliability of self-reports among various socio-demographically-defined sub-groups, variables were examined as age, education, family income, migration status, exposure to pornography, alcohol use, number of lifetime partners and treatment seeking behavior. Calculation of proportions and chi-square tests were used to assess the significance of bivariate relationships. Multiple logistic regression techniques were employed to assess the significance of independent variable relationships on the reliability of self-reports.

Written informed consent was obtained from each individual before the interview. The RISHTA study was approved by the Ethics Committee of the Indian Council of Medical Research (HMSC-ICMR), institutional review boards (IRBs) of the collaborating partners: the International Institute for Population Sciences (IIPS) in Mumbai, India; the University of Connecticut Health Center in Farmington, Connecticut, USA; and the Institute for Community Research in Hartford, CT, USA.

## Results

The population from which the sample is drawn is mixed Hindu (42%), Muslim (54%), and Christian/Buddhist (4%). The men have a mean age of 32 years, a mean education of six years and 18% are illiterate. They are primarily daily wage workers (38%), petty traders/hawkers (23%), and salaried private workers (19%), with a mean income of Indian rupees 3,167 per month (US \$72). Median age at marriage was 23 years; median age at first sexual debut was 21 years, with 16% having had their sexual debut with a female prior to 18 years of age. The socio-demographic and sexual characteristics of participants and non-participants in STI testing sample were not significantly different in terms of age, literacy, income and sexual history.

### Laboratory Confirmed STIs

The results of the laboratory testing revealed that at the time of survey, 3.8% of the men were suffering from gonorrhoea, 1.2% from acute syphilis and 0.9% from HSV-2. Chlamydia was detected in only 0.3% of the cases. The combined prevalence of acute STI was detected in 6.1% of the cases. A past history of syphilis was detected in 4.7% of the men and HSV-2 was in 9.8%. Overall, 12.1% of randomly selected married men in the age range of 21–40 showed a past history of either syphilis or HSV-2.

### Self-Reported STI-Like Symptoms

The self-reported STI-like symptoms were clustered into the following two categories (1) urethral discharge and (2) genital ulcer or blisters on male genitals. Of the 641 tested, 122 (19.0%) reported a least one of the urethral discharge symptoms and 38 (5.9%), reported

various kinds of genital eruptions. Past history of urethral discharge symptoms were reported by 56% of the men with 33% reporting a past history of genital eruptions.

### **Self-Reports of Unsafe Sexual Behavior**

Over forty percent (42.6%, 273/641) of the married men reported pre-marital sex with a woman and 2.5% (16/641) with a man. The mean age at first premarital sex was 18.6 years (N = 273) for those having first sex with a woman (not their wives) and 16.3 years for those having sex with a man (N = 16). For those men whose first sex is with their wives, the mean age was 22.4 (N = 366). More than a quarter of the men (179/641, 27.9%) reported having had at least one episode of sexual intercourse with a woman outside of marriage, while 15.9% (102/641) reported extramarital sex in the last one year. Only a small percentage, 0.9% (6/641) of men, reported extramarital sex with a man. Almost five percent (32/641, 4.9%) of men reported payment to a woman for sex within the past 12 months. Fifty eight percent of the men have reported use of a condom in extramarital sex with the sex worker, while only 26% reported use of condom in extramarital sex with a woman other than sex worker.

### **Validity and reliability of self-reports**

Men's reports of symptoms were compared with the results of laboratory diagnosis of STIs. In the study population, only one-third (2.0% out of the 6.1% STI positives) of the men who were STI positive had reported symptoms, while those remaining did not report any symptom. Approximately one-fourth (26% out of the 94% STI negatives) of the men who were STI negative had reported symptoms. Measures of sensitivity, specificity and predictive power were used to summarize the results (see Table 1).

The sensitivity of self-reported STI-like symptoms as a predictor of confirmed STIs were found to be very low. Sensitivity of self-reported unsafe sexual behavior as a predictor of laboratory-confirmed STI infection was also low. However, the value of sensitivity in the case of unsafe sexual behavior as predictive of STI infection is better (sensitivity range: 12.8 – 14.8; specificity range: 83.9 – 84.0) than the values of sensitivity in the case of reported symptoms as predictive of STI infection (sensitivity range: 7.1 – 15.4; specificity range: 80.7 – 94.2). Despite the low sensitivity of each type of self-report, taking both self-reported symptoms and self-reported unsafe sex together improves the sensitivity to a significant extent (sensitivity range: 25.9 – 35.7, specificity range: 68.1 – 68.5). The difference in sensitivity values between self-reports of symptoms or unsafe sex alone as against the self-reports taken together in predicting laboratory-confirmed results is statistically significant ( $\chi^2 = 2.83$ ,  $p < 0.05$ ).

A total of 214 men (33%) reported having a past history of symptoms that could be indicative of syphilis and 84 men (13.0%), were detected to be positive through laboratory tests for lifetime syphilis (TPHA positive only) and/or HSV-2 (IgG positive only). Both sensitivity (43%) and specificity (68%) were found to be relatively high with respect to the past history of symptoms related to syphilis/HSV-2 as against a confirmed past history of syphilis/HSV-2 lifetime infections. As with current history, sensitivity was highest when past symptoms were combined with past history of sexual exposure.

### Factors associated with consistency between self-reports and laboratory results

The results presented in Table 2 suggest that several background characteristics such as age, migration status, exposure to pornographic materials, alcohol intake, number of lifetime sexual partners, history of prior sexual health problem treatment, mobility and living with wives in Mumbai were significantly associated with consistency in self-reports of symptoms and/or unsafe sexual behaviour. A significantly high proportion of men not exposed to pornographic materials are more likely to accurately report (without any over and under reporting) their symptoms and sexual risk behaviour (71.8%) as compared to men who access pornographic materials (57.4%). Further, high proportions of men living with their wives in Mumbai (68.2%) accurately report their symptoms and sexual risk behaviour than the men living without their wives in Mumbai (50.5%).

### Sub-population differences in reliability of self-reports

While a combination of self-reports of both STI-like symptoms and unsafe sexual behavior increases sensitivity, we considered the possibility that the reliability of self-reports may vary among different sub-groups in the population, defined by both socio-demographic and behavioral variables (see Table 2).

The results indicate that consistency in self-reports in predicting laboratory-confirmed STI infection increases with age. The odds of correctly reporting symptoms among men aged 31–35 years is two times higher (95% CI: 1.1–3.6) than the men below 25 years of age. Consistency in self-reports was higher among men who reported no exposure to pornographic materials (OR: 1.58, 95% CI: 1.1 – 2.3) than among men with exposure to pornographic materials. The odds of consistency in self-report is three times (95% CI: 2.1, 4.6) higher for men with only one lifetime sexual partner relative to those men with more than one lifetime sexual partner. Married men with wives residing with them are more consistent in their self-reports (OR: 2.33; 95% CI: 1.3 – 4.0) than the men without their wives in residence.

## Discussion

Biological markers are usually intended to verify self-reports in STI investigation. This study found that a significant number of STI positive men failed to report risky behavior and that a significant number of men who reported risky behavior were STI negative. Nearly three-fourths of the infected individuals reported no STI symptoms and no unsafe sexual behavior. The great majority of uninfected men did report STI-like symptoms. These results suggest that dependence on self-reports does not lead to an effective estimation of STI prevalence. STI secondary prevention programs cannot depend on self-reports as a means of outreach and early diagnosis.

In this study, laboratory confirmed STI test results did not effectively identify the prevalence of individuals within a population who are involved in unsafe sex. Therefore an emphasis on laboratory-diagnosed cases misses the opportunity for primary prevention among those involved in unsafe sexual behavior. Thus, rather than the biological test verifying self-reported behavior, we would propose that biological testing presents a complimentary

approach to behavioral research in which together they provide a more effective estimation of an at-risk population and a guide for more targeted interventions.

This study concerning men's misreporting of behaviour and/or STI symptoms is consistent with results of studies with men as well as with those studies that have focused on women and found similar results in assessment of gynaecological morbidity (Prual et. al., 1998; Aral and Peterman, 2002; Aral, 2004). However, the present study highlights the conditions under which self-reports of sexual risk and symptoms can match with the biologically-identified STIs. For instance, the sensitivity and specificity between self-reports of sexual risk or symptoms and STI morbidity is higher when the information asked was on past history. And the sensitivity and specificity are relatively low if they are about the current sexual risk or symptoms indicating that men are more likely to accurately report their past behaviours than their current behaviours.

The multiple logistic regression analysis further identified increasing age, recent migration status, no exposure to pornographic materials, single sexual partner, and those who did not seek STD treatment in the last three months prior to interview as significantly associated with consistency of self-reports. Further analyses of these data indicate that a majority of STI positive men who failed to report symptoms or sexual risk behaviour were staying in nuclear families (95 per cent), owned residences (85 per cent), had semen related problems in the past (85 per cent), had only one lifetime partner (75 per cent), reported no extramarital sex (96 per cent), and reported no premarital sex (75 per cent), and had never sought STD treatment. On the other hand, the STI negative men who reported symptoms or sexual risk behaviour were those younger in age, had more life time partners, were exposed to pornographic materials and received prior STD treatment. These results indicate that there are identifiable subsets of men are more or less accurate in their recognition of symptoms and their reporting.

The present study found that the reporting of sexual risk behaviour is higher in the younger age group (<30 years) and is consistent with the results of Cleland et. al. (2004) in which they note that self-reported sexual risk behaviour typically declines from around the age of 30 years. Despite the differences in reported sexual behavior by age, the consistency in self-reports as compared with diagnosed STI infection was higher in older ages as compared to younger ages, even after controlling for several background characteristics including condom use. Among young men, though the reporting of sexual risk was higher the data showed that they have over reported the STI-like symptoms, perhaps due to a lower level of knowledge of sexually transmitted diseases.

The data presented in this paper provide support for the need to have the combination of self-report of symptoms and unsafe sex in predicting laboratory confirmed STIs. In addition, both self-reported history of symptoms and unsafe sex behavior are predictive of a laboratory-confirmed past history of STIs. Finally, consistency of self-report has been found to be greater among particular socio-demographic and behavioral sub-groups within this population-based study. The data presented here demonstrates the need for a more complex analysis of the interrelationship of population-based self-report and biological data. The results should also encourage researchers to continue efforts to implement population-based,

behavioral and biological STI surveys as a means of maximizing available data in characterizing STI prevalence and risk in communities.

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Table 1

Comparison of self-reported symptoms with results of laboratory diagnosis among men in slums of Mumbai city

Self-reports of men	Laboratory diagnosis					
	Gonorrhoea/Chlamydia		Syphilis/HSV-2		Gonorrhoea/Chlamydia/Syphilis/HSV-2	
Current:	Yes	No	Yes	No	Yes	No
<b>Urethral discharge symptoms</b>						
Yes	3	119			6	116
No	24	496			33	487
	S 11.1, SP 80.7, PPV 2.5, NPV 95.4					
<b>Genital ulcer /blister symptoms</b>						
Yes			1	37	3	35
No			13	591	36	568
	S 7.1, SP 94.1, PPV 2.6, NPV 97.8					
<b>Unsafe sex behaviour</b>						
Yes	4	98	2	100	5	97
No	23	516	12	527	34	505
	S 14.8, SP 84.0, PPV 3.9, NPV 95.7 S 14.3, SP 84.0, PPV 1.9, NPV 97.7 S 12.8, SP 83.9, PPV 4.9, NPV 93.7					
<b>Self-reports of current symptoms/unsafe sex behaviour</b>						
Yes	7	196	5	198	11	192
No	20	419	9	430	28	411
	S 25.9, SP 68.1, PPV 3.4, NPV 95.4 S 35.7, SP 68.5, PPV 2.5, NPV 97.9 S 28.2, SP 68.2, PPV 5.4, NPV 93.6					
<b>Past history:</b>						
<b>Genital ulcer /blister symptoms</b>						
Yes			36	178	43	171
No			48	380	68	360
	S 42.9, SP 68.1, PPV 16.8, NPV 88.7 S 38.7, SP 67.8, PPV 20.1, NPV 84.1					

	Laboratory diagnosis		
	Gonorrhoea/Chlamydia	Syphilis/HSV-2	Gonorrhoea/Chlamydia/Syphilis/HSV-2
<b>Self-reports of men</b>			
<b>Self-reports of unsafe sex behaviour</b>			
Yes	13	57	67
No	14	27	44
	S 48.2, SP 47.1, PPV 3.9, NPV 95.4	S 67.9, SP 49.6, PPV 16.9, NPV 91.1	S 60.4, SP 48.9, PPV 19.8, NPV 85.5
<b>Self-reports of past symptoms and/or unsafe sex behaviour</b>			
Yes	7	74	90
No	20	10	21
	S 25.9, SP 20.8, PPV 1.4, NPV 86.5	S 88.1, SP 22.4, PPV 14.6, NPV 92.6	S 81.1, SP 21.5, PPV 17.8, NPV 84.4

**Urethral discharge related symptoms:** Pus discharge, white discharge, blood discharge from penis, lower abdominal pain, burning sensation during urination, pain in penis, redness of penis

**Genital ulcer /blister related symptoms:** Ulcers in genital, swollen glands in groin, sores on the penis, pain in the penis, redness of penis, nodules on the genital organs, syphilis

**Sensitivity:** the percentage of individuals found positive (i.e., infected) by the gold standard test who were also reported symptoms /sexually risky behaviour.

**Specificity:** the percentage of negative cases (i.e., uninfected) by the gold standard test who were not reported symptoms /sexually risky behaviour.

Table 2

Percent men whose STI test results match with self-reports of symptoms/unsafe sex behaviour by back ground characteristics; adjusted odds ratios on the prediction of consistency in self-reports by background characteristics.

Characteristics	% whose self-reports match with STI test results		Total number of men		Odds ratios for self-reports in agreement with STI test results	
					Adjusted Odds ratio	95% CI
<b>Socio-demographic characteristics/</b>						
<b>Age<sup>***</sup></b>						
21–25 years	56.8	95	Ref	-	-	-
26–30 years	66.3	184	1.35	0.29	0.78, 2.34	
31–35 years	75.8	178	2.02	0.01	1.12, 3.64	
36–40 years	60.0	185	0.97	0.94	0.56, 1.72	
<b>Educational status<sup>ns</sup></b>						
Illiterate	65.7	99	Ref	-	-	-
Literate upto primary	60.2	83	0.73	0.35	0.37, 1.42	
Literate more than high school	66.7	460	0.91	0.72	0.54, 1.53	
<b>Family Income<sup>ns</sup></b>						
<2500	62.0	229	Ref	-	-	-
2600–5000	67.7	322	1.15	0.47	0.78, 1.71	
>5000	68.1	91	1.02	0.94	0.57, 1.82	
<b>Migration status to the current place<sup>*</sup></b>						
1–5 years	82.4	51	Ref	-	-	-
6+ years	63.4	366	0.43	0.04	0.19, 0.99	
Born in Mumbai	65.8	225	0.49	0.10	0.22, 1.14	
<b>Exposure to porno materials<sup>***</sup></b>						
Yes	57.4	270	Ref	-	-	-
No	71.8	372	1.58	0.02	1.1, 2.32	
<b>Risk behaviour Characteristics/</b>						
<b>Alcohol use<sup>*</sup></b>						
No	69.6	382	Ref	-	-	-
Yes	60.0	260	0.87	0.47	0.59, 1.27	

<i>Characteristics</i>	% whose self-reports match with STI test results	Total number of men	Odds ratios for self-reports in agreement with STI test results	p-value	95% CI
<b>Number of lifetime partners<sup>***</sup></b>					
More than one	51.5	309	Ref	-	-
Only one	79.0	333	3.12	<0.001	2.13, 4.55
<b>Treatment taken for SHP<sup>**</sup></b>					
Yes	56.0	193	Ref	-	-
No	69.9	449	1.42	0.05	1.01, 2.17
<b>State<sup>ns</sup></b>					
Maharashtra	69.2	172	Ref	-	-
South India	63.4	153	0.75	0.27	0.45, 1.25
Rest of India	65.0	317	1.09	0.70	0.68, 1.78
<b>Mobility<sup>ns, #</sup></b>					
Not mobile	66.3	475	Ref	-	-
Mobile	63.9	158	0.94	0.77	0.62, 1.42
<b>Wife stays with respondent in current place<sup>***</sup></b>					
No	50.5	91	Ref	-	-
Yes	68.2	551	2.33	<0.001	1.37, 4.0
<b>Interviewer code</b>	--	--	1.01	0.10	0.96, 1.10

/ Chi-sq test:

\*\*\* p &lt; .001

\*\* p &lt; .01;

\* p &lt; .05;

ns – Not significant

Dependent variable in the model: Comparison of self reported STI risk with STI test results (0 – do not match, 1 – matches)

Value of R<sup>2</sup> = 22.0 percent

Ref = Reference category

CI = Confidence interval

SHP = sexual health problem

# Mobility is defined as short-term commuting involving at least one overnight stay away from home in the course of income generation (e.g. short and long distance truckers).

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