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Full Length Research Paper

Seroprevalence and Risk Factors of Hepatitis B, C and Sexually Transmitted Treponema Pallidum Infections in Jail Inmates of Quetta, Balochistan

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We evaluated the prevalence and risk factors of acquiring sexually transmitted and blood born related infections that is treponema Pallidum, Hepatitis B virus, and Hepatitis C virus in male prisoners in district jail Quetta Balochistan, Pakistan. Prevalence of hepatitis B virus, hepatitis C virus, and treponema pallidum were 6%, 4% and 5.5% respectively. The mean age of the subjects participated in the study was 39 years (18-60Y). Infections were greatly associated with younger age, illiteracy, unemployment, Injection drug use (IDUs), sharing of needles and shaving blades and extra marital sex. Long duration of incarceration also influenced on the elevated prevalence of infections. This study provides an appealing data of Hepatitis and Treponema pallidum among inmates. The high infection prevalence among inmates represents a significant community health issue. Regular screening, health educational programs, and general disease prevention efforts must be widely implemented within correctional facilities and HBV immunity vaccination to prisoners should be applied.

Keywords: Hepatitis B, Hepatitis C, Inmates, Prevalence, Risk factors, Treponema pallidum

INTRODUCTION

Prisoners are at more risk as compare to the general population to blood born and sexually transmitted disease (Bick, 2007). In many countries they have an increased prevalence of blood born and sexually transmitted infections (STIs) (Adjei et al., 2008). They have an

elevated prevalence rate of human immunodeficiency virus (HIV) infection, hepatitis B infection, hepatitis C infection, syphilis, Chlamydia and *Mycobacterium tuberculosis* infections (Hammett et al., 2002).

Each year about 9.25 million people are in lockers worldwide, with 30 million inmates moving from prison to the community and/or back again (Walmsley, 2011). In a sero-prevalence study, it is reported that hepatitis B surface antigen (HBsAg), hepatitis B core antibodies (HBcAb) and hepatitis C antibodies (HCV) exist up to

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42.9%, 46.03% and 53% respectively in prison inmates (Zary et al., 2012).

Prisoners generally come from marginalized settings; they are at increase risk to acquire HIV, HBV, HCV and TP infections. Because of their lifestyle and high risk behaviours that is, addict to injection inside and outside the prison, unsafe sex, and tattooing (Btler et al., 2007; Niveau, 2006). Injecting drug use is the most common and frequently risk factor after male-to-male contact and heterosexual habits till reported (Alizadeh et al., 2008).

Hepatitis is valid public health problem, affecting billion of people worldwide, mainly by viral hepatitis B and C. Both the infections are challenging health problem, spreading rapidly in developing countries, due to lack of health education and facilities, poverty, illiteracy and lack of availability of vaccination for hepatitis B (Hasan et al., 2010). In a report of world health organization there are 350 million people infected with chronic hepatitis-B and 170 million people with chronic hepatitis-C infections globally (Previsani and Lavanchy, 2002; WHO, 2008).

The tenth leading cause of death the HBV infections globally causing the death of 563000 and hepatitis C of 366000 deaths each year (Perz et al., 2006). Pakistan with its large population of 165 million is the worst affected region with hepatitis B and C globally. Middle East and Indian sub-continent is of intermediate endemicity with HBV infection, where the chronic hepatitis B virus carrier rate among the general population is 2-5% (WHO, 2008). In Bangladesh there is lack of actual data regarding the hepatitis B virus infection in the general population. The studies conducted there have only selected the high risk groups, such as drug addict, commercial sex worker, health workers, prisoners and hospitalized patients (Rumi et al., 1998). The available global data suggest an elevated prevalence and transmission of infectious disease of TB, HIV, HBV, HCV and syphilis in prisons (stuckler et al., 2008).

The relation between incarceration and high transmission of blood-borne viruses, such as human immunodeficiency virus, hepatitis B virus, hepatitis C virus and syphilis in prisons has been known for several years (Catalan-Soares et al., 2000; Haber et al., 1999). Prisons are breeding place for infectious disease; they are easily accessible for screening and for the improvement of health and/or alter the course of disease (Abdul et al., 2010). Injecting drug use is the more common and frequently reported risk factor increasing the prevalence of infectious disease (Alizadeh et al., 2005). Other risk factors analyzed for causing higher prevalence of these infections in prisoners are; previous imprisonment, tattooing, and high risk sexual behaviours such as having multiple sex partners, homosexuality and not using condom (Skoretz et al., 2004).

In a study of Taylor and friends indicated a growing fact that human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) infections have

actually been carried to individuals, while they were in prison (Taylor et al., 2000). Compared to the general population, prisoners globally continue to demonstrate a significantly higher prevalence of hepatitis B, C and HIV infections (Weinbaum et al., 2005). Unlike in Europe and America, in our country Pakistan, there is a deficiency of printed data on HIV, HBV and HCV infections among prison inmates.

To our knowledge there was no past study or data on risk factors associated with the high prevalence and the epidemiological status of HBV, HCV and syphilis infections available among male prisoners in district jail Quetta, Balochistan. Assessment of extent and sources of risk factors will facilitate about how to screen for these infections, collect data on the prevalence of disease in order to conclude the preventive measures to protect the public and audit the arrangement of health care and treatment. Thus, the aim of this study is to investigate the prevalence and risk factors of syphilis, and hepatitis B and C virus infections by serological methods among men incarcerated in the central jail Quetta Balochistan, Pakistan.

MATERIALS AND METHODS

Study Area

We conducted a cross sectional study in district Jail Quetta, Pakistan. This facility serves as the principal incarceration venue for adult males of different crimes. The study protocol was approved by the Inspector General (IG) Prisons.

Recruitment Process and Study Population

Two hundred male prison inmates were recruited for this study. Prior to the study informed consents were obtained. Socio-demographic and risk assessment information was collected on self-administered questionnaires. A representative sample size suspected as viral and bacterial infected after their clinical sign and symptoms collected by medical doctor/paramedical staff investigated for Hepatitis B surface antigen (HBsAg), Hepatitis C antibodies (HCV) and treponema pallidum (TP) causing syphilis.

Prisoners had full authority to accept or refuse to take part in the study. Each participant was explained that his acceptance or refusal would not affect their incarceration nor their possibility for parole. Those did not consent to participate were excluded from the study.

Specimen Collection

About five milliliters (ml) of blood were aseptically collected from each prison inmate by venipuncture of the cubital vein using sterile disposable syringes. Each

Table 1. Sociodemographic characteristics of inmates Tested for tuberculosis

S.#	VARIABLE	# Of Prisoners (%)	HBV Pos (%)	HCV Pos (%)	TP Pos (%)
1.	Age (years)				
	18-30	142 (71)	5 (3.5)	3 (2.1)	7 (4.9)
	31-40	26 (13)	2 (7.6)	2 (7.6)	1 (3.8)
	41-50	21 (10.5)	5 (23.8)	2 (9.5)	2 (9.5)
	> 50	11 (5.5)	0 (00)	1 (9.0)	1 (9.0)
2.	Education				
	Illiterate	113 (56.5)	8 (7.0)	7 (6.1)	7 (6.1)
	Literate	87 (43.5)	4 (4.5)	1 (1.1)	4 (4.5)
3.	Married				
	Yes	78 (39)	6 (7.6)	6 (7.6)	5 (6.4)
	No	122 (61)	6 (4.9)	2 (1.6)	6 (4.9)
4.	Previous Occupation				
	Employed	15 (7.5)	3 (20)	0 (00)	2 (13.3)
	Unemployed	42 (21)	0 (00)	0 (00)	1 (2.3)
	On Daily wages	143 (71.5)	9 (6.2)	8 (5.5)	8 (5.5)
5.	Duration of Incarceration				
	< 1 year	86 (43)	8 (9.3)	6 (6.9)	7 (8.1)
	1-2 years	70 (35)	3 (4.2)	2 (2.8)	3 (4.2)
	2-3 years	29 (14.5)	1 (3.4)	0 (00)	0 (00)
	> 4 years	15 (7.5)	0 (00)	0 (00)	1 (6.6)
6.	IDUs				
	Yes	35 (17.5)	7 (20)	4 (11.4)	6 (17.1)
	No	165 (82.5)	5 (3.0)	4 (2.4)	5 (3.0)
7.	Opium/Chars addict				
	Yes	33 (16.5)	5 (15.1)	6 (18.1)	6 (18.1)
	No	167 (83.5)	7 (4.1)	2 (1.1)	5 (2.9)
8.	Sharing of syringes before incarceration				
	Yes	27 (13.5)	6 (22.2)	4 (14.8)	5 (18.5)
	No	173 (86.5)	6 (3.4)	4 (2.3)	6 (3.4)
9.	Sharing of shaving blades				
	Yes	20 (10)	5 (25)	4 (20)	3 (15)
	No	180 (90)	7 (3.8)	4 (2.2)	8 (4.4)
10.	Extramarital sex				
	Yes	21 (10.5)	3 (14.2)	3 (14.2)	10 (47)
	No	179 (89.5)	9 (5.0)	5 (2.7)	1 (0.5)
11.	Homosexuality				
	Yes	05 (2.5)	0 (00)	0 (00)	3 (60)
	No	195 (97.5)	12 (6.1)	8 (4.1)	8 (4.1)

sample was placed in sterilized plain tubes. Serum separated into sample vials and stored at -4°C until analyzed.

Questionnaire

Jail health care staff and study team were trained in data collection and sampling techniques. All 200 consenting participants completed a structured questionnaire assessing socio-demographic characteristics, and risk factor profile for the infections under investigation.

Assay Procedure

A 5 ml blood sample was collected from willing participants. Specimens were tested in virology section at

Fatima Jinnah General and Chest Hospital Quetta, Pakistan to detect hepatitis B surface antigen, anti-HCV antibodies and treponema pallidum (TP). Kit of the Abbott Laboratories was used for screening. All samples were tested according to the manufacturer's instructions.

RESULTS

Basic Socio demographic Profile

This study included 200 prisoners participated in the study. Table 1 outlines the basic socio-demographic characteristics of the prisoners. The mean age of the respondents was 39 years (range 18-60). All the selected prisoners were male. Seventy eight 78 (39.0%) of the

Table 2. Risk factors comparison for HBV/HCV/TP Positivity

	Sharing of syringes	Sharing of shaving blades	IDUs	Addict of chars/opium	Extramarital sex	Duration of incarceration	Younger age	Illiteracy
HBV	6	5	7	5	3	8	5	8
HCV	4	4	4	6	3	6	3	7
TP	5	3	6	6	10	7	7	7

prisoners were married. More than half 113 (56.5%) were illiterate. literacy rate was 43.5% with very few number reported with formal education. Before being they locked, 42 (21.0%) were unemployed, 15 (7.5%) were employed, and 143 (71.5%) prisoners working on daily wages. Large number of the prisoners 86 (43%) were having less than one year of duration incarceration. 70 (35%) prisoners were of 1-2 years of incarceration, there were only 15 prisoners having more than 4 years of duration of incarceration.

35 (17.5%) prisoners were of injecting drug user (IDUs) before incarceration. 33(16.5%) were having a habit of using opium/chars. 27 (13.5%) were answered as they share contaminated syringes/needles of each others. 20 (10%) prisoners were interviewed as having a habit of sharing of shaving blades. 21 (10.5%) prisoners had a history of extramarital sex and 05 (2.5%) were involved in homosexuality.

Prevalence

A total of 200 male prison inmates with the mean age of 39 years (range 18-60 Y) participated in the study. 12 (6.0%) were seropositive for hepatitis B surface antigen (HBsAg), 08 (4.0%) were positive for hepatitis C antibodies (HCV), and 11 (5.5%) were positive for treponema pallidum (TP). One prisoner co-infected for hepatitis B and treponema pallidum (TP), while the other for hepatitis C and treponema pallidum (TP). None of the prisoners were co-infected with hepatitis B and C.

Risk factors for the Positivity of Hept B, C and TP

Table 2 outline the major risk factors in increasing the prevalence of hepatitis and syphilis infections. Mostly of the viral and bacterial infected prisoners were of the younger age (18-30 years) had the highest seroprevalence rate of hepatitis B 05 (3.5%), hepatitis C 3 (2.1%) and TP 7 (4.9%). Illiteracy also showed high risk in the prevalence of these infections. High proportions of the prisoners were poorly educated and mostly did not have the correct knowledge of HBV and HCV and TP transmission modes. In our study among 113 (56.5%) illiterate prisoners, 8 (7.0%) were infected with HBV, 7 (6.1%) with HCV and 7 (6.1) with TP.

Unemployment or lack of employment also played

important role in elevating the prevalence of these infection in prison and in society. Hundred and forty three (71.5 %) prisoners were working on daily wages bases before incarceration, which usually not available daily. This unemployment or lack of employment leads the people socioeconomically disadvantaged and become involve in unethical or illegal activities of chars, opium, IDUs etc. In our study among these 143 prisoners, nine 9 (6.2%) were positive for HBV, 8 (5.5%) for HCV and 8 (5.5%) were positive for TP. In class of addict of chars/opium 5 (15.1%) were involve in HBV, 6(18.1%) in HCV and 6(18.1%) were of TP positive. In IDUs 7 (20%) were Hepatitis B positive, 4(11.4%) Hepatitis C and 6(17.1%) were positive for treponema pallidum. Twenty prisoners (10 %) were involve in sharing of blades, having infection of hepatitis B 5(25%), hepatitis C 4(20%), TP 3 (15%) respectively. Other major risk factor found was sharing of reuse or contaminated needles by IDUs. In our study 27 (13.5%) prisoners were involve in sharing of contaminated syringes/needles, among which 6 (22.2%) prisoners were infected with hepatitis B, 4(14.8%) were hepatitis C. The prevalence of infection was higher in prisoners using contaminated syringes and prisoners with IDUs; as expected. Higher prevalence was also noted in prisoners involve in extramarital sex. Ten (47%) of the prisoners found positive for TP among 21 prisoners involve in heterosexuality, while 3 (60 %) were positive for TP among five prisoners involve in homosexuality.

DISCUSSION

Knowledge of the prevalence and circulation of blood born viruses and sexually transmitted diseases (STDs) in different parts of the world is important for the planning of preventive measures and for the development of vaccination programs. The comparison of their prevalence among prisons, and with the general population in the same geographical area is important to provide a basis for action and changes in health policy, education and clinical practice. Prison data provide epidemiological observation into a subset of high risk population's at lower cost than comparable community surveys (White, 1999).

The prisoners have poor literacy rates, low socioeconomic intensity, closed/overcrowded living condition, insufficient ventilation, poor health and many had been incarcerated previously, as seen in other prison studies (Stuckler et al., 2008).

The purpose of this study was to work out the seroprevalence of hepatitis B, C and treponema pallidum among male prisoners in district jail Quetta Balochistan, Pakistan. The current study, which is believed to be the first in the province, provides actual evidence for an outbreak of HBV, HCV and TP occurring within prison.

According to the statistical calculation obtained in this study, HBV infection has been detected in 12 (6.0 %) prisoners, HCV in 8 (4.0%) prisoners and TP in 11 (5.5 %) subjects in the prison. Two prisoners were co-infected with HBV, HCV and TP. One was co-infected with hepatitis-B and treponema pallidum and the other one was co-infected with hepatitis-C and treponema pallidum. None of the inmates had the co-infection of hepatitis B with Hepatitis C.

Compared to the general population, prisoners globally continue to demonstrate significantly higher prevalence of blood born and sexually transmitted infections (Adjei et al., 2006). In a study of Qureshi *et al.*, estimated the prevalence of hepatitis B surface antigen (HBsAg) was 2.5%, hepatitis C antibodies (HCV Ab) 4.8%, is one of the highest rates in the world (Qureshi et al., 2010).

According to the study of Nadeem *et al.*, 9.8% of hepatitis B infection (HBsAg) prevalence detected in the general population of the province Balochistan (Nadeem et al., 2011). In a seminar June 2011, Dr Huma Qureshi highlighted the high prevalence rate in the province, topping the prevalence of hepatitis B in Balochistan (4.3%) chased by Sindh (2.5%), Punjab (2.4%) and Khyber Pakhtunkhwa (1.3%) (Dawn, 2011). In a serological study by Marri and Ahmed, the prevalence of hepatitis B surface antigen (HBsAg) in Quetta was reported to be 11.0% (Marri and Ahmed, 1997).

In a report of world health organization the prevalence rate of HBV, HCV and TP are higher among the male prisoners than in reports from the general population in Pakistan (Ali et al., 2008).

In our study a theatrical increase noted in the prevalence of HBV, HCV and TP infection in the younger age group of 18-30 years. The prevalence of HBV was noted to be (3.5%), HCV (2.1%) and treponema pallidum (4.9%) showing alarming sign for hepatitis control program. Illiteracy also found an important risk factor and play important role in spreading the infection. Major part of the study prisoners didn't know about the correct knowledge of infection and their transmission. In our study high proportion of risk in prisoners were from illiterate (56.5 %) or with low level of literacy rate. Prevalence of HBV, HCV and TP found in this group of prisoners were (7.0%), (6.1%) and (6.1%) respectively.

Unemployment or lack of employment make the people mentally disturb and lead to participate in illegal activities

of using charrs, opium/heroin and injection drug use etc.

In a study of Husa P and Ovesna P highlighted the low level of employment as risk factors in the prevalence of Hepatitis C in the country (Husa and Ovesna, 2011). In our study we found only (7.5%) of prisoners were employed in government and non-government organization. Among these, 3 were hepatitis B, 2 prisoners were reactive for TP and none of the prisoners was Hepatitis C. When this employment data is compared with unemployed and daily wages employment, we found a high prevalence among the unemployment group. The prevalence rate among this group was (6.2%), (5.5%) and (7.8%) for Hepatitis B, C and TP respectively.

Drug addiction brings about serious and severe problems and endangers public and individual health. The problems and disease occurs due to injection easily leads individual deaths. The prevalence of Hepatitis B, C and TP was considerably higher in prisoners who were Injection drug users than none IDUs. In our study findings there were 35 (17.5%) prisoners were IDUs, among which 20% prisoners HBV, 11.4% HCV and 17.1 % were of TP infected. High prevalence rates of HCV and HBV infections among IDUs also have been reported in Iran (Masoumeh et al., 2012). Viral hepatic infections are spreading through the contaminated needles and syringes commonly shared by injectable drug users, it is accepted that IDUs frequently have a higher prevalence of these infections as compared to the general population particularly (Zohreh and Gholamreza, 2010).

In a behavioral survey 1994 in Sindh prisons on genital ulcers and urethritis, concluded that sexually transmitted disease rates would be a serious problem in the prison population (Akhtar et al., 1999).

In a study of Kazi et al, found high prevalence rate of syphilis 8.9% among prisoners in Pakistan (Abdul et al., 2010). In our study we found the prevalence rate of treponema pallidum (5.5 %) of not a stereotypically low prevalence rate from a Muslim country Pakistan. Paid for sex with female was the major significant predictor for treponema pallidum positively, but this might reflect social response bias because male-to-male sex is not ethically acceptable in Pakistani society and is refused, though bit prevalent. In our study the prevalence of TP were more in prisoners involve in extramarital sex i.e. 10 (90.9%). Five prisoners were involved in habits of homosexuality among which three were positive for TP.

In an epidemiological study in prisoners in Brazil, 13.9% prisoners were positive for HIV and 22.8% for syphilis (Strazza et al., 2004). In a study of sabitu et al., 14.9% inmates were reported have had sexual intercourse in prison. These sexual encounters were founded, 56.2% in homosexual and 43.8% in heterosexual cases (Sabitu and Joshua, 2009). Prisoners may receive new infections during their incarceration period, due to overcrowding, insufficient ventilation, poor nutrition, weak diagnosis and treatment, poor hygiene

control and absence of harm reduction efforts like condom use and/or unsterilized needle use and unexpected shifting to other facilities (Bick, 2007). Prisoners before being locked in prison, highly active in high risk activities such as injecting drug using, tattooing and using unsterilized needles and sexual activities. They are the key transmitter of infections when are being locked in prison, although banned, but some time these activities also takes place inside prison (Clark and Cameron, 2004).

Duration of incarceration in both lower and upper income countries are incubator for spreading the infectious disease (Comfort and Grinstead, 2007). In our study the prisoners having about a year of incarceration were more positive for HBV (9.3%), HCV (6.9%) and TP (8.1%) showing a high risk factor during which prisoners become involve or continue the unethical activities within prisons as well, affecting/spreading the infection in other prisoners and in the society after being locked. Infected prisoners ultimately arrive to their homes and to the society and can smoothly disseminate their infections through sensitive attitude i.e. through oral, genital or through blood transfusion. In our study 78(39%) prisoners were married, among which 6 (7.6%), 6 (7.6%), 5 (6.4) were positive for HBV, HCV and TP respectively. These prisoners on releasing may easily transfer the infection to their life partners.

Substance abuse was common 33 (16.5) as was needle user. HBV, HCV and TP Positivity rate were 5 (15.1), 6 (18.1), 6 (18.1) respectively. Prisoners shared their shaving blades before and after incarcerations were 20 (10%) and their Positivity rate for HBV, HCV and TP were 5(25%), 4(20%), 3(15%) respectively. The prisoners having habits of sharing of needles with each other were in the percentages of 22.2%, 14.8% and 18.5% showing major risk factor in disseminating the viral and bacterial infections.

CONCLUSION

This study provides an appealing data of hepatitis B, hepatitis C and *Treponema pallidum* to prevent these infections among inmates. Active and untreated HCV, HBV and TP infection among jail inmates can lead to transmission in both civilian and incarcerated populations. The morbid and insecure manner of acting such as tattooing, piercing, use of unsterilized blades, extramarital sex with paid sex worker with very low condom use, and drug addiction were the most important factors related to infection.

Prison based screening program enable intervention among the inmates through disease detection and also preventing viral hepatitis through vaccination. The high prevalence of hepatitis and *treponema pallidum* in jail need successful vaccination programs and can made

health, education, and social services within a prison setting by long-term investment.

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