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An Assessment of Vulnerability to HIV Infection of Female Smugglers in Hilli Port, Bangladesh

Islam, Md. Shahidul

University of Rajshahi

An Assessment of Vulnerability to HIV Infection of Female Smugglers in Hilli Port, Bangladesh

Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Philosophy in the Department of Population Science and Human Resource Development of the University of Rajshahi, Bangladesh

Under the Supervision of

Dr. Md. Rafiqul Islam
Professor
Dept. of Population Science
and Human Resource Development
University of Rajshahi
Rajshahi-6205

Dr. Md. Nazrul Islam Mondal
Associate Professor
Dept. of Population Science
and Human Resource Development
University of Rajshahi
Rajshahi- 6205

Submitted by

Md. Shahidul Islam
Roll No.:   06210
Reg. No.:   4504
Session: 2006-2007

Department of Population Science and Human Resource Development
University of Rajshahi, Rajshahi
Bangladesh

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Dedicated
To
My Beloved Parents

University of Rajshahi
Department of Population Science and Human Resource Development

Supervisor's Certificate
Submission of Thesis for M.Phil Degree

The following statement is to be signed by the student's supervisor before the dispatch of the thesis to the approved examiners.

Student's Name: **Md. Shahidul Islam**

Roll No.:   **06210**

Session: **2006 – 07**

Course: **M.Phil**   Faculty: **Science**

Thesis Title: **An Assessment of Vulnerability to HIV Infection of Female Smugglers in Hilli Port, Bangladesh**

The undersigned do hereby state that:

1. the above student's work, including the thesis, has been completed to my satisfaction and the thesis is ready for examination and
2. an oral presentation of the thesis has been made in accordance with the ordinance of University of Rajshahi for **M.Phil Degree**.

Supervisor's Comments: To the best of our knowledge, this work neither in part nor in full has been submitted to any other University or Institution for the award of any degree.

Supervisor   **Co-supervisor**

(Dr. Md. Rafiqul Islam)   **(Dr. Md. Nazrul Islam Mondal)**
Professor   Associate Professor
Department of Population Science and   Department of Population Science and
Human resource Development   Human resource Development
University of Rajshahi   University of Rajshahi

Declaration of Originality

This dissertation entitled "**An Assessment of Vulnerability to HIV Infection of Female Smugglers in Hilli Port, Bangladesh"** submitted by me in the Department of Population Science and Human Resource Development, University of Rajshahi for the degree of Master of Philosophy is based on my research work.

To the best of my knowledge, this research work neither in part nor in full has been submitted to any other University or Institution for the award of any degree.

(Md. Shahidul Islam)
M.Phil Fellow
Roll Number: 06210
Session: 2006 - 2007
Dept. of Population Science and
Human Resource Development
University of Rajshahi
Rajshahi - 6205
Bangladesh
June, 2013

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Abstract

Female smugglers in Hilli port of Bangladesh are more vulnerable of Sexually Transmitted Infections (STIs) and HIV/AIDS because of their high mobility. Therefore, the assessment of vulnerability to HIV infection among female smugglers has long been an interesting topic to population and health researchers in Bangladesh. This study is an effort to assess the determinants of knowledge and awareness about HIV/AIDS, HIV/AIDS contamination risks, sexually abused through smuggling, perpetrators of sexually abused and perpetrators of drug affection among female smugglers based on the data of 300 female smugglers in Hilli port, Bangladesh collected by purposive sampling technique, which are the key elements of the assessment of vulnerability to HIV infection. To carry out the objectives, univariate, bivariate and multivariate techniques like descriptive statistics, chi-square test, binary logistic regression analysis and multinomial logistic regression analysis have been employed in accordance with their importance.

In this study, it is observed that most of the female smugglers are belonged to <30 years of ages (82%) in which a remarkable numbers (22.3%) are teenagers, i.e., 10-20 years aged. The majorities have primary (30%) and under secondary (31.7%) level of education. Similar pattern of parent's educational qualification has been observed where mother's education has downgraded relative to father's education in every level of education. Again, the majorities (63%) have earned 500-1000 Tk per month and all of female smugglers have improved their living conditions through this profession. Poverty (95%), pressure of family (56.3%) and absence of husband (38%) have been found as main cause of involvement in this profession. However, only 50% have details knowledge, 51.3% have knowledge about the way to protect from HIV/AIDS and 45% have awareness about HIV/AIDS. Although 70% female smugglers know that condom can protect this epidemic but only 30% use condom at the time of sex. The majorities (69.3%) think that they have the risks of HIV/AIDS contamination because 74% have been sexually abused by male colleagues (53.5%), Indian track drivers (30.9%), BSF (13.4%) and BGB (2.3%) through this profession, in which 55% exercise unsafe sex. Furthermore, most of the female smugglers (92.3%) have been influenced to take drug by male colleagues (39.7%), Indian track drivers (45.5%), BSF (11.2%) and BGB (3.6%) through the profession of smuggling.

However, it has been identified that educated respondents, those have awareness by person, doctor and NGO workers, those have knowledge about the bad impact of HIV/AIDS from media, those are participated in HIV/AIDS seminar and in religious seminar are more likely to have knowledge about HIV/AIDS as compared with their counterparts respectively; and respondents who are belonged to >20 years of age group, those have awareness by person, doctor and NGO workers and who have any understanding with HIV affected persons are more likely to have awareness about HIV/AIDS as against their counterparts respectively.

Again, there have been found the statistical significant association of HIV/AIDS contamination risks with knowledge about the way to protect from HIV/AIDS, exercise unsafe sex, participation on HIV/AIDS

seminar, sexually abused passing through smuggling, using condom in sexual relation and influence to taking drugs in this profession respectively. In addition, respondents who exercise unsafe sex, those are sexually abused and influenced to take drugs passing through smuggling have found to be having more risks of HIV/AIDS contamination as against their counterparts respectively.

In this study, smuggler's age, father's education, marital status, reasons of coming to smuggling, monthly income through smuggling and unsafe sex have statistical significant association; and smuggler's age, reasons of coming to this profession, monthly income through smuggling, unsafe sex and drug affecting have statistical significant effect on sexually abused through smuggling respectively. It is also mentionable that female smugglers are more vulnerable of sexually abused after 25 years of their ages and poverty is one of the main reasons to coming this profession which is also significant reason of sexually abused. Nevertheless, the chance of sexually abused has been decreased with increasing the monthly income through smuggling.

It has been determined through multinomial logistic regression analysis that father's education, marital status, unsafe sex and types of drug affecting have significant effect on Indian track driver; and respondent's educational status, marital status, reasons of coming to smuggling and monthly income through smuggling have significant effect on BSF/BGB by whom female smugglers are sexually abused. It is clear that the vulnerability of sexually abused by BSF/BGB decreases with increasing the smuggler's educational level and monthly income through this profession; and unmarried female smugglers and those have the habit of unsafe sex and injection or other types of drug using have been sexually abused more by Indian track driver respectively.

There have also been found the significant associations of perpetrators of drug affecting with smuggler's age, educational status, father's education, mother's education, marital status, reasons of coming to smuggling, monthly income through smuggling, unsafe sex and types of drug affecting respectively. The tendency of drug affecting through male colleague of smuggling and Indian track driver is increasing with increasing smuggler's age, and unmarried female smugglers have more chance of drug affecting by them. Moreover, the smugglers whose reasons of coming to this profession is poverty have more chance of drug affecting by male colleague of smuggling and the smugglers who exercise unsafe sex have more chance of drug affecting by Indian track driver as against their counterparts.

In the light of the present study, it is strongly recommended that enhancing education with community based health related educational program through mass media, avoiding unsafe sex with increasing the effective use of condom, stopping the sexual harassment or sexually abused through smuggling and the influence to take drugs by their male colleagues, Indian track drivers or others in the profession, empowering the female smugglers and poverty reduction strategy are essential for reducing the vulnerability to HIV infection as well as for stopping smuggling among female smugglers in Hilli port, Bangladesh. Hopefully, this study would be very helpful for policy makers, program designers/planners to design or redesign program(s) or existing program(s) considering the identified risk factors.

Content

List of Tables

List of Figures

List of Abbreviation and Acronyms

AIDS	:	Acquired Immune Deficiency Syndrome
BBS	:	Bangladesh Bureau of Statistics
BBC	:	British Broadcasting Corporation
BDHS	:	Bangladesh Demographic and Health Survey
BGB		Border Guard Bangladesh
BSF		Border Security Force
CARE	:	Cooperative for American Remittances to Europe
CIA	:	Cooperative Information Agents
CSW	:	Commercial Sex Worker
CW	:	Countries of the world
DFID	:	Department for International Development
DIC	:	Drop-in Centers
GNP	:	Gross National Product
GDP	:	Gross Domestic Product
HASAB	:	HIV/AIDS and SDT Alliance Bangladesh
HDI	:	Human Development Index
HIV	:	Human Immunodeficiency Virus
ICDDR,B	:	International Center for Diarrhoeal Disease Research, Bangladesh
IDU	:	Intravenous Drug Users
IMF	:	International Monetary Fund
LD	:	Leishman Donovan
PID	:	Pelvic Inflammatory Diseases
PLWHA	:	People Living With HIV/AIDS
PRB	:	Population Reference Bureau

NAC	:	National AIDS Committee
NER	:	North Eastern Region
NGO	:	Non-Government Organization
RTI	:	Reproductive Track Infection
SFSW	:	Street-based female sex workers
STI	:	Sexually Transmitted Infection
STD	:	Sexually Transmitted Diseases
TB	:	Tuberculosis
TFR	:	Total Fertility Rate
TV	:	Television
UNDP	:	United Nation Development Program
UNICEF	:	United Nation Children Emergency Found
UNFPA	:	United Nation Fund for Population Activities
USAID	:	United States Agency for International Development
VCCT	:	Voluntary and Confidential HIV Counseling and Testing
WHO	:	World Health Organization
WPDS	:	World Population Data Sheet
WPP	:	World Population Prospects
CL	:	Counseling
EM	:	Electronic Media
Est.	:	Estimation
INS.	:	Institute
MS	:	Multiple Source
PM	:	Print Media

Chapter 1

Introduction

1.1 Background of the Study

Human Immunodeficiency Virus (HIV) is one kind of virus and Acquired Immune Deficiency Syndrome (AIDS) is a killer disease caused by HIV. It continues to be a very common complication worldwide. The virus is generally transmitted through sexual contact, from infected women to their unborn children or through contaminated needles (infections) or blood (Rahman et al., 2009). During the twenty-first century, it was the fourth cause of mortality, with more than 5 percent of deaths all over the world (Murray et al., 2001). In a study, up to 40 million people are estimated to live with HIV in the world. At the end of 2010, an estimated 34 million people [31.6 million–35.2 million] were living with HIV worldwide (UNAIDS, 2011).

Bangladesh has a predominantly Muslim population of roughly 153 million people (BBS preliminary report, 2011) located between India and Myanmar. HIV in Bangladesh remains at relatively low levels in most at risk population groups, with the exception of injecting drug users (IDUs) where prevalence continues to grow. In addition, although overall HIV prevalence remains under 1% among the general population in Bangladesh, there are many risk factors that could fuel the spread of HIV among high-risk groups (WB, 2008). However, Bangladesh is considered as a low prevalence, high risk situation for HIV/AIDS due to high risk sexual behaviors. Despite recent strong economic growth, poverty in Bangladesh continues to be pervasive. Nearly half of its total populations live

below the poverty line and Bangladesh remains one of the least developed countries across the world. Bangladesh features the third highest number of poor people living in a single country after India and China. These challenges are magnified by a population density of roughly 964 people per square kilometer-one of the highest in the world (BBS preliminary report, 2011). Such poverty fuels many high-risk behavior patterns, including female smugglers who have sexually abused by BGB, BSF and their colleague, which is obviously a risk factor for the spread of HIV. Some people think, however, that the actual number of people living with HIV/AIDS in Bangladesh is much higher than the figure released by the government-13,000 (UNAIDS, 2002) and Chowdhury (2005) puts it at 30,000. Lack of adequate policy, resources as well as awareness for testing HIV/AIDS among common people is the main reason for not identifying the actual prevalence in Bangladesh. Bangladesh Government (2006) showed by Bangladesh's seventh round of serological surveillance, HIV prevalence among all high risk groups remained below 1% with the exception of IDUs. Among IDUs, prevalence was less than 2% in all sites except Dhaka. In Dhaka, prevalence rose from 1.7% in 1999 to 7% in 2006 marking the first concentrated epidemic among any high risk group in Bangladesh**.**

In many countries, AIDS has stalled or reversed decades of human development. The impact of HIV/AIDS reaches every concern of society in Bangladesh. HIV/AIDS also has become a national concern in Bangladesh and the government has already developed a national strategy and an operational plan to address the country's needs (Sarkar, 2009). Worldwide experience of HIV/AIDS has suggested that public knowledge on AIDS is the most fundamental weapon against the AIDS pandemic although its vaccine or remedy has not been developed (UNAIDS China, 2002). The level of knowledge of the population is thus an important measure for understanding the magnitude of the challenges by

Government and Non-government organizations (United Nations, 2002). It is strongly needed to assess the current level of specific knowledge about HIV/AIDS transmission and prevention by women and other key socio-demographic factors to meet the targets and goals of HIV/AIDS prevention and control. In recent years, there has been an increasing incidence of research on the clinical and epidemiological aspects of HIV.

Mobile populations such as truckers and migrant workers are at risk for contracting HIV infection (Ramjee et al., 2002). Many different factors, including time spent away from home, may contribute to risky behavior among mobile occupational groups. For example, a study among truck drivers in South India found that an increased duration of trips was a significant risk factor for HIV infection (Monjunath et al., 2002). However, a study in Brazil reported a high prevalence of risk behavior among short route truck drivers, found that other factors were involved in increasing vulnerability to HIV infection (Villarinho et al., 2002). Female smuggler also spending both long and short periods away from home, hence they may be count as mobile population groups.

The present study demonstrates the female smugglers in Hilli Port as an integral part of a high-risk behavior network between India and Bangladesh. In the National Surveillance for HIV, vulnerable groups such as transport workers, male and female sex workers, male sex with males and trans-genders are included (Gazi et al, 2008). Without having preliminary information on risk behavior of a particular group, it is impossible to assess their vulnerability. The present study has provided first hand information about such a vulnerable group and we encourage their inclusion into the National Serological Surveillance for HIV. It would provide stronger evidence whether they are at risk of acquiring HIV infection due to cross border mobility and sexual linkages.

1.2 Global Situation of HIV/AIDS

The disaster, AIDS, has been spread all over the world and millions of people have been victimized by it's prolong and sharp claw which leading the largest cause of death in the world and the fourth leading cause of death overall (Decosas and Kane, 1995; UNAIDS and Institute of Medicine, 1995). In 2003, almost five million people became newly infected with HIV, which was the greatest number in any one-year since the beginning of the epidemic. At the global level, the number of people living with HIV continues to grow from 35 million in 2001 to 38 million in 2003 (UNICEF/UNAIDS, 2004). At the end of 2010, women accounted for just over half of all adults living with HIV worldwide (UNAIDS, 2010).

According to UNAIDS/WHO AIDS (2011), around 30.8 million adults and 2.5 million children were living with HIV at the end of 2010. During 2010, 2.7 million people became infected by HIV that causes AIDS and 1.8 million deaths from AIDS. The number of deaths probably peaked around 2005, and has since declined only slightly. Globally, around 11% of HIV infections are among babies who acquire the virus from their mothers; 10% result from injecting drug use; 5-10% are due to sex between men; and 5-10% occur in healthcare settings. However, the epidemic had left behind 16.6 million AIDS orphans (those aged under 18 who have lost one or both parents to AIDS) by the end of 2005. The latest statistics of the global HIV and AIDS epidemic were published by UNAIDS (2011), and refer to the end of 2010 which are given below:

Table 1.2.1: AIDS & HIV Statistics Including Death (2010)

Characteristics	Estimate	Range
People living with HIV/AIDS in 2010	34 million	31.6-35.2 million
Adults living with HIV/AIDS in 2010	30.8 million	29.2-32.6 million
Women living with HIV/AIDS in 2010	15.9 million	14.8-17.2 million
Children living with HIV/AIDS in 2010	2.5 million	1.6-3.4 million
People newly infected with HIV in 2010	2.7 million	2.4-2.9 million
Adults newly infected with HIV in 2010	2.2 million	2.0-2.4 million
AIDS deaths in 2010	1.8 million	1.6-1.9 million
Orphans (0-17) due to AIDS in 2010	16.6 million	14.4-18.8 million

Source: 'UNAIDS report on the global AIDS epidemic-2011' (UNAIDS, 2011)

The number of people living with HIV rose from around 8 million in 1990 to 33 million by the end of 2009. The overall growth of the epidemic has stabilized in recent years. The annual number of new HIV infections has steadily declined which occurs due to the significant increase in people receiving antiretroviral therapy and the number of AIDS-related deaths has also declined. Since the beginning of the epidemic, nearly 30 million people have died from AIDS-related causes (UNAIDS, 2010) and the global trends of HIV/AIDS has disclosed in the following figures:
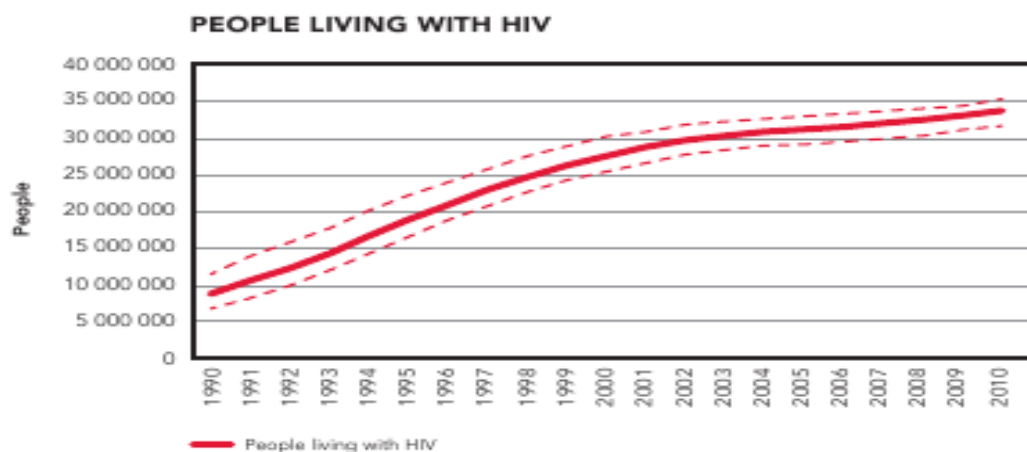
Figure 1.2.1: Number of Persons Living with HIV/AIDS Globally

NEW HIV INFECTIONS AND AIDS-RELATED DEATHS
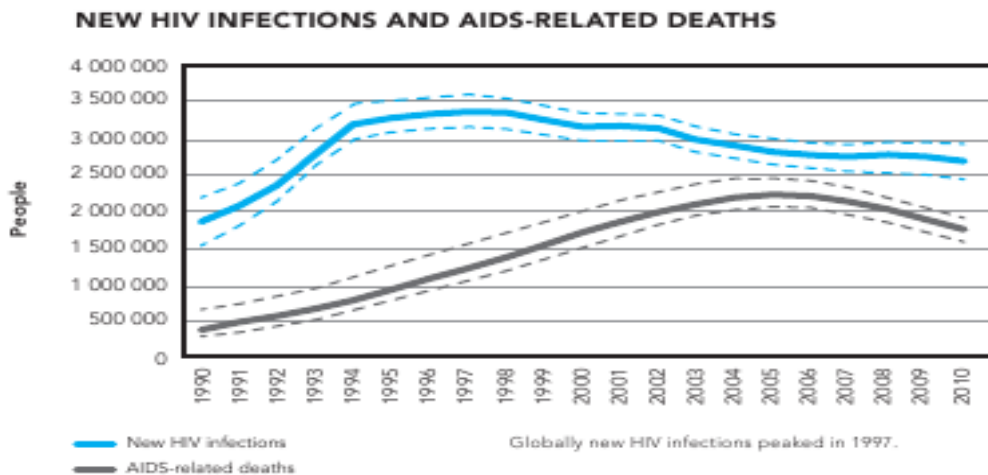
Figure 1.2.2: Globally New HIV Infections and AIDS Related Deaths

1.3 Regional Situation of HIV & AIDS

Sub-Saharan Africa is the mostly affected area of HIV in the world. Only 12% population of the world live in Africa but about 68% HIV affected people of total population live in this continent and 70% of new HIV infections occur in 2010 (UNAIDS, 2010). The most affected country in this continent are Namibia and Swaziland where the assuming outbreak is maximum (33.40) in Swaziland. In these areas, 2 million children aged less than 15 years were HIV affected, total 2.7 million people were HIV affected and 2 million people were died by HIV in this year (PIACT, 2007). However, more than 25 million people have died of AIDS since 1981. Africa has 12 million AIDS orphans. At the end of 2006, women accounted for 50% of all adults living with HIV worldwide, and 61% in sub-Saharan Africa. Young people (under 25 years old) accounted for half of all new HIV infections worldwide. In developing and transitional countries, 7.1 million people were in immediate need of life-saving AIDS drug (Bronfman, 1998).

In Eastern Europe and Central Asia, there was a 250% increase in the number of people living with HIV from 2001 to 2010. The HIV epidemics in Latin America are generally stable. The number of annual new HIV infections in Oceania increased slowly until the

early 2000s, and then declined. The number of people living with HIV in this region reached an estimated 54000 [48000–62000] at the end of 2010, about 34% more than the estimate for 2001. The regional statistics of HIV/AIDS are given in Table 1.3.1.

Table 1.3.1: Regional Statistics of HIV & AIDS, 2010 and 2001

Region	Year	Adults & children living with HIV /AIDS	Adults & children newly infected	Adult prevale nce (%)	Deaths of adults & children	Young people (15–24) prevalence	
						Male	Female
Sub-Saharan Africa	2010	22.9 million	1.9 million	5.0	1.2 million	1.4	3.3
	2001	20.5 million	2.2 million	5.9	1.4 million	2.0	5.2
North Africa and Middle East	2010	470,000	59,000	0.2	35000	0.1	0.2
	2001	320,000	43,000	0.2	22000	0.1	0.1
South and South-East Asia	2010	4.0 million	270,000	0.3	250,000	0.1	0.1
	2001	3.8 million	380,000	0.3	230,000	0.2	0.2
East Asia	2010	790,000	88,000	0.1	56000	<0.1	<0.1
	2001	380,000	74,000	<0.1	24000	<0.1	<0.1
Oceania	2010	54,000	3300	0.3	1600	0.1	0.2
	2001	41,000	4000	0.2	1800	0.1	0.2
Latin America	2010	1.5 million	100,000	0.4	67000	0.2	0.2
	2001	1.3 million	99,000	0.4	83000	0.2	0.1
Caribbean	2010	200,000	12000	0.9	9000	0.2	0.5
	2001	210,000	19000	1.0	18000	0.4	0.8
Eastern Europe and Central Asia	2010	1.5 million	160,000	0.9	90000	0.6	0.5
	2001	410000	210,000	0.3	7800	0.3	0.2
Western and Central Europe	2010	840,000	30000	0.2	9900	0.1	0.1
	2001	630,000	30000	0.2	10000	0.1	0.1
North America	2010	1.3 million	58,000	0.6	20000	0.3	0.2
	2001	980,000	49000	0.5	19000	0.3	0.2
Global Total	2010	34.0 million	2.7 million	0.8	1.8 million	0.3	0.6
	2001	28.6 million	3.1 million	0.8	1.9 million	0.4	0.8

Source: UNAIDS (2011) 'UNAIDS report on the global AIDS epidemic' - 2011

In the early to mid-1980s, while other parts of the world were first beginning to deal with serious AIDS epidemics, Asia remained relatively unaffected by this newly discovered health problem. By the early 1990s, however, epidemics had emerged in several Asian countries, and by the end of that decade, HIV was spreading rapidly in many areas of the continent. Today, HIV is a growing problem in every region of Asia. Although national HIV prevalence rates in Asia appear to be relatively low (particularly in comparison with sub-Saharan Africa), the populations of some Asian countries are so vast that these low percentages actually represent very large numbers of people living with HIV. The latest statistics compiled by UNAIDS suggest that in 2010, 3.7 million people were living with HIV in Asia (USAID, 2011). In Myanmar, about 240 thousand people living with HIV/AIDS has been estimated at the end of 2009 and the estimated adult prevalence of HIV is 0.6%. Antiretroviral therapy coverage in Myanmar is low, with only 18% of those in need of treatment receiving it. The HIV/AIDS statistics of Myanmar are disclosed in Table 1.3.2.

Table 1.3.2: Myanmar (Burma) HIV & AIDS Statistics

Characteristics	Estimate
Estimated total population, 2010	53,414,374
Estimated number of people living with HIV/AIDS, end 2009	240,000
Estimated number of women living with HIV/AIDS, end 2009	81,000
Estimated adult HIV prevalence, end 2009	0.6%
Estimated number of AIDS-related deaths in 2009	18,000

In India, the first AIDS case was detected in 1986 and since then HIV infection has been reported in all states and union territories. Previously it was thought that around 5 million people were living with HIV in India - more than in any other country. It is now thought that around 2.39 million people are living with HIV. Of these, an estimated 39% are

female and 3.5% are children. Although much of India has a low rate of infection, certain places have been more affected than others. HIV epidemics are more severe in the southern half of the country and the far north-east. The highest HIV prevalence is found in Andhra Pradesh, Maharashtra, Tamil Nadu and Karnataka in the south; and Manipur and Nagaland in the north-east which are very nearest to the border of Bangladesh. Infections in the north-east are mainly found amongst IDUs and sex workers. The following table shows the estimated number of people living with HIV/AIDS in India.

Table 1.3.3: Estimated Number of People Living with HIV/AIDS in India, 2007

Characteristics	Estimate
People living with HIV/AIDS	2.39 million
Adult (15 years or above) HIV prevalence	0.32%

1.4 Situation of HIV/AIDS in Bangladesh

In Bangladesh, the first case of HIV/AIDS was detected in 1989. Till December 2010, there were 2088 reported cases of HIV, 850 cases of AIDS, and among them 241 died (Govt. of Bangladesh, 2011) (Figure 1.4.1). The country is still considered as a low HIV/AIDS prevalent country but it is at a critical moment in the course of its AIDS epidemic. There are significant levels of risky behaviors that make the country vulnerable to HIV/AIDS. The most vulnerable groups for HIV/AIDS in Bangladesh are: commercial sex workers (CSWs), MSM, male sex worker (MSW), hijras and injecting drug users (IDU) (Islam and Conigrave, 2008).
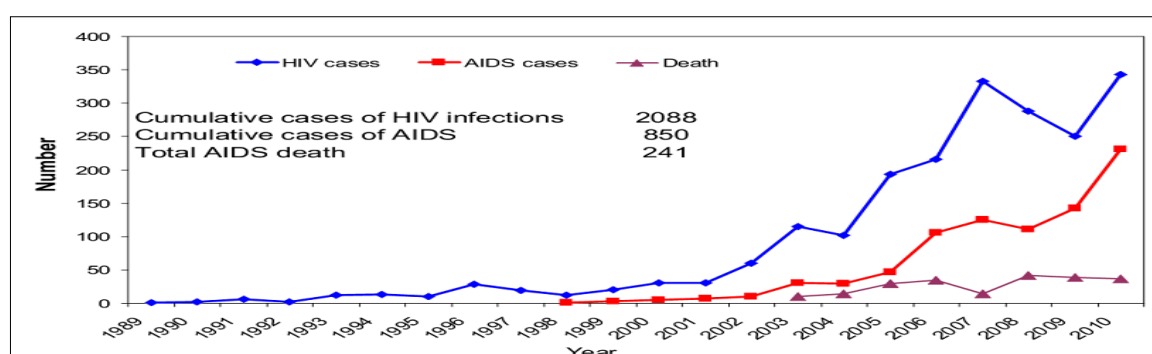
Figure 1.4.1: Trends of HIV/AIDS Cases in Bangladesh

There are significant population of sex workers based in brothel, street, hotel and residence in Bangladesh. They are composed of both male and female. An estimated 54,000–90,000 female sex workers (FSW) (brothel, street and hotel based) and 40,000–150,000 MSM and MSW and 10,000–15,000 hijras are involved in high risk sexual behavior and sex trade. The most recent (ninth) round of national HIV sero-surveillance (2011) has been revealed that the highest prevalence (0.7%) of HIV is so far among IDUs. For the first time HIV was detected among IDUs in ninth round survey although the prevalence remains very low. Among heroin smokers, 0% tested positive for HIV. However, HIV prevalence has remained low (<1%) amongst all groups of FSWs except the casual FSWs. Similarly all other sentinel groups for sexual transmission of HIV had a low prevalence (<1%); for example, only two MSM tested HIV positive out of a sample of 402. Only three transvestites/transsexuals out of a sample of 407 tested positive for HIV, while none of the MSWs and none of the bridge population (rickshaw pullers, truckers, and dockworkers), who are reported to be major users of sex workers, was HIV positive. Again, the prevalence of HIV among PWID is 15.7%, among heroin smokers are 0.0%, among street based FSWs are 0.5%, among hotel based FSWs are 0.6%, among casual FSWs are 1.6%, among residence based FSWs are 0.4%, among MSMs and MSWs are 0%, and among hijras are 4.2% (Table 1.4.1).

Table 1.4.1: Prevalence of HIV in 9th Round of Serological Surveillance

Indicators	HIV				
	% positive (total number tested)				
	2003-2004	2004-2005	2006	2007	2011
	Round 5	Round 6	Round 7	Round 8	Round 9
Drug Users					
PWID	4.6(1008)	15.9(4624)	22.9(5057)	22.5(5937)	15.7(6984)
Heroin smokers	0.8(391)	0.5(399)	0(401)	0.2(402)	0(388)
FSW					
Brothel based	2.1(2204)	2.2(2155)	1.7(2200)	ND	ND
Street based	0.2(1206)	0.2(804)	0.3(791)	1.0(1086)	0.5(1398)
Hotel based	2.1(698)	0.6(293)	0(287)	0.6(701)	0.6(867)
Casual	2.0(679)	1.7(967)	0.8(1048)	3.0(1217)	1.6(227)
Residence based	ND	ND	ND	ND	0.4(258)
MSW	0(274)	0(235)	0.7(284)	0.3(400)	0(402)
MSM	0(399)	0(405)	0.2(401)	0(399)	0(400)
Hijras	0.2(405)	0.8(381)	0.6(353)	0.3(392)	4.2(438)

PWID=People who inject drug   FSW=Female sex worker

MSW=Male sex worker   MSM=Male sex with male

ND=Not done

Source: 9th round HIV surveillance report 2011

Over the period of 1999 -2011, HIV prevalence in central Dhaka showed rapid increase of HIV prevalence. The 8th Serological surveillance shows that the HIV rate has crossed the concentrated epidemic among IDUs. Rates in Central Bangladesh rose from 1.4% to 7% since 1999, up to as high as 11% in one neighborhood of Dhaka. Data also show that 44% of female IDUs are also sex workers. Moreover, most of these men do not use condom in their commercial sex encounters and female sex workers report lowest condom use in the region (0-12 % with new client by different groups of FSW). However, the prevalence of HIV/AIDS in first, second, third, fourth, fifth, sixth, seventh, eighth and ninth round is 0.8%, 0.3%, 0.4%, 0.4%, 0.4%, 0.7%, 0.9%, 0.7% and 0.5% respectively.

Though Bangladesh is a low prevalence country (the last surveillance conducted in 2010-2011 found that national prevalence of HIV is <1%), but there are significant level of risky behavior that makes our country vulnerable to HIV/AIDS. There is consensus that there are risk factors for the spread of HIV in Bangladesh which are formal and informal commercial sex trade, low levels of condom use, increasing injecting drug use, and rising prevalence levels among injecting drug users. The following figure shows the national prevalence of HIV/AIDS from first to ninth round of serological surveillances.
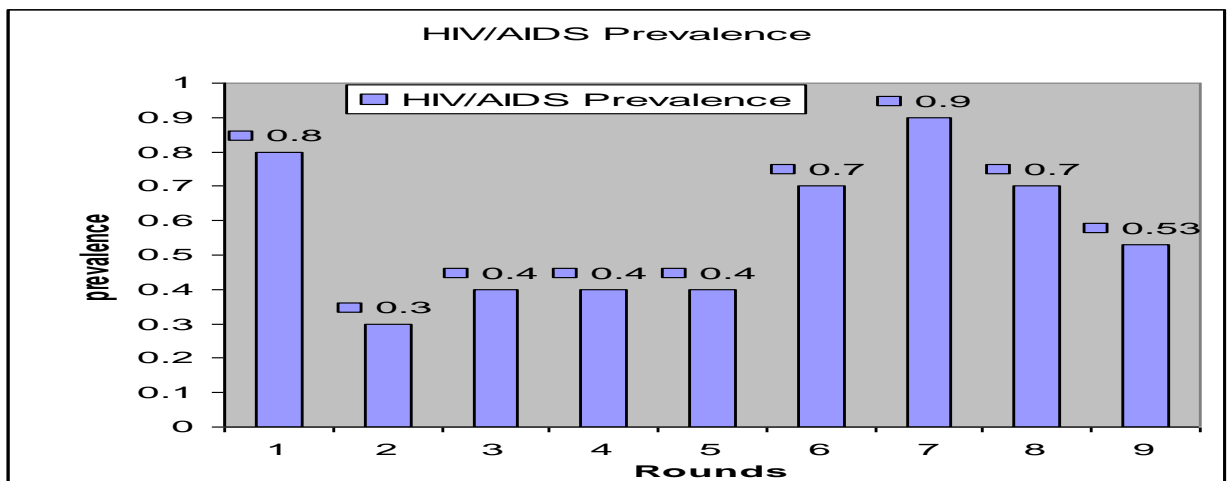
Figure 1.4.2: Patterns of National Prevalence of HIV/AIDS

1.5 Activities of Government and Non-Government Organization in Bangladesh on HIV/AIDS

The service of both government & NGOs has expanded of which at least 385 NGOs are actively engaged in HIV/AIDS-related activities in the country, particularly in working with marginalized and hard-to-reach groups (Sultana, 2005). Bangladesh receives international support from various development partners.

UNDP: UNDP has been historically involving the UN agencies in case of supporting the National Response. Currently it has developed activities in the following areas:

- Support to NAP-staff and capacity building.

- Blood safety

- NGO support

World Bank: The World Bank supports the Governments two-pronged strategy: First, increasing HIV/AIDS advocacy, prevention, and treatment within the Government's existing health programs, and second, scaling up interventions among high risk groups. The World Bank and other donor agencies have supported advocacy and policy dialogue regarding the control of HIV/AIDS. Advocacy and policy dialogue have been included under the next sector program of the world Bank-sponsored Health, Nutrition and Population Sector Program (HNPSP, 2005-2010). The aim is to increase the availability and utilization of user-centered, effective, efficient, equitable, affordable and accessible quality services, having essential services package, improved hospital services, nutritional services or other selected services.

UNICEF: UNICEF is developing activities in the areas of IEC and adolescent health with support from the UNAIDS secretariat.

UNFPA: UNFPA is actively integrating HIV/AIDS/STD in the different components of its RH program.

WHO: WHO offers capacity building on program management.

DFID: DFID has been supporting the Shaki project of CARE, which works mainly with vulnerable populations, also provides technical and financial assistance to other NGOs. Through its regional approach, DFID seeks support of policy-makers and want to focus on migration.

USAID: With USAID support, the Social Marketing Company distributes more than 160 million condoms in a year. In addition, the Social Marketing Company will initiate condom social marketing for HIV/AIDS and sexual transmitted infection prevention. More recently USAID has been supporting the following activities:

- Expansion of current USAID activities to ensure national coverage by prevention programs for male and female sex workers, their clients, MSM, and injecting drug users;

- Improvement of sexually transmitted infection services for at-risk populations;

- Nongovernmental organization capacity building in HIV prevention programs;

- Ensuring access to and affordability of condoms and promoting their correct and consistent use;

- Voluntary counseling and testing for at-risk population;

- Financial and technical support for behavioral surveillance activities;

- Monitoring and evaluation;

- Operations research; and

- Policy and advocacy to create an enabling environment.

ADB: Asian Development Bank (ADB) funded 'Urban Health Care Project' has a component of the HIV/AIDS prevention. Through its continual and worldwide spread, AIDS presents different challenges wherever it arises.

CARE: To prevent a future HIV epidemic, CARE-Bangladesh has an HIV/AIDS prevention program since 1995 to support the Government's HIV/AIDS control program, which aims to create a common platform to tackle HIV/AIDS. CARE's HIV program promotes responsible and safe behavior of people in general and risk people in particular,

in partnership with different organizations to enhance their technical and organizational abilities to carry out the program. Major interventions of the HIV program of CARE are:

- Technical and management help to NGOs and CBOs for capacity building

- Outreach Activities

- Monitoring, Evaluation and Survey

- Advocacy and Networking

- Drop-In Centers: There are 83 Drop-In Centers where clinical, non-clinical and social services are offered to at-risk communities.

ICDDR, B: International Center for Diarrheal Disease Research, Bangladesh (ICDDR,B) has been conducting National Serological Surveillance for HIV in the country on behalf of the Govt. of Bangladesh in collaboration with other partners. So far 5 National Sentinel Surveillance was carried out on high-risk groups.

1.6 Concept and Terminology

The major concept and terminology that are related to this study has briefly discussed below:

1.6.1 HIV

HIV (Human Immunodeficiency Virus) is the virus that causes AIDS (Acquired Immuno deficiency Syndrome). Virus is a parasite and is so small that it can only be seen through an electronic microscope. HIV destroys special cells in human body permanently. Those special cells are responsible for combating germs entering the body and defend the body against attacks by bacteria and virus.

1.6.2 AIDS

AIDS stands for Acquired Immunodeficiency (or Immune Deficiency) Syndrome. It results from infection by a virus called HIV. This virus infects key cells in the human body called CD4- positive (CD4+) T cells. These cells are part of the body's immune system, which fights against infections and various cancers. When HIV invades the body's CD4+ T cells, the damaged immune system loses its ability to defend against diseases caused by bacteria, viruses, and other microscopic organisms. A substantial decline in CD4+ T cells also leaves the body vulnerable to certain cancers. There is no cure for AIDS, but medical treatments can slow down the rate at which HIV weakens the immune system.

1.6.3 History of HIV

Scientists have different theories about the origin of HIV, but in a recent study (2003) of the ancestry of the virus that caused the AIDS epidemic, scientists have traced HIV to two strains of a virus found in monkeys in Africa (Web site of AIDS.com). The viruses probably passed into chimpanzees when the apes ate infected monkey meat. Earlier studies have shown that HIV1, the virus that causes the most common form of human AIDS, originated from a simian immunodeficiency virus (SIV), which is found in chimpanzees. But how chimps came to have SIV has been a mystery. American and English researchers analyzed the genetic pattern of a number of SIV strains in African monkeys and concluded that at least two strains found in the red-capped Mangabeys and in the greater spot-nosed monkeys in south-central Africa combined to form the type of SIV now found in African chimps. The recombination of these monkey viruses

happened in chimpanzees and the chimp transmitted it to humans on at least three occasions, according to a virologist at the University of Alabama, Birmingham. Three types of HIV1, called M, N and O, probably were transmitted from chimps to human decades ago. A second type of AIDS, called HIV2, is known to have been transmitted from the sooty Mangabey in West Africa to humans directly, without going through the chimp.

Monkeys and chimps both represent a reservoir of SIV viruses that could, in theory, be spread to humans, forming a new type of immune deficiency disease. The viruses were most likely spread from species to species when chimps eat monkey meat and hunters in Africa eat chimp meat. Chimps are known to hunt and eat whatever monkey species they can catch. As for humans, it is not such a good idea to hunt and eat monkeys because there is a risk for humans to come into contact with a new form of HIV. Genetic studies suggest that lower monkeys first became infected with SIV in 100,000 years ago or even earlier. Although SIV can infect chimps and the lower monkeys, the virus does not cause disease in those animals. The virus attacks the white blood cells, called CD4 cells, but it does not make the animals sick or cause decline in their white blood cells.

In humans, HIV attacks and kills white blood cells and eventually overwhelms the body's ability to replace them. Without these disease-fighting white blood cells, the body becomes defenseless against infections that are easily controlled by the immune system in healthy people. The transfer between chimps and humans probably happened before 1930. The earliest known case of HIV was from a blood sample collected in 1959 from a man in Kinshasa, Democratic Republic of Congo. The virus was at first named HTLV-III/LAV (human T-cell lymph tropic virus-type-III/lymsphadenopathy- associated virus) by an international scientific committee. This name was later change to HIV.

1.6.4 History of AIDS

In 1982 public health officials began to use the term 'AIDS', to describe the occurrences of opportunistic infections, Kaposi's sarcoma, and Pneumocystis Carinii Pneumonia (PCP) in previously healthy men. Formal tracking (surveillance) of AIDS cases began that year in the United States. The last stage of HIV infection is called AIDS. However, the remarkable incidences of AIDS are mentioned below:

1959 – The oldest specimen of the (HIV) ever detected in a blood sample – donated a man in Leopoldville, Congo.

1981 – The first cases of unusual immune system failures are identified among gay men, women and injecting drug users.

1982 – Acquired immunodeficiency syndrome (AIDS) is defined for the first time.

1985 – Film star Rock Hudson becomes the first international icon to disclose he has AIDS.

1986 – Enter President Regan (the 40th President of the United States).

1987 – The first therapy for AIDS – azidthymidine (AZT) is approved for use in the United State.

1988- WHO declares, 1 December as World AIDS Day.

1990 – By 1990 around 1 million children had lost one or both parents to AIDS.

1991 – The red ribbon becomes an international symbol of AIDS awareness.

1996 – Antiretroviral therapy is presented for the first time at the 11th international AIDS Conference in Vancouver.

1998 –The first short- course regimen to prevent mother– to –child transmission is announced.

1999 – The first efficacy trial of a potential HIV vaccine in a developing country starts in Thailand.

2005 – By the end of 2005 1.3 million people in low – and middle – income countries are receiving access to antiretroviral therapy.

2010 – At the G8 Summit in Gleneagles, Scotland, leaders pledge to come as close as possible to universal access to antiretroviral treatment worldwide by 2010.

1.6.5 Differences between HIV and AIDS

The term AIDS refers to an advanced stage of HIV infection, when the immune system has sustained substantial damage. Not everyone who has HIV infection develops AIDS. When HIV progresses to AIDS, however, it has proved to be a universally fatal illness. Few people survive five years from the time they are diagnosed with AIDS, although this is increasing with improvements in treatment techniques. Experts estimate that about half the people with HIV will develop AIDS within 10 years after becoming infected. This time varies greatly from person to person, however, and can depend on many factors, including a person's health status and health-related behaviors. People are said to have AIDS when they have certain signs or symptoms specified in guidelines formulated by the US Centers for Disease Control and Prevention (CDC).

1.6.6 Symptoms of HIV

Most people newly infected with the HIV virus show few, if any, symptoms for a few years. But during this a symptomatic period, HIV is actively multiplying, infecting, and killing cells in the immune system, particularly CD4+ T cells. As the immune system

weakens, symptoms begin to emerge. Some people, but not all, develop symptoms within a month or two of exposure to HIV. These people may have a flu-like illness with such symptoms as:

> ➢ Fever

> ➢ Rash

> ➢ Headache

> ➢ Loss of appetite

> ➢ Swollen glands (enlarged lymph nodes)

> ➢ Achy muscles and joints etc.

1.6.7 Modes of HIV/AIDS Transmission

Epidemiological studies have shown three ways of HIV/AIDS transmission from one individual to others. Those are:

> ➢ Sexual transmission

> ➢ Exposure to blood, blood products, transplanted organs or contaminated instruments and

> ➢ Mother of fetus/ infant transmission.

Penetrative sex with an infected person without using protective measures is the most frequent of HIV transmission. This includes both vaginal and anal intercourse. Oral sex can transmit HIV infection only if there are cuts in the lining in the mouth, bleeding gums or ulcer in genitalia. The risk of oral transmission is much less than that of vaginal or anal transmission. No cases have been reported through kissing.

The most common ways that HIV is passed from one person to another are:

> ➢ Through sexual intercourse (vaginal, anal, or oral sex) with a person who has HIV.

➤ By sharing needles or drug injections with someone who has HIV.

➤ During pregnancy or birth, or through breastfeeding, mothers who have HIV can pass the virus to their babies.

➤ HIV can enter the body through the vagina, penis, mouth, mucous membranes like the eyes, the anus or rectum, a vein (injection/intravenous drug use), or cuts and sores.

➤ HIV can also be transmitted through blood transfusions or blood clotting factors with HIV.

1.6.8 When HIV Infection Is Not Spread?

Many researches indicate that HIV is not transmitted by casual contact such as:

➤ Touching or hugging

➤ Sharing household items such as utensils, towels, and bedding

➤ Contact with sweat or tears

➤ Sharing facilities such as swimming pools, saunas, hot tubs, or toilets with HIV-infected people

➤ Coughs or sneezes.

1.6.9 Treatment

When the HIV was first identified in the early 1980s, there were few drugs to treat the virus and the opportunistic infections associates with it. Since then, a number of medications have been developed to treat both HIV/AIDS and opportunistic infections. Although there is no treatment, currently available that can cure people of HIV or AIDS, a number of therapies have been developed to help them stay healthier and live-longer.

> ➢ Some medications target HIV itself, to reduce the virus's assault on the immune system.

> ➢ Other treatments are used to treat or prevent specific opportunistic infections that threaten the health of people with HIV-damaged immune system.

1.6.10 Smuggle

The definition of Smuggle according to the online dictionary is:

1. to import or export (goods) secretly, in violation of the law, especially without payment of legal duty.

2. to bring, take, put, etc., surreptitiously: She smuggled the gun into the jail inside a cake.

3. to import, export, or convey goods surreptitiously or in violation of the law.

1.6.11 Smuggling of Persons

The procurement, in order to obtain, directly or indirectly, a financial or other material benefit, of the illegal entry of a person into a state of which the person is not a national or a permanent resident. Smuggling, contrary to trafficking, does not require an element of exploitation, coercion or violation of human rights (IOM, 2007; USAID, 2010).

1.6.12 Female Smuggler

Female smugglers are female population who secretly and illegally takes goods or people into or out of a country, especially as a way of earning money.

1.6.13 HIV Vulnerability

Vulnerability results from a range of factors that reduce the ability of individuals and communities to avoid HIV infection (USAID, 2010).

These may include-

(1) personal factors such as the lack of knowledge and skills required to protect oneself;

(2) factors pertaining to the quality and coverage of services, such as inaccessibility of services due to distance, cost and other factors;

(3) societal factors such as social and cultural norms, practices, beliefs and laws that stigmatize and dis-empowers certain populations (UNAIDS,2008b; USAID,2010).

1.6.14 Spaces of Vulnerability

The places in which, migrant workers live, work or pass through are high-risk spaces of vulnerability. The presence of many different migrant and mobile populations and interactions with local communities at such places as land border posts, ports, construction sites, informal settlements, farm compounds and mines creates a fluid social environment in which social norms regulating behavior are usually not followed and migrants may feel a sense of anonymity and limited accountability, which can lead to high risk sexual behavior. Poverty and lack of job opportunities in the communities surrounding such places also induces many women (both migrant and local) to engage in transactional and commercial sex with those who have resources or disposable incomes (USAID, 2010).

1.7 Review of Literature

With the increasing of HIV prevalence, the different studies about the knowledge and awareness about HIV/AIDS have been performed in various sites. Western theoreticians, academicians and scholars have done many researches on AIDS awareness. Studies on AIDS awareness by the Indian scholars are also significant and praiseworthy. However, studies on particular area of AIDS field in Bangladesh are very scanty. The studies, which have been done in Bangladesh, are fully or directly related to our problem. However, the studies, which are more or less relevant to our study, are carefully reviewed here.

Haregu et al. (2013) studied on 'epidemiological patterns of HIV/AIDS and diabetes in developing countries: a cluster analysis'. The findings suggested that HIV/AIDS and diabetes were heading in reverse directions during the study period in the study regions. Hence, countries with higher prevalence of Diabetes tended to have lower prevalence of HIV/AIDS and vice versa. The identified clusters were found to describe these patterns of variation across geography and time. They also concluded that the clusters may be useful in considering a set of coordinated country level interventions.

Hasan et al. (2013) documented that a considerable number of the sample population (39.3%) completed the primary education but the majority belonged to low income group (68.4%), followed by the very low income group (22.4%). Almost everyone (98.3%) heard the word HIV/AIDS and the majorities (90.6%) knew that the disease is transmissible from person to person and mainly by sexual intercourse (78.9%). Only 28.2% had some idea about the sign and symptoms of HIV. About 64.4% thought that persons having heterosexual partners (including prostitutes) are high-risk groups. The main source of information was radio/TV, newspaper. Unfortunately, 76.9% of the respondents had poor awareness while only 10.6% had good awareness. They also noted

that the level of awareness increased with age and literacy, which shows the window of opportunity for the policymakers that educational intervention program, may be effective for them.

Sarkar et al. (2013) identified the vulnerable groups which have lower level of specific knowledge about transmission and ways of avoiding HIV/AIDS. Majority of respondents, about 92% floating and 99% frequently moving, heard the name HIV/AIDS from various sources of media, but 52% floating and 31% frequently moving respondents did not know the fearfulness of HIV/AIDS. Electronic media was the most dominant source of hearing about HIV/AIDS. In this study, it was also found that uncontrolled and unsafe sexual relation is the main cause of HIV/AIDS. In multivariate logistic analysis, they found that in case of frequently moving respondents, respondents' age, marital status, education and occupation exerted significant effect on the knowledge about the fearfulness of HIV/AIDS; whereas in floating respondents, only education variable exerted significant effect on the knowledge about the fearfulness of HIV/AIDS.

Sarma and Oliveras (2013) conducted a cross sectional study on teachers in Bangladesh to identify the factors that support or hinder their role in HIV/AIDS education. Based on exposure to teachers' training, the districts were divided into control and intervention areas and the teachers' ability, skill, and their participation in HIV/AIDS education were compared between the districts. Trained teachers in the intervention schools were more likely to participate, less likely to face difficulties, and more likely to use interactive teaching methods in HIV/ AIDS classes compared to the controls who did not receive any training. Inadequate allocation of time for conducting the HIV/AIDS class was found to be barriers to HIV/AIDS education that suggest the need to provide teachers with more support in terms of training and logistics.

Berhan and Berhan (2012) used Demographic and Health Surveys data (DHS 2003-2009) from 28 countries in and outside Africa to determine risky sexual behaviour among women with regard to their age, residence, educational level and wealth index. They found that approximately 18% were practicing higher-risk sex. Risky sexual behavior was found to have statistically significant association with women living in urban areas, attained secondary and above education and middle to highest wealth index. Sensitivity analysis demonstrated the stability of the pooled odds ratios for outliers. Better educational attainment, high wealth index and being employed were also associated with high HIV prevalence.

Goni and Rahman (2012) in a study among blood donors in Rajshahi Metropolitan of Bangladesh showed that, though 89% blood donors knew that it is transmitted through blood transfusion, only 1% of them had undertaken blood test before donation, which is alarming. The odds of having preliminary and preventive knowledge reduced with the increase in age of the respondents. Besides these, blood donors who were educated and who were in service were found to be more aware about the HIV/AIDS than the others.

Huq and Chowdhury (2012) found from a study among brothel-based Female Sex Workers (FSWs) in Bangladesh that condom use was high but not consistent among bonded FSWs (those who are under the control of a Sordarni) who had regular clients. The bonded FSWs reported being maltreated by the Sordarnis for refusing to have sex without a condom, and access to health services was hindered by Sordarnis. Implications of the study were that integrated HIV intervention should provide more encouragement to relevant stakeholders to promote mutual support towards safe sex practices for the FSWs.

International Organization for Migration (2012) reported that knowledge of modes of HIV/AIDS transmission among migrant workers is low. Thirty-nine percent of current migrants/returnees and 46% of prospective migrants stated that they did not know any potential modes of acquiring HIV infection. In addition, 14% of current migrants/returnees and 7% of prospective migrants incorrectly believed that HIV/AIDS could be acquired by coughing and sneezing, shaking hands, using utensils/kitchen appliances, mosquito bites, and caring for someone who is sick with AIDS.

Mondal et al. (2012) used Bangladesh Demographic and Health Survey (BDHS), 2007 data to assess the level of awareness about HIV/AIDS among ever married women. They found that respondent's education, husband's education, husband's occupation, age at marriage, watching TV, electricity in the household, marital status, and residence had statistically significant effects on HIV/AIDS awareness ($p<0.01$). Marriage in the older age (>18 years), education, and mass media campaigns were strongly suggested for increasing knowledge and awareness to be controlled the spread of HIV/AIDS as well as STDs among ever married women in Bangladesh.

Weine and Kashuba (2012) reviewed systematically 97 articles from the health and social science literatures and illustrated that HIV risk was associated with multilevel determinants at the levels of policy, socio-cultural context, health and mental health, and sexual practices. The policy determinants most often associated with HIV risk were: prolonged and/or frequent absence, financial status, and difficult working and housing conditions. The socio-cultural context determinants most often associated with HIV risk were: cultural norms, family separation, and low social support. The physical and mental health factors most often associated with HIV risk were: substance use, other STIs, mental health problems, no HIV testing, and needle use. The sexual practices most often

associated with increased HIV risk were: limited condom use, multiple partnering, clients of sex workers, low HIV knowledge, and low perceived HIV risk.

Mona (2011) found that the prevalence of HIV awareness was significantly higher in case of employed than the housewives (50% vs. 12.4%, p<0.001). Although the wives of the unskilled labor and the skilled employee were equal (25% vs. 25%), the wives of skilled employee had significantly higher awareness than the wives of the unskilled laborer (30.7% vs. 10.9%, p = 0.001). The study also found that higher awareness level was significantly associated with higher education of the participants and higher education of the husband. Occupationally, housewives were found to have very low level of awareness compared with the employed group of participants. Again the wives of skilled employees had a significantly higher prevalence of awareness compared with the wives of unskilled laborer.

Ochako et al. (2011) reported the lower comprehensive HIV and AIDS knowledge among urban young women in Kenya. The strongest predictors for having comprehensive knowledge were found to be education, having tested for HIV, knowing someone with HIV, and having a small or moderate to great risk perception.

Ahmed and Mahmood (2010) showed that tuberculosis (TB) is the major opportunistic infection of AIDS in developing countries. According to the data provided by Bangladesh Sheikh Mujib Medical University, the number of detected people living with HIV/AIDS reached 204 as of December 2002. Most of them died of TB indicating the relationship between AIDS and TB. About 74,000 Bangladeshi people go abroad for jobs every year, which might be the sources of spreading HIV/AIDS, when they come back to the country. They had given the link between TB and AIDS, such TB program

could also work more closely with AIDS program to absorb some of the HIV surveillance responsibilities of the AIDS program, integrate clinical training and build in cross-referral systems. They also concluded that if TB and HIV/AIDS are not taken seriously soon, it will ravage our society.

Chowdhury et al. (2010) noted that HIV/AIDS is an alarming influential cause of death in worldwide. This study was used to analysis the women awareness about HIV/AIDS in Bangladesh and revealed that the majority of women knew the name of AIDS and preventive measure with consistent used of condom. The Chi-square (χ^2) test result implied that those parents' education and occupation; watching television (TV) and regular meeting with health workers were highly significantly associated with heard the name of AIDS, knowledge about AIDS and preventive knowledge of AIDS. Logistic analysis indicated that the women who watch TV had 10.621 times higher knowledge about AIDS than the women who do not watch TV. Literate women were 2.237 times more likely to know that condom can prevent AIDS than that of illiterate women, and the women who watch TV had 9.917 times higher preventive knowledge than the women who haven't watched TV.

Gibney et al. (2010) were reviewed the behavioral risk factors for HIV/AIDS in Bangladesh in a foregoing article. They had suggested that the unregulated blood supply system, in particular, posed a serious danger in terms of the spread of the HIV epidemic. While the certain socio-cultural factors were contributing to low levels of HIV in Bangladesh, the prevalence of biomedical and behavioral risk factors were suggested the importance of implementing targeted cost effective interventions now.

Sarkar et al. (2010) revealed that permanent resident respondents had more awareness about HIV/AIDS than the floating and frequently moving population. It also showed that about 92% floating respondents were heard the name of HIV/AIDS by various sources of media. On the other hand, the about same amount (99.00%) of frequently moving and permanent resident heard the name of HIV/AIDS by various sources of media. In this study it also found that uncontrolled and unsafe sexual relation is the main causes to AIDS. Further, >50% respondents thought that the avoiding ways from HIV/AIDS is using condom during intercourse and <15% respondents indicated that transmission way is by blood and appreciation of sex.

Zhao et al. (2010) examined the students' sources of HIV/AIDS information and assessed the overall level, and possible gender and grade (middle school vs. high school) differences, in their HIV/AIDS awareness and knowledge. This study indicated an overall low and inconsistent level of AIDS knowledge among secondary school students in China. Most of the students could identify models of HIV transmission, but a large proportion held misconceptions regarding symptoms, activities that did not transmit the virus, treatment and preventive measures. The level of using school, family and peers for obtaining information about HIV/AIDS was generally low. There was a discrepancy between the level of utilization and trust of mass media as the main source of HIV/AIDS knowledge.

Khosla (2009) documented that Bangladesh has maintained a low HIV prevalence (of less than 1%) despite multiple risk factors. It was reported that there were very high levels of HIV infection among a subgroup of male IDUs. Although biomedical and behavioral changing projects were important, they did not address the root causes of observed risky behaviors among 'high-risk' groups. In Bangladesh, these groups include

sex workers, IDUs, MSM and the transgender population 'Hijra'. It was found that poverty and bias against women were major exclusionary factors.

Mondal et al. (2009) found from a study of seven round behavioral and serological surveillance that the HIV epidemic had remarkably increased to 7% among IDU in central Bangladesh, indicating the urgent need to increase prevention. The study results revealed that Bangladesh is a low prevalence country which is turning into one with a concentrated epidemic due to the high HIV prevalence rate of IDU (7%) among the most-at-risk groups. Within this at risk population, IDU had the highest prevalence rate of HIV transmission, followed by FSWs, clients of sex workers, and MSM. If the transmission rate is continuous to increase, the situation will be uncontrolled. So, there is an urgent need for a comprehensive prevention program to control the spread of HIV.

Sarkar (2009a) concluded that there is no way to get rid of the unbearable sufferings from this killer disease; HIV/AIDS: prevention is the only solution to get rid of it. This study gave an idea about this type of health problem and revealed that currently married women (71%) had heard more of HIV/AIDS than formerly married women (about 57%), and TV was the most dominant source for getting information about HIV/AIDS. In this study, it was also proved that avoiding unsafe blood transfusion is one of the best possible ways of preventing HIV/AIDS. From multivariate logistic analysis, it was revealed that currently married women were more likely to have knowledge about HIV/AIDS than formerly married women.

Sarkar (2009b) identified that media exposure had a statistically significant positive influence on correct knowledge of AIDS transmission and prevention. TV was the most dominant media exposure than radio and newspaper. The most frequently routes

of HIV/AIDS transmission were through unsafe blood transfusion. The correct knowledge of ways of prevention of HIV/AIDS was use of condoms during intercourse (51% urban population believes) and abstaining from sexual intercourse (51% rural population believes). Multivariate logistic analysis revealed that urban married women were more likely to have knowledge about HIV/AIDS than rural married women.

Sultana (2009) showed a descriptive cross-sectional study that was carried out on 'HIV/AIDS awareness' among the blood donors of Dhaka Medical College Hospital. A total of 110 (87.3% male, 12.7% female) donors participated in this study. Their mean age was 24.9 ± 5.2 years. More than 60% of the respondents had primary or secondary level of education. Two-thirds (66.11%) of them donated blood for their relatives, while the rest did it for donation's sake. Although 93.6% of the respondents heard about AIDS (TV being the most common source), none had a good or excellent level of awareness about the disease. About mode of transmission, 20.9% had average level of knowledge, and very few had a good level of knowledge regarding its prevention. More than half (54.2%) of the respondents had the view that the country was at a risk from the disease, and nearly three quarters (72.5%) were of the opinion that mass awareness campaigns on HIV/AIDS could improve the situation.

Unnikrishnan et al. (2009) assessed the awareness and attitude of the general public toward people living with HIV/AIDS in Mangalore, a city in Coastal Karnataka. The study was community-based cross-sectional study of population included 630 individuals aged 18 years and above. The results showed that about one-third of the population thought that one could get infected by merely touching an HIV positive individual. Approximately 45% stated that they would dismiss their maid on finding out her HIV positive status. About 54% were willing to undergo the HIV test. The

respondents with less than secondary school education had a discriminatory attitude toward HIV positive people, with regard to them deserving to suffer, dismissing a HIV positive maid, hesitating to sit next to a HIV positive person in the bus, divorcing the infected spouse, and willingness to get tested for HIV, which was found to be statistically significant.

Gazi et al. (2008) reported that over 40% of the boatman had visited Myanmar during the course of their work and 17% of these boatmen had sex with CSWs while aboard.

Lal et al. (2008) noted that all of the students had heard of HIV/ AIDS although only 19.9% and 51.4% were able to write the full form of HIV and AIDS respectively. Among 2400 secondary school students from Mumbai, only 50% of students knew about the sexual route of transmission. Only 31.1% and 23.4% cited blood transfusion and mother to baby transmission as routes of transmission respectively. Moreover, 14.9% had knowledge about condoms as a means of protection, which awareness was significantly higher amongst boys.

Mondol et al. (2008) studied the socio-demographic correlation of knowledge and awareness about HIV/AIDS among the garments worker in Gazipur district, Bangladesh. For this, a total number of 178 garments worker had been interviewed through a structured questionnaire by purposive sampling Technique. The results showed that about half of them did not know how to read and write, and did not use condom during sexual intercourse. A logistic regression model was employed which revealed that respondent's age, education, marital status, place of birth, listening about HIV/AIDS and

media information about HIV/AIDS had highly significant effects on knowledge and awareness about HIV/ASDS of garment workers.

Mondal et al. (2008a) analyzed the sexual behavior and STDs of street-based female sex workers (SFSWs) of Rajshahi city and also examined their socio-demographic profiles. Among the SFSWs attending three drop-in centers (DIC) named PIACT, PROVA, and Suraksha Madhumita in Rajshahi, 150 self-motivated and willing individuals were interviewed through a structured questionnaire. Among these SFSWs, 56.7% were infected with two or more pathogens of STDs, and gonorrhea, chlamydia, herpes, syphilis, and trichomoniasis were observed in 23.3%, 27.3%, 24%, 17.3%, and 20% respectively. They found a strong association between the prevalence of STDs among SFSWs and their socio-demographic profiles. Illiterate and comparatively older SFSWs who spent very little money for health purposes, had larger numbers of children, and used condoms inconsistently were observed to be at higher risk of STDs.

Rahman (2008) focused on male's knowledge and awareness about AIDS/STDs in Rajshahi District of Bangladesh. The findings revealed that about 87% men were aware about HIV/AIDS and women were found same aware of AIDS. Only 54.8% men were found aware of STIs, and more than 45% of the respondents had no knowledge of STIs. This showed that majority of the male said uncontrolled sexual relation which was the major reason of spreading AIDS. It had also been found that education, residence, religion, occupation and mass media facility were the significant factors to influence AIDS knowledge among men.

Singh et al. (2008) focused on HIV/AIDS awareness of auto rickshaw drivers in Ludhiana city, Punjab, India. They showed that out of total 600 auto rickshaw drivers,

384 (64%) had heard about HIV/AIDS. Awareness level increased with increase in educational status. Out of 384, 74.2% drivers knew that unprotected sex is the main mode of transmission. TV (63%) was the common media as source of information. Only 36.2% knew that the disease is not curable.

Samant et al. (2006) reported that 28% of females had no relationship between the risk of contracting HIV and the type of sexual intercourse compared to 3% of males (p<0.05). In general, there were considerable misconceptions regarding the spread and risk of HIV transmission among all medical students. About 66% of females were comfortable to share with doctors and nurses (co-workers) in clinics and hospitals compared to 36% of males. Among all medical students, 44% preferred not being friends with HIV infected individuals, and 62% favored abstinence only messages for prevention of HIV among teenagers.

Chaudhury et al. (2005) found that 50% of the truck drivers did not know whether needles had any role in the spread of HIV/AIDS. About 30-40% thought that needles had nothing to do with the transmission of AIDS. Forty to fifty percent of respondents had the misconception that AIDS can be contracted by casual contact and by being in the same room with a person with AIDS. Two third of the truck drivers did think that monogamy and condom use is an effective method for AIDS prevention. An association between low knowledge of AIDS and high negative attitude towards persons with AIDS was found to exist, which was statistically significant.

Jalswal et al. (2005) focused on HIV/AIDS and STI related knowledge, attitude and practice among high school students in Kathmandu valley. They reported that about 45.8% had prior knowledge of HIV, 65.2% knew that HIV/AIDS could be transmitted by

sharing same needle, 46.2% knew that vaccine was not yet available for HIV/AIDS. Knowledge about STI was also quite low, 41.5% knew that pus in the urine was symptom of STI and 41.7% knew that STI was curable. Of the study group, 4.2% had previous sexual intercourse, 64.2% had sexual intercourse with friend and 35.17% had sexual intercourse with CSWs. But 1.8% would commit suicide if they contracted HIV/AIDS. According to sex wise distribution, female's knowledge about HIV was low (43.2% as compared to male 48%), male's knowledge about transmission of HIV/AIDS from pregnant mother to child was low (89.7%) as compared to female knowledge (94.2%). Female's knowledge about CSWs as high-risk group was low (87.8%) as compared to male's knowledge (90.6%). They concluded that a school education program would bring about statistically significant positive change in the knowledge, attitude and practices regarding HIV/AIDS and STI.

Mondal et al. (2005) performed a study on CSWs in brothel at Tangail, Bangladesh and mentioned that the CSWs are the main root of spreading HIV/AIDs to the general population. They found that among the total number of CSWs, 40.7% were of 15-20 age group and 72% were of 15-25 age group, 98% sex workers had not heard about the mother-to child transmission, only 32% sex workers had used condom regularly. In this study, they had suggested to the mother as well as CSWs with HIV not to give birth.

1.8 Importance of the Study

Since AIDS is not curable, it is very important to take the preventive measures. For that reason, indentifying the vulnerable groups and their knowledge and awareness level plays a vital role in case of taking the preventive measures. The present study considers these

issues. So, it has a great importance. The major importances of this study are mentioned below:

a) It is necessary to explore awareness conditions of HIV/AIDS in Bangladesh female smugglers.

b) In Bangladesh, there is an urgent need to detect the possible high-risk groups effectively.

c) It is necessary to provide some evidence based information and guidelines to the policy makers and planners about awareness of female smugglers.

1.9 Objectives of the Study

Female smugglers are one of the major vulnerable groups in case of HIV infection in Bangladesh. They are more vulnerable because of various socio-economic contexts in Bangladesh. Hilli port is one of area in Bangladesh where smuggling occurs more. So, it is very important to assess the vulnerability as well as the knowledge and awareness level of HIV infection of female smugglers in Hilli port of Bangladesh. Therefore, the specific objectives of this study are given below:

i) to explore the background characteristics of female smugglers related to HIV/AIDS,

ii) to find out the differentials and determinants of knowledge and awareness about HIV/AIDS among female smugglers, and

iii) to assess the vulnerability to HIV/AIDS infection of female smugglers in Hilli port, Bangladesh.

1.10 Organization of the Study

In this section, it has been briefly discussed how this study has been organized. The associated chapters in this study with the corresponding materials that have been disclosed in the respective chapter are mentioned here. The whole thesis has been divided into six chapters. In order to accomplish a meaningful representation, the organization of the study has been discussed below:

Chapter one is introduction chapter which contains background of the study, global and regional situation of HIV/AIDS, HIV/AIDS activities in Bangladesh, concept and terminology, review of literature, importance, objectives and organization of the study.

In chapter two, a briefly discussion on data sources and data processing, the analytical methods and statistical software has been mentioned.

Chapter three entitled "Background Characteristics" has been furnished with the background characteristics with their frequency and percentage distribution.

Chapter four highlights the differentials and determinants of HIV knowledge and awareness of female smuggler through chi-square test and binary logistic regression method.

In Chapter five, it has been tried to assess the vulnerability to HIV of female smugglers such as vulnerable characteristics, association between risks of HIV/AIDS contamination and vulnerability related factors, and their determinants etc.

The last chapter has been entitled as the "conclusion" where the overall summary of the result has been disclosed at a glance with necessary recommendation. Finally, bibliography has been presented at the end of this thesis.

Chapter 2

Data and Methodology

Research methodology is the philosophy of research to systematically solve the problem. Methodology is must for every kind of research problems and execution of research work. Systematically, it is very essential to collect accurate and sufficient data to prepare thesis paper. This chapter provides a brief description of selection of study title, study area, population and sample, sampling design, questionnaire preparation, data collection and processing, computer application in research, conceptual framework, methodology and limitation of present study.

2.1 Study Area

To collect primary data, selection of study area is indispensable. There are six division and sixty four districts including six city corporation districts in Bangladesh. For field level data, considering practical constraints including time, resources and distance, Hili Port in Bangladesh has been selected purposively. Generally we know that floating population like smugglers especially women are environmentally, biologically, sociologically and economically more vulnerable to HIV infection than frequently moving and permanent resident population. Socially the floating people are vulnerable due to their lesser role in decision-making including when, where and how to engage in sexual intercourse and whether or not to use a condom. To meet the targets, the selection of the study area has been guided more by practical considerations than by

methodological reasons. However, we took all possible care and steps in making sure the quality of the data to achieve the objectives of the study.

2.2 Study Population

Study population is that population on whom data is collected. The study population of this study was the female smugglers of Hili port in Bangladesh.

2.3 Sampling Design and Sample Size

The study has been performed to observe the knowledge and awareness about HIV/AIDS of female smugglers and the factor of knowledge and awareness. For this purposive sampling technique has been applied. The sample size of this study was 300.

2.4 Selection of Respondents

Respondents means from which the data were collected. Each female smuggler was considered as respondents in the present study.

2.5 Questionnaire Preparation

A successful research depends on a good questionnaire. To fulfill the objectives of the research, a set of questionnaire has been prepared. So, a questionnaire is a keystone of the survey. Language of the questionnaire should be simple. In the questionnaire, every question was relevant to the objective of the survey. Data were collected through individual questionnaire. At first, the questionnaire was pre-tested and reformed.

The questionnaire was designed in such a way that maximum information could be obtained within a short time by covering our objects of the study. The questionnaire was designed considering the following characteristics:

(i)   Number of questionnaire in the questions should be limited;

(ii) A respondents should adequately be assumed that his identify will not revealed and information will no be against his interest;

(iii) Avoid long and confusing question and for mutate simple and questions them slowly put the difficult will one.

2.6 Data Collection

The data should be collected keeping in view of the object of the survey. The data have been collected from May 15 to November 30 of 2009 from female smugglers of Hili port in Bangladesh by direct interview method. This method relates to the collection information directly from the respondents. For the method of data collection the women were directly interviewed and collect the desire information by the pre-designed questionnaire. The purpose of accurate information of each question is explained to them. Scope of the survey and the manner in which the answer are to be recorded was clearly explained to them. The edition of the completed questionnaires helped in amending and recording errors or eliminating data that are obviously erroneous and in consistent. All kinds of mistake have been concerted which were found in our questionnaires and all answers have been observed carefully. As a result we feel there is no irrelevant information.

2.7 Data Processing

The easiest procedure of analyzing the data is to use computer program. At present no body thinks to analyze data without a suitable computer program. No other alternative is available to analyze the data quickly, easily and correctly. So, suitable computer

programs have been selected for data entry and analysis. For the data processing and analysis following stages are followed:

2.7.1 Editing

After the completion of data collection, the data were carefully checked each schedule of questionnaire. The data were edited rigorously to make correction of any existing inconsistencies in data and to minimize non-sampling error of the study. We make editing in order to have complete, consistent, and accurate and homogeneous data.

2.7.2 Coding

It refers to the process of assigning numbers or symbols to answer, i.e., response can be put into a limited numbers or categories or classes that make the process, easier and faster.

Table 2.7.2.1: Some of the Codes and Levels of the Variables

Full name	Code name	Labels	
Marital status	q7	1) Married	2) Unmarried
		3) Divorced	4) Widowed
		5) Others	
Hear about HIV/AIDS	q14	1) Yes	2) No
Use of contraception	q9	1) Yes	2) No
Vulnerability to HIV/AIDS	q25	1)Yes	2)No
Influence in sexual relation by the profession	q27	1)Yes	2)No

2.7.3 Computerization

Edited and coded data were next processed in a computer. At first, the data were entered in the worksheet. Entire computerization of data has performed by a computer package named SPSS for windows version 17, the most convenient program for data analysis for

social science. Microsoft Excel and Microsoft Word also used for completing the research.

2.8 Selection of Variables

According to the literature of statistics, variable refers to those that have the variation. In this study several variables have been considered such as, Age, Sex, Religion, and Duration of couple life and like. Among all variables that are taking part in this study, we have revealed some selected dependent and independents variables in terms of this study related to the female smugglers. The brief description has been disclosed bellow that represents different dependent and independents variables with their corresponding process of assuming.

2.8.1 Dependent Variables

In this study, several variables have been considered for example, Age, Sex, duration of couple life and so on. For making this study more reliable and meaningful it had to choice some independent and some dependent variables for the sake of making analysis associated to the association and logistic regression. From the questionnaire three dependent variables have been selected named as knowledge, awareness of HIV/AIDS and risks of HIV/AIDS contamination.

2.8.2 Independent Variables

The selected independent variables are age, educational Status, aware by person, doctor and NGO worker, Do You Know Bad Impact of HIV/AIDS from Media, Participation in HIV/AIDS Seminar, Participation in Religious Seminar, Do You Have any Understanding with HIV affected Person, having unsafe sex, sexually abused in the

profession, influence to take drugs in the profession knows the way to protect from HIV/AIDS and use condom during sexual relation etc.

2.9 Methodology

Methodology is must for every kind of research problems and execution of research work. Systematically, the methodology applied for this study was (1) Frequency distribution and percentage distribution, (2) Bivariate distribution, (3) Logistic regression (binary and multinomial).

2.9.1 Frequency Distribution and Percentage Distribution

Table that show the distribution of the frequencies in the different classes is called a frequency table and the manner in which the class frequencies are distributed over the class intervals is called the grouped frequency distribution of the variable. This is used to show the general picture of this study. Percentages and measures of central tendencies have also employed in this study for getting the real picture of the study.

2.9.2 Bivariate Distribution

In this section, we present contingency analysis, which is designed to test any association between different phenomenons. All the contingency tables are prepared on the basis of classification of variables. From each contingency table examination of association between component and the various segment of the component are made by computing Chi—square using the formula given by:

$$\chi^2 = \sum_{ij} \frac{O_{ij}^{\ 2}}{E_{ij}} - N$$

Which follows chi-square distribution with (r-1) (c-1) degrees of freedom.

Where, O_{ij} = The number of observed frequency in (i, j) th cell

E_{ij} = The number of expected frequency in (i, j) th cell

N = Total number of frequency

r = number of rows

c = number of columns.

2.9.3 Binary Logistic Regression Analysis

There are a variety of multivariate techniques that can be used to predict a binary dependent variable from a set of independent variables. Multiple regression analysis and discriminant analysis are two related techniques but these techniques are applicable only when the dependent and independent variables are measured in interval scale under the assumption that they are distributed normally with equal variances. However, in most of applications dependent variable may be dichotomous and one or more explanatory variables are qualitative or measured in nominal or ordinal scales and the assumption of normality is violated. To overcome this problem a very interesting and appropriate technique is the logistic regression method was illustrated by Wolker and Duncun (1967), Cox (1970), Lee (1980) and Fox (1984) have further illustrated the Cox's model.

The logistic regression method does not require any distributional assumption. This regression is useful when the dependent variable is dichotomous. Since it does not require any distributional assumptions, unlike many other multivariate techniques (i.e. the variables are normally distributed with equal variances), it can appropriately handle situations in which the independent variables are qualitative or measured in nominal and ordinal scale. The logistic regression model can be used not only to identify risk factors but also to predict the probability of success. This model expresses a qualitative

dependent variable as a function of several independent variables both qualitative and quantitative (Fox, 1984).

Let Y_i denote the dichotomous dependent variable for the i-th observation and $Y_i = y_i = 1$, if the i-th individual is a success and $Y_i = y_i = 0$, if the i-th individual is a failure.

So that, $P_i = E\{Y_i = 1 / X_i\} = \dfrac{1}{1+e^{\left(-(\beta_0+\beta_i X_i)\right)}}$ .... (2.9.4.1)

where, X_i is explanatory variable and

$$1- P_i = E\{Y_i = 0 \mid X_i\} = 1 - \dfrac{1}{1+e^{\left(-(\beta_0+\beta_i X_i)\right)}}$$

$$= \dfrac{e^{-\left(\beta_0+\beta_i X_i\right)}}{1+e^{\left(-(\beta_0+\beta_i X_i)\right)}}$$

$$= \dfrac{1}{1+e^{\left(\beta_0+\beta_i X_i\right)}} \quad \text{... (2.9.4.2)}$$

Therefore we can write

$$\frac{P_i}{1-P_i} = e^{(\beta_0+\beta_i X_i)} \quad \text{.. (2.9.4.3)}$$

Now if we take natural log of the equation (2.11.3) we obtain

$$L_i = \log_e \left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_i X_i \text{.. (2.9.4.4)}$$

Here, $\dfrac{P_i}{1-P_i}$ given in (2.9.4.3) is simply the odds ratio and L_i given in (2.9.4.4) is known as log-odds.

Instead of single explanatory variable, we can count two or more explanatory variables. Let $X_{i1}, X_{i2} \ldots X_{ik}$ the vector of k independent explanatory variables for the i-th response. The logarithm of the ratio P_i and $(1- P_i)$ gives the linear function of X_{ij} and the model (2.9.4.4) becomes.

$$L_i = \log\left(\frac{P_i}{1-P_i}\right) = \sum_{j=0}^{k} \beta_j X_{ij} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.9.4.5)$$

Where we consider $X_{i0} = 1$ and β_j is the parameter relating to X_{ij}

The function (2.9.4.5) is a linear function of both the variables X and the parameter β L_i is called the logit and hence the model (2.9.4.5) is called logistic regression model.

(i) Interpretation of the Parameters

Interpretation of the Parameters in logistic model is not so straight forward as in linear regression model. So, it is relevant to present a little discussion about it. Since the logit transformation $L_i = \log_e\left(\dfrac{P_i}{1-P_i}\right)$ is linear in parameters, we can interpret the parameters using arguments of linear regression. Thus the interpretation may be described as follows:

We have, $P_i = \dfrac{e^{\beta_0 + \beta_1 X_1 + \ldots\ldots + \beta_k X_k}}{1 + e^{\beta_0 + \beta_1 X_1 + \ldots\ldots + \beta_k X_k}}$ is a linear in parameter,

i.e., $L_i = \log_e \left(\dfrac{P_i}{1-P_i} \right) = \beta_0 + \beta_1 X_1 + \ldots\ldots\ldots\ldots +\beta_k X_k \ldots\ldots\ldots$ (2.9.4.6)

So, arguing analogously as in the case of linear model we can say that β_j (j=1,2,............)

represent the rate of change in $\log_c \left(\dfrac{P_i}{1-P_i} \right)$ for one unit change in X_j (other variables

remaining constant).

The interpretation of the parameter in logistic regression has another interesting aspect. In fact, this is the proper interpretation for the parameters of qualitative variable coefficient. To describe this, we first consider that the independent variable (X_j) is dichotomous. This case is not only simplest but also it gives the conceptual foundation for all other situations. The description is given below.

We have $\log_c \left(\dfrac{P_i}{1-P_i} \right) = \beta_0 + \beta_1 X_1 + \ldots\ldots + \beta_j X_j + \ldots\ldots \beta_k X_k$

Now if W_j is a dichotomous variable taking values 0 and 1, then the odds ratio 'O' (say) for $X_j = 1$ against $X_j = 0$ is (keeping all other X's fixed)

$$\dfrac{\dfrac{P_i\left(Y_i = 1 \middle| X, X_j = 1\right)}{\left\{1 - P_i\left(Y_i = 1 \middle| X, X_j = 1\right)\right\}}}{\dfrac{P_i\left(Y_i = 1 \middle| X, X_j = 0\right)}{\left\{1 - P_i\left(Y_i = 1 \middle| X, X_j = 0\right)\right\}}}$$

$$= \dfrac{e^{\beta_0 + \beta_1 X_1 \ldots\ldots + \beta_k X_k}}{e^{\beta_0 + \beta_1 X_1 + \ldots\ldots + \beta_k X_k}}$$

$$\Rightarrow \log_c O = \beta_j$$

So, we can directly estimate the coefficients of a logistic regression model as $\log_e O$ and hence can interpret. If a qualitative independent variable has m categories, we introduce only (m-1) dummy variables and the remaining one is taken as reference category.

(ii) Computation of Probability (P_i)

We can compute the probability p_i from the estimated odds ratio. This calculation is very simplest. Given a data set of X variables in equation (2.9.4.5), where of course β's are estimated from fitted model, then we have

$$\log_e \frac{P_i}{1-P_i} = c \text{ (Some constant)}.$$

$$\Rightarrow \frac{\hat{p}_i}{1-\hat{p}_i} = e^c \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{ (2.9.4.7)}$$

From this equation (2.9.4.7) p_i can be computed easily.

(iii) Estimation of the Parameters

In order to estimate the unknown parameters, the standard ordinary least square (OLS) method cannot be used. Because, in that case, it must be faced some special problem as non-normality of the disturbance terms, heteroscedastic variance of the disturbance terms, non-fulfillment of the axiom i.e. $0 \leq p_i = E(Y_i \mid X) \leq 1$ and questionable value of R^2 as a measure of goodness of fit.

To eliminate the above problem, Cox (1970) suggested the maximum likelihood estimation method in place of standard OLS method and proposed the following function:

$$L(\beta_0, \beta_1, \dots \beta_k) = \frac{\prod_{i=1}^{n} \exp(Y_i \sum_{j=0}^{k} \beta_j X_{ij})}{\prod_{i=1}^{n} \{1 + \exp(Y_i \sum_{j=0}^{k} \beta_j X_{ij})\}}$$

$$= \frac{\exp\{\sum\limits_{i=1}^{n}(Y_i\sum\limits_{j=0}^{k}\beta_j X_{ij})\}}{\prod\limits_{i=1}^{n}\{1+\exp(Y_i\sum\limits_{j=0}^{k}\beta_j X_{ij})\}}$$

$$= \frac{\exp\{\sum\limits_{j=0}^{k}\beta_j\sum\limits_{i=1}^{n}X_{ij}Y_i\}}{\prod\limits_{i=1}^{n}\{1+\exp(Y_i\sum\limits_{j=0}^{k}\beta_j X_{ij})\}}$$

$$= \frac{\exp\{\sum\limits_{i=1}^{n}\beta_j t_j\}}{\prod\limits_{i=1}^{n}\{1+\exp(Y_i\sum\limits_{j=0}^{k}\beta_j X_{ij})\}} \, ,$$

Where, $t_j = \sum\limits_{i=1}^{n} X_{ij}Y_j$, j = 0, 1,…,k. Then the log-likelihood function is given by

$$\text{Log}_e \text{ L }(\beta_0, \beta_1,\dots,\beta_k) = \sum\limits_{j=0}^{k}\beta_j t_j - \sum\limits_{i=1}^{n}\log_e\left\{1+\exp\left(Y_i\sum\limits_{j=0}^{k}\beta_j X_{ij}\right)\right\} \quad \text{……..} \quad (2.9.4.8)$$

Now, taking partial derivatives with respect to β_j and put them equal to zero and solving the equations simultaneously and iteratively so as to produce β_j, j = 0,1, ……k. Iteration would continue until certain convergence criteria are met. For simplicity, the readymade results after some iteration are obtained through SPSS for windows base 20.0 version for large sample size.

2.9.4 Multinomial Logistic Regression Analysis

The model for multinomial logistic regression is-

$$P(Y_i = K) = \frac{\exp(\sum_{j=0}^{p} X_{ij}\beta_{jk}}{\sum_{m=1}^{n} \exp(\sum_{j=o}^{p} X_{ij}\beta_{jm})}$$

Multinomial logistic regression performs maximum-likelihood estimation of models with discrete dependent variables. This method is most useful when the dependent variable has more than two outcomes, which can not be handled by binary logistic regression model. Suppose the outcomes 1,2,3,…… m recorded in Y, and the exploratory variables in X. For expositional purposes, let us assume that the dependent variable Y have m = 3 outcomes.

Such as,

$$Y = \begin{cases} 1, \textit{if the female smugglers are in fluened to take drugs by male colleagues} \\ 2, \textit{if the female smugglers are in fluened to take drugs by Indian track drivers} \\ 3, \textit{if the female smugglers are in fluened to take drugs by BSF / BGB} \end{cases}$$

Even though the outcomes are coded 1, 2 and 3; the numerical values are arbitrary. For this unordered categorical property of Y, the multinomial logistic regression is an appropriate method rather than ordinary regression and logistic regression analysis. Corresponding to each outcome category of Y = 1, 2 and 3, in the multinomial logistic model, set of coefficients $\beta^{(1)}$, $\beta^{(2)}$ and $\beta^{(3)}$ are estimated, which gives,

$$P(Y = 1) = \frac{e^{X\beta^{(1)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}} \qquad \ldots\ldots(1)$$

$$P(Y = 2) = \frac{e^{X\beta^{(2)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}} \qquad \dots\dots(2)$$

$$\text{and} \quad P(Y = 3) = \frac{e^{X\beta^{(3)}}}{e^{X\beta^{(1)}} + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}} \qquad \dots\dots(3)$$

From equation (1), (2) and (3) it is obvious that there exists more than one solution of $\beta^{(1)}$, $\beta^{(2)}$ and $\beta^{(3)}$ which leads to the same probabilities for Y=1, Y=2 and Y=3.

To identify the model, one of $\beta^{(1)}$, $\beta^{(2)}$ or $\beta^{(3)}$ is arbitrarily set to zero, it does not matter which. That is, if we set arbitrarily $\beta^{(1)} = 0$ the remaining coefficients $\beta^{(2)}$ and $\beta^{(3)}$ would measure the changes relative to the Y = 1 group.

Setting $\beta^{(1)} = 0$, the equation (1), (2) and (3) becomes,

$$P(Y = 1) = \frac{1}{1 + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}}$$

$$P(Y = 2) = \frac{e^{X\beta^{(2)}}}{1 + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}}$$

and

$$P(Y = 3) = \frac{e^{X\beta^{(3)}}}{1 + e^{X\beta^{(2)}} + e^{X\beta^{(3)}}}$$

The relative risk of Y = 2 to the base category Y = 1 is,

$$\frac{P(Y = 2)}{P(Y = 1)} = e^{X\beta^{(2)}}$$

and the relative risk of $Y = 3$ to the base category $Y = 1$ is,

$$\frac{P(Y = 3)}{P(Y = 1)} = e^{X\beta^{(3)}}$$

In the above equation X and β s are vectors equal to $(X_1 X_2 ... X_k)'$ and $(\beta_1^{(i)} \beta_2^{(i)} ... \beta_k^{i})'$

$\forall i = 2,3$ respectively.

The ratio of the relative risk for a one unit change in X_j is then,

$$\frac{e^{\beta_1^{(i)} X_{ij} + ... + \beta_j^{(i)}(X_j + 1) + ... + \beta_k^{(i)} X_k}}{e^{\beta_1^{(i)} X_{ij} + ... + \beta_j^{(i)}(X_j) + ... + \beta_k^{(i)} X_k}}$$

$$= e^{\beta_j^{(i)}} ; \forall i = 2,3$$

Thus the exponential value of a coefficient is the relative risk ratio for a one unit change in the corresponding variable. The risk is being measured as the risk of category relative to the base category.

2.10 Limitation of the Study

At the time of conduction of the research some genuine problems have been faced and the problems are following:

i. For financial constraints and lack of sufficient time, the whole city was not covered and put as few questions as possible;

ii. Many of the people are not very well known about the term HIV and AIDS, which put them in a baffling situation at the time of answering my questions. Moreover, they are not willing enough to provide appropriate information about any question relevant to HIV/AIDS;

iii. The tendency of hiding the correct answer of some aspects like income, monthly expenditure, age at marriage etc. was noticed among the respondents;

iv. Some of the respondents did not co-operate frankly. Most of the time they were not interested to answer my question, the reason behind that many organizations and researchers had done this type of work in the past but did nothing to them;

v. Some of the respondents were busy with their work. For this reason they cannot provide enough time for giving answer and avoid interviewer;

vi. Some female household heads did not give interview directly for the protection of religious bindings or any other causes.

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Chapter 3

Background Characteristics

In any research, it is important to know the background characteristics of the study or target population or nature of the data. This assessment leads to the interpretation of some basic characteristics of the women smugglers. In order to study the background characteristics of different variables, it is important to focus on the frequency distribution of the considered variables. Frequency distribution shows the pattern of distribution and observations in different groups. Thus important preliminary step of this study is to examine the frequency distribution of some considered variables. In this section we will examine some important selected independent variables which are considered to be important in relation to the HIV knowledge and awareness through their perspective frequency distribution. Some important demographic and socioeconomic characteristics of smuggler are given in the following tables.

3.1 Socio-demographic Characteristics

In this analysis, religion, age, educational status of respondents, educational status of father, educational status of mother, marital status are considered as demographic variables. The frequency distribution of respondents according to the selected demographic characteristics is presented in Table 3.1.1.

There are many religions, communities and minorities in Bangladesh. We have studied 300 female smugglers. Of whom, our study proclaims a greatest share (71.3%) of Muslim female smugglers. Age is measured by number of completed years at last birthday. For

example, a person aged 15 years, 10 months and 18 days has been recorded as 15 years (BBS, 2007). Table 3.1.1 depicts that largest part (59.7%) is in 20-30 years age group. Higher aged female smugglers are too little (1.3%). We observe that a countable part of female smugglers (9.7%) are illiterate that means they does not have any education and large number of respondents (31.7%) have the educational level of under secondary. Among them 30% are primarily educated. The percentages of secondary level education of female smugglers are 27%. Also, the percentages of higher secondary level education and above of female smugglers are so small (1.6%).

Education is the backbone of a nation and hence, the educational qualification of parents of female smugglers is a vital indicator for knowledge and awareness of HIV. In Table 3.1.1, it is found that 47% fathers and 64.3% mothers are illiterate where the illiterate mothers are large. Also 45% fathers and 33% mothers have completed their primary education where the percentages are decreasing with the increasing of educational levels.

Marital status is the most important demographic variable for the description and analysis of any kinds of research. Now we can see that, among the total respondents of number 300, maximum number of respondents is married and the percentage is 33.34% where the unmarried women are 27.3%. There are 31.33% divorced respondents and 10.3% women are widowed.

Table 3.1.1: Distribution of Socio-demographic Characteristics of Respondents

Characteristics	Frequency (%)	Characteristics	Frequency (%)
Religion		**Educational status of father**	
Islam	214 (71.30)	Illiterate	141 (47)
Hindu	79 (26.30)	Primary	135 (45)
Buddha	1 (0.30)	Under secondary	16 (5.30)
Christian	6 (2.00)	Secondary	7 (2.30)
Total	300 (100)	Higher secondary	1 (0.30)
Age (in years)		Total	300 (100)
10-20	67(22.30)	**Educational status of mother**	
20-30	179 (59.70)	Illiterate	193 (64.30)
30-40	50 (16.70)	Primary	99 (33)
40-50	4 (1.30)	Under secondary	7 (2.30)
Total	300 (100)	Secondary	1 (0.30)
Educational status of respondents		Higher secondary	0 (0.00)
Illiterate	29 (9.70)	Total	300 (100)
Primary	90 (30)	**Marital status**	
Under secondary	95 (31.70)	Unmarried	82 (27.30)
Secondary	81 (27)	Married	100 (33.34)
Higher secondary	5 (1.60)	Divorce	94 (31.33)
Total	300 (100)	Widow	31 (10.30)
		Total	300 (100)

3.2 Socio-economic Characteristics

Socio-economic variables play vital role in case of analyzing the field of vulnerability to HIV infection among female smugglers in Hilli port in Bangladesh. In this analysis, duration of couple life, duration of professional life, monthly income and development in this profession are considered as socio-economic variables. The frequency distribution of respondents according to the selected socio-economic characteristics is presented in Table 3.2.1.

Duration of couple life is the most important socio-economic variable for the description and analysis of any kinds of research. Now we can see that, among the total respondents of number 300, maximum (54%) respondents have 5-10 years couple life duration where

the minimum (0.3%) respondents have 15-20 years couple life duration. There are 32.3% respondents who are married but did not stay with their husband.

Profession is an important indicator for knowledge and awareness of HIV/AIDS. Smuggling is a prohibited profession and there is no security in life and economic condition. Hence, long term involvement in this profession play important negative role in life. From the Table 3.2.1 we found that 92.3% respondents are involved with this profession from 1 to 10 years. So that, the vast portion of total work force is threat for our country.

Monthly income is another important indicator of socio-economic status. It has been found that most of the respondent's monthly income is less than 1000 taka and the percentages are 63%. In the group 3000-4000 Taka, it contains 0.7% of total 140 respondents. Only 0.3% respondents usually earn money above taka 5000.

All the respondents of this study have agreed that they have developed by this profession. Although smuggling profession is an illegal way to earn money, they like this profession because of developing their temporary financial condition.

Table 3.2.1: Distribution of Socio-economic Characteristics of Respondents

Characteristics	Frequency (%)
Duration of couple life (in years)	
0	97 (32.30)
1-5	162 (54)
5-10	114 (38)
10-15	22 (7.30)
15-20	1 (0.30)
Total	300 (100)
Duration of professional life	
1-5	163 (54.30)
5-10	114 (38)
10-15	22 (7.30)
15-20	1 (0.30)
Total	300 (100)
Income (in TK.)	
500-1000	189 (63)
1000-2000	92 (30.70)
2000-3000	14 (4.70)
3000-4000	2 (0.70)
4000-5000	3 (0.30)
Total	300 (100)
Development by this profession	
No	0 (0)
Yes	300 (100)
Total	300 (100)

3.3 HIV/AIDS Related Characteristics

The following table gives us a summary about the frequency and percentage of the knowledge and awareness of HIV/AIDS related variables.

From the Table 3.3.1 we can notice that out of total respondents, 95% have heard about HIV/AIDS. This table also shows that fifty percent respondents have detail knowledge about HIV/AIDS, while almost half of total respondents do not deserve detail knowledge.

Awareness about HIV/AIDS is an important factor to protect the affection of this disease. The study shows that 55% female smugglers are not aware about HIV/AIDS where less than fifty percent (45%) are aware.

Contraception refers to measures that are taken in order to prevent sexual intercourse or coitus from resulting in conception. Use of contraception usually needs both the husbands and wife's approval. Generally, family planning methods are not widely practiced among the lower education groups, particularly in rural areas of Bangladesh. This table reveals that 30% female smugglers uses contraceptive methods and rest of the respondents are not practiced with the use of contraceptive method. Among the total contraceptive users 73.3% are pill users, 14.4% are injection users, 8.9% are condom users and 3.3% female smugglers uses stable method. Our study shows that among the total respondents of number 300, maximum numbers of them are known that condom protect HIV/AIDS and the percentage is 70%. There are 30% respondents who don't even know that condom can protect HIV/AIDS. Among total female smugglers, 55% are related with unsafe sexual relation, which is the dangerous situation and important barrier to protect the extension of HIV/AIDS.

Seminar can play a vital role to create the knowledge and awareness about any matter to the people. Hence, seminar on HIV/AIDS can play an important role to protect HIV/AIDS. In our study, it is found that 37.3% respondents participate on HIV/AIDS seminar and most of them are not involved with any HIV/AIDS seminar.

Every religion advises to control illegal works. Hence, participation in any religious seminar can protect her from HIV/AIDS. In this study, 29.3% female smugglers are involved with religious seminar but most of them are not involved.

In our study, 43% people know that the treatment of AIDS is available and rest of the respondents know that the treatment of AIDS are not available. Also, this study indicates that firstly HIV/AIDS is a contiguous disease according to 45.7% respondents; secondly HIV/AIDS is a fatal disease according to 58% respondents. We have observed that 46% female are familiar with HIV/AIDS patients and 69.3% respondents think that they are at risk of HIV/AIDS. Of the total respondents, 46% have understanding with those persons who are HIV affected.

Table 3.3.1: Distribution of HIV/AIDS Related Characteristics

Characteristics	No (%)	Yes (%)	Total (%)
Heard about HIV/AIDS	15 (5%)	285 (95%)	300 (100%)
Details know about HIV/AIDS	150(50%)	150(50%)	300 (100%)
Aware about HIV/ AIDS	165 (55%)	135 (45%)	300 (100%)
Contraceptive use	210 (70%)	90 (30%)	300 (100%)
Know that condom protect HIV/AIDS	90 (30%)	210 (70%)	300 (100%)
Unsafe sexual relation	135 (45%)	165 (55%)	300 (100%)
Participation in HIV/AIDS seminar	188 (62.70%)	112 (37.30%)	300 (100%)
Participation in religious seminar	212 (70.70%)	88 (29.30%)	300 (100%)
Available treatment of AIDS	171 (57%)	129 (43%)	300 (100%)
Contiguous disease	163 (54.30%)	137 (45.70%)	300 (100%)
Fatal disease	126 (42%)	174 (58%)	300 (100%)
Risk of affecting HIV/AIDS	92 (30.7%)	208 (69.3%)	300 (100%)
Understanding with HIV affected person	163 (54%)	137 (46%)	300 (100%)

3.4 Multiple Responses

A female smuggler may have various causes to involve in this profession. In the Table 3.4.1, we get 606 answers from 300 respondents which indicate that one may choice more than one option. Firstly, a number of 286 respondents (95% of total cases and 47% of total answers) think that poverty may considered as the main cause for involving in this profession. Secondly, 166 choices (56.3% of total cases and 27.4% of total answers) corresponding family pressure indicates that family pressure may be considered as second cause for involving in this profession. Thirdly, 114 choices (38% of total cases and 18.8% of total answers) corresponding absence of husband indicates that absence of husband may be considered as the third cause for involving in this profession.

We have observed that 154 (51.3%) respondents have knowledge about HIV/AIDS and also, 154 (51.3%) respondents have spreading knowledge about HIV/AIDS. HIV/AIDS can spread in different ways. Firstly, we try to find out the main sources of HIV/AIDS spreading. In this study, we observe total 301 answers from 154 respondents which indicate that one may choice more than one option. Initially, 156 choices (52% of 154 cases and 51.8% of 301 answers) corresponding sexual relation with affected persons indicates that sexual relation with affected persons may be considered as the main source for spreading HIV/AIDS. Secondly, 66 respondents (42.9% of 154 cases and 21.9% of 301 answers) among 154 have expressed their opinion that HIV/AIDS is spreading by taking blood from affected persons. Thirdly, about 26 respondents (approximately 17% of 154 cases and 9% of 301 answers) among 154 have claimed that HIV/AIDS is spreading by injection and breastfeeding. Finally, about 15 (or 13) respondents (approximately 9% of 154 cases and 5% of 301 answers) have proclaimed that HIV/AIDS is spreading by pregnancy and delivery.

This observation shows that 51.3% respondents have known about the protection system of HIV/AIDS where the rest of the respondents have totally unknown about this matter. So, basis on this study approximately half portion of total female smugglers are threaten for our nation. Among 154 respondents who have knowledge about HIV/AIDS protection system, 146 respondents (94.8% of 154 cases and 48.8% of 299 answers) have expressed their opinion that HIV/AIDS can be protected by using condom during sexual intercourse. Secondly, 85 respondents (55.2% of 154 cases and 28.4% of 299 answers) have said their opinion that HIV/AIDS can be protected by taking HIV/AIDS free blood. Thirdly, 31 respondents (approximately 20.1% of 154 cases and 10.4% of 299 answers) have suggested that HIV/AIDS can be protected by protecting HIV/AIDS during pregnancy, delivery and breastfeeding. Finally, 22, 11 and 4 respondents (14.3%, 7.1% and 2.6% of 154 cases and 7.4%, 3.7% and 1.3% of 299 answers) have expected that the spreading of HIV/AIDS can be protected by avoid used syringe, to help a affected female not to be a mother and to say no AIDS.

Our study reveals that 70.3% respondents have been aware by recognized person, NGO workers and Doctors. Among these respondents 222 respondents (95.3% of 211 cases and 76.3% of 291 answers) have been informed to be aware about HIV/AIDS by NGO workers. Secondly, 37 respondents (15.9% of 211 cases and 12.7% of 291 answers) have been known about HIV/AIDS by doctors. Thirdly, 29 respondents (12.4% of 211 cases and 10% of 291 answers) have been known about HIV/AIDS by recognized person. Hence, the NGO workers and doctors play an important role to increase the awareness about HIV/AIDS.

Table 3.4.1: Distribution of Multiple Responses of Different Characteristics

Characteristics	Frequency	Percent of cases	Percent of responses
Causes of involvement in this profession			
Intentionally	41	13.70	6.80
Family pressure	166	56.30	27.40
Poverty pressure	286	95	47
Absence of husband	114	38	18.80
Total	606	202	100
Have knowledge about HIV?			
No	146	48.70	48.70
Yes	154	51.30	51.30
Total	300	100	100
If yes, have any HIV spreading knowledge?			
No	146	48.70	48.70
Yes	154	51.30	51.30
Total	300	100	100
If yes, how it is spreading?			
Sexual relation with affected person	156	101.30	51.80
Taking blood of affected person	66	42.90	21.90
By Injection	25	16.20	8.30
Pregnancy	15	9.70	5.00
Delivery	13	8.4	4.30
Breast feeding	26	16.90	8.60
Total	301	195.40	100
Do you know any way to protect HIV/AIDS?			
No	146	48.70	48.70
Yes	154	51.30	51.30
Total	300	100	100
If yes, what is the protection?			
Using condom	146	94.80	48.80
Taking HIV free blood	85	55.20	28.40
To avoid used syringe	22	14.30	7.40
To help affected female not to be a mother	11	7.10	3.70
To protect HIV at the time of pregnancy, Delivery and breastfeeding	31	20.10	10.40
To say no AIDS	4	2.60	1.30
Total	299	194.20	100
Do you aware by person, doctor and NGO worker?			
No	89	29.70	29.70
Yes	211	70.30	70.30
Total	300	100	100
If yes, who are the persons?			
Doctor	37	15.90	12.70
Person	29	12.40	10
NGO workers	222	95.30	76.30
Other	3	1.30	1
Total	291	124.90	100

Media may play an important role to increase the knowledge about bad impact of HIV/AIDS and to create awareness to the society. Depend on our study (from Table 3.4.2) we can show that 193 (64.3% of total cases 300) female smugglers have been known the bad impact of HIV/AIDS by media. Among these respondents 189 respondents (96.4% of 193 cases and 46.7% of 405 answers) have been known the bad impact of HIV/AIDS from television. Secondly, 173 respondents (90.1% of 193 cases and 42.7% of 405 answers) have been known the bad impact of HIV/AIDS by radio and rest of these has been gained the knowledge about bad impact of HIV/AIDS by newspaper.

About symptoms of HIV/AIDS 65.3% female smugglers are totally unknown and a lower portion of these smugglers have knowledge on symptoms of AIDS. Among these respondents 88 respondents (85.4% of 104 cases and 34.4% of 256 answers) have known that Diarrhea is a symptom of HIV/AIDS. Secondly, 83 respondents (80.6% of 104 cases and 32.4% of 256 answers) have known that repetition of fever is another symptom of HIV/AIDS and the rest of these have known that weight less, less preventive power and various diseases are others symptoms of HIV/AIDS.

Table 3.4.2: Distribution of Multiple Responses of Different Characteristics

Characteristics	Frequency	Percent of cases	Percent of responses
Do you know about bad impact of HIV/AIDS from media?			
No	107	35.70	35.70
Yes	193	64.30	64.30
Total	300	100	100
If yes, what are the media?			
Radio	173	90.10	42.70
Television	189	96.40	46.70
Newspaper	43	22.40	10.60
Total	405	210.90	100
Do you know about symptoms of AIDS?			
No	196	65.30	65.30
Yes	104	34.70	34.70
Total	300	100	100
If yes, what are the symptoms of AIDS?			
Diarrhea	88	85.40	34.40
Weigh less	57	55.30	22.30
Less preventive power	15	14.60	5.90
Various diseases	13	12.60	5.10
Repetition of fever	83	80.60	32.40
Total	256	248.50	100

Chapter 4

Determinants of HIV Knowledge and Awareness of Female Smugglers

In this chapter we have discussed the result of Chi-square test statistic and Logistic regression method. Firstly, by using Chi-square statistic we have tried to get a preliminary idea of independency of socioeconomic and demographic characteristics with knowledge and awareness about HIV among the female smugglers. Since an empirical association between two variables not necessarily imply a causal relationship between them, it is essential to adjust the effect of correlated variables in order to determine more precisely the net effect that any particular factor has on knowledge and awareness about HIV. In order to estimate independent effects of each variable with other variables controlled, we have further analyzed the data within a multivariate framework. There are various statistical methods for multivariate analysis use for the dichotomous schooling data. These are log-linear, logistic, probit and transformed equation models, path analysis etc. In this section we have used binary logistic regression analysis to identify the significant variables which have important effects on knowledge and awareness about HIV among female smugglers. Due to dichotomous nature of the dependent variables, it does not require distributional assumptions unlike many other multivariate techniques. It can deal with situations in which the independent variables are qualitative or measured in nominal or ordinal scale. It can also be used to examine the risk factors as well as predict the probability of success. For categorical variables, by estimating the logarithm of the value of success (P_i) to failure ($1 - P_i$) and relation is to the independent variables, the logistic parameters can easily be interpreted in terms of odds ratio. Relative odds can be estimated

for the categories of each independent categorical variable or combination of these variables.

We would like to study whether there is any association between knowledge about HIV as well as awareness about HIV and different phenomena like Age; Educational Status; Do You Aware by Person, Doctor and NGO Worker; Do You Know Bad Impact of HIV/AIDS from Media; Participation in HIV/AIDS Seminar; Participation in Religious Seminar; Do You Have any Understanding with HIV affected Person. For this reason we have used Chi-square statistic for testing any association of them with knowledge about HIV of female smugglers.

4.1 Differentials and Determinants of Knowledge about HIV among Female Smugglers

The contingency analysis between knowledge about HIV and other characteristics have been shown in Table 4.1.1. It is observed from Table 4.1.1 that 51.3% of total respondents have knowledge about HIV. That means, 48.7% of our collected sample have no knowledge about HIV. The percent of respondents who are known about HIV increases gradually with the progress of education. That means, the knowledge about HIV has association with education.

Table 4.1.1 reflects that do you aware by person, doctor and NGO worker has significant association with knowledge about HIV. Among the total respondents who have knowledge about HIV 97.4% have informed by person, doctor and NGO worker where as 2.6% have not informed. In the case of another characteristic "do you know bad impact of HIV/AIDS from media", we see that it is highly associated with knowledge about HIV. Among the female smugglers who have knowledge about HIV, 97.4% has known the bad

impact of HIV by media whereas 2.6% have not informed. Participation in seminar (both HIV/AIDS and religious) is highly associated with knowledge about HIV. Among the total respondents, 65.6% have gained HIV knowledge by HIV related seminar and 54.5% by religious seminar.

Table 4.1.1: Association between HIV Knowledge and Some Selected Socio-demographic Characteristics

Characteristics	HIV knowledge			Calculated value of χ^2, ρ-value, df
	No (%)	Yes (%)	Total (%)	
Educational status				
Illiterate	55.20	44.80	100	$\chi^2 = 5.589$
Primary	51.10	48.90	100	ρ = 0.02
Under secondary	45.30	54.70	100	df = 4
Secondary	48.90	53.10	100	
Higher secondary	40	60	100	
Total	48.70	51.30	100	
Do you aware by person, doctor and NGO worker?				
No	95.50	4.50	100	$\chi^2 = 108.47$
Yes	28.90	71.10	100	ρ = 0.00
Total	48.70	51.30	100	df = 1
Do you know bad impact of HIV/AIDS from media?				
No	96.30	3.70	100	$\chi^2 = 147.866$
Yes	22.30	77.70	100	ρ = 0.00
Total	48.70	51.30	100	df = 1
Participation in HIV/AIDS seminar				
No	71.80	28.20	100	$\chi^2 = 105.484$
Yes	9.80	90.20	100	ρ = 0.00
Total	48.70	51.30	100	df = 1
Participation in religious seminar				
No	67	33	100	$\chi^2 = 94.553$
Yes	4.50	95.60	100	ρ = 0.00
Total	48.70	51.30	100	df = 1

In the above we have discussed about associated factors of HIV knowledge among female smugglers. Also, impacts of the associated factors on knowledge about HIV which is identified by logistic regression analysis are discussed in the following table. While measuring the impact of some selected factors on knowledge about HIV, the dependent variable is classified by-

$$Y = \begin{cases} 1, \; if \;\; the \; respondents \; have \; knowledge \; about \; HIV \\ 0, \; otherwise \end{cases}$$

In logistic regression analysis, the effect of each independent variable on the dependent variable is indicated by the odds ratios for each variable category relative to the reference category for which the odds ratio is 1. The odds ratio has a clear interpretation and is straightforward.

Table 4.1.2: Results of Logistic Regression Analysis of HIV Knowledge by Some Selected Characteristics

Characteristics	Regression co-efficient (β)	Standard error of β	ρ - value	Odds ratio
Educational status				
Non-educated (r)	…	…	…	1.000
Educated	0.081	0.097	0.108	1.085
Do you aware by person, doctor and NGO worker?				
No (r)	…	…	…	1.000
Yes	2.933	0.716	0.000	18.789
Do you know bad impact of HIV/AIDS from media?				
No (r)	…	…	…	1.000
Yes	3.925	0.692	0.000	50.673
Participation in HIV/AIDS seminar				
No (r)	…	…	…	1.000
Yes	2.046	0.575	0.000	7.736
Participation in religious seminar				
No (r)	…	…	…	1.000
Yes	3.240	0.797	0.000	25.532
Constant	-6.974	1.260	0.000	0.001

N.B.: (r) represents the reference category.

Education has positive significant effect on knowledge about HIV among female smugglers. The educated respondents are 1.085 times more likely to have knowledge about HIV as compared to uneducated respondents. Do you aware by person, doctor and NGO worker have positive significant impact on knowledge about HIV? The respondents who are informed by person, doctor and NGO worker are 18.789 times more likely to have knowledge about HIV than that of reference category. The respondents who are informed about the bad impact of HIV from media are 50.673 times more likely to have knowledge about HIV as compared with of reference category. The respondents who are participated in HIV seminar are 7.736 times more likely to have knowledge about HIV than that of reference category. The respondents who are involved with religious seminar are 25.532 times more likely to have knowledge about HIV as compared to reference category.

4.2 Differentials and Determinants of Awareness about HIV among Female Smugglers

The contingency analysis (Table 4.2.1) reveals that 45% of total respondents have awareness about HIV. That means most of the respondents (55.7%) of our collected sample have no awareness about HIV. The percent of conscious respondents about HIV increases gradually with the increase of age group. The HIV awareness has significant association with age.

Table 4.2.1 reflects that do you aware by person, doctor and NGO worker has significant association with awareness about HIV. Among the conscious respondents 53.6% have informed about HIV by person, doctor and NGO worker where as 46.4% have not informed. In case of another characteristic do you know bad impact of HIV/AIDS from media we see that it is highly associated with awareness about HIV. 52.8% of total

conscious respondents have been known the bad impact about HIV by media where as the rests are not informed by media.

Do you have understanding with HIV affected person is highly associated with awareness about HIV. 62.8% respondents who have awareness about HIV have relation with HIV affected person where as the rests have no relation with them.

Table 4.2.1: Association between HIV Awareness and Some Selected Socio-demographic Characteristics

Characteristics	HIV awareness			Calculated value of χ^2, ρ-value, df
	No (%)	Yes (%)	Total (%)	
Age (in years)				
10-20	67.20	32.80	100	$\chi^2 = 9.585$
20-30	52	48	100	$\rho = 0.02$
30-40	54	46	100	df = 3
40-50	0	100	100	
Total	55	45	100	
Do you aware by person, doctor and NGO worker?				
No	75.30	24.70	100	$\chi^2 = 21.029$
Yes	46.40	53.60	100	$\rho = 0.00$
Total	55	45	100	df = 1
Do you know bad impact of HIV/AIDS from media?				
No	69.20	30.80	100	$\chi^2 = 13.472$
Yes	47.20	52.80	100	$\rho = 0.00$
Total	55	45	100	df = 1
Do you have any understanding with HIV affected person?				
No	69.90	30.10	100	$\chi^2 = 32.184$
Yes	37.20	62.80	100	$\rho = 0.00$
Total	55	45	100	df = 1

We have discussed about associated factors of HIV awareness among female smugglers in Hilli port of Bangladesh. Also, impacts of the associated factors on awareness about HIV that are estimated by logistic regression analysis are discussed in the following table. While measuring the impact of some selected factors on knowledge about HIV, the dependent variable are classified as-

$$Y = \begin{cases} 1, \text{ if the respondents have awareness about HIV} \\ 0, \text{ otherwise} \end{cases}$$

In logistic regression analysis, the effect of each independent variable on the dependent variable is indicated by the odds ratios for each variable category relative to the reference category for which the odds ratio is 1. The odds ratio has a clear interpretation and is straightforward.

Table 4.2.2: Results of Logistic Regression Analysis of HIV Awareness by Some Selected Characteristics

Characteristics	Regression co-efficient (β)	Standard error of β	ρ - value	Odds ratio
Age				
≤20 years (r)	…	…	…	1.000
>20 years	0. 073	0. 022	0.001	1. 076
Do you aware by person, doctor and NGO worker?				
No (r)	…	…	…	1.000
Yes	1.314	0.349	0.000	3.722
Do you know bad impact of HIV/AIDS from media?				
No (r)	…	…	…	1.000
Yes	0.492	0.338	0.145	1.636
Do you have any understanding with HIV affected person?				
No (r)	…	…	…	1.000
Yes	1.354	0.293	0.000	3.873
Constant	-3.826	0.675	0.000	0.022

N.B.: (r) represents the reference category.

Age has positive significant effect on awareness about HIV among female smugglers. The female smugglers who are belonged to >20 years of age groups are 1.076 times more likely to have awareness about HIV than that of the respondents who are belonged to ≤20

years of age groups i.e., the awareness about HIV among female smugglers increases with increasing their ages. Again, the respondents who are informed by person, doctor and NGO worker are 3.772 times more likely to have awareness about HIV as compared with the reference category and the respondents who are informed about the bad impact of HIV from media are 1.636 times more likely to have awareness about HIV relative to the reference category. The respondents who have any understanding with HIV affected persons are 3.873 times more likely to have awareness about HIV as compared to the reference category which notice that female smugglers in Hilli port of Bangladesh are vulnerable to HIV infection.

Chapter 5

Assessment of Vulnerability of Female Smugglers

Vulnerability results from a range of factors that reduce the ability of individuals and communities to avoid HIV infection (USAID, 2010). Often the places in which, migrant workers live, work or pass through are high-risk spaces of vulnerability. The presence of many different migrant and mobile populations and interactions with local communities at such places as land border posts, ports, construction sites, informal settlements, farm compounds and mines creates a fluid social environment in which social norms regulating behavior are usually not followed and migrants may feel a sense of anonymity and limited accountability, which can lead to high risk sexual behavior. Poverty and lack of job opportunities in the communities surrounding such places also induces many women (both migrant and local) to engage in transactional and commercial sex with those who have resources or disposable incomes (USAID, 2010). In this chapter we would like to assess the vulnerability of female smugglers through bivariate and multivariate analysis. Therefore, the chi-square test, binary and multinomial logistic regression method is used to fulfill the objectives of the study.

5.1 Vulnerable Characteristics

In our survey, 69.3% respondents are risks of HIV/AIDS contamination that means 7 out of 10 female smugglers are at risks of HIV/AIDS contamination in the Hilli Port. It is visible that about fifty percent (48.7%) respondents do not know how to protect from HIV/AIDS. Among total sample, 55% respondents exercise unsafe sex. In the smuggling

profession, 7 out of 10 female are sexually abused by their male colleagues and others. They are mainly abused by their male colleagues (53.5%), following Indian track driver (30.9%), BSF (13.4%) and BGB (2.3%). Conversely, 92.3% respondents are influenced to take drugs passing through the smuggling profession. In such cases, 39.7% are influenced to take drug by their male colleagues, 45.5% by Indian track drivers, 11.2% by BSF and 3.6% by BGB.

Table 5.1.1: Distribution of Vulnerable Characteristics among Female Smugglers in Hilli Port, Bangladesh

Characteristics	Number of respondents (%)
Risk of HIV/AIDS contamination	
Yes	208 (69.3)
No	92 (30.7)
Knows the way to protect from HIV/AIDS	
Yes	154 (51.3)
No	146 (48.7)
Exercise unsafe sex	
Yes	165 (55.0)
No	135 (45.0)
Sexually abused passing through the profession	
Yes	222 (74.0)
No	78 (26.0)
By whom sexually abused	
Male colleagues	116 (53.5)
Indian truck drivers	67 (30.9)
BSF	29 (13.4)
BGB	5 (2.3)
Influence to take drugs passing through the profession	
Yes	277 (92.3)
No	23 (7.7)
By whom influence to take drugs	
Male colleagues	110 (39.7)
Indian truck drivers	126 (45.5)
BSF	31 (11.2)
BGB	10 (3.6)

Note: () indicates percentage of respondents

In a word, the female smugglers are sexually hazard not only low prevalence area of Bangladesh but also in high prevalence area of India. Therefore, it is concluded that the female smugglers are vulnerable to HIV infection.

5.2 Differentials and Determinants of HIV/AIDS Contamination Risks among Female Smugglers

An attempt has been made in this section to predict the likelihood of risk behaviors among the female smugglers in regard to the risks of HIV/AIDS contamination. At first, we would like to study whether there is any association between risks of HIV/AIDS contamination and vulnerability related variables. To fulfill this, Chi-square test has been performed. Again, to find out the determinants of HIV/AIDS contamination risks among female smugglers, binary logistic regression analysis has been employed. In binary logistic regression analysis, the dependent variable is defined by-

$$Y = \begin{cases} 1, \textit{if the respondents have the risks of HIV / AIDS contamination} \\ 0, \textit{otherwise} \end{cases}$$

and the category of independent variables are shown in respective table.

The results of Chi-square test have been demonstrated in Table 5.2.1. This contingency analysis shows that respondents, who are at risks of HIV/AIDS contamination, decrease gradually (51.3% to 48.7%) with the increase of their knowledge of how to protect from HIV/AIDS, if they do not know how to protect from HIV/AIDS contamination then the risks of HIV/AIDS contamination increases, that means, the risks of HIV/AIDS contamination is significantly associated with their knowledge how to protect from HIV/AIDS.

Table 5.2.1 reflects that the exercise of unsafe sex among respondents have significant association with the risks of HIV/AIDS contamination. Among the 300 respondents 135 have exercised unsafe sex and the rest have not. In case of participation on HIV/AIDS seminar, the result is highly associated with the risks of HIV/AIDS contamination. It is observed that the risks of HIV/AIDS contamination decrease if the respondents' participation on seminar increases.

In this study, Table 5.2.1 demonstrates that if the respondents are sexually abused by their male colleagues and others in their profession then the risks of HIV/AIDS contamination is 80.3%, but if they are not abused the rate is 19.7%. That is, if the respondents sexually abused then risks of HIV/AIDS contamination increases. Condom use in sexual relation is highly associated with risks of HIV/AIDS contamination.

In case of taking drugs, when the female smugglers are influenced by colleagues and others, the risk of HIV/AIDS contamination is 93.8%, otherwise the risk is 6.2%. This indicates that the risk of HIV/AIDS vulnerability is higher among the female smugglers who are influenced to use drug.

Table 5.2.1: Association between Risks of HIV/AIDS Contamination and Vulnerability Related Variables

Variables	Risks of HIV/AIDS contamination			χ^2 value, ρ value
	No (%)	Yes (%)	Total (%)	
Knows the way to protect from HIV/AIDS				5.994, 0.014
Yes	57 (62.0)	97 (46.6)	154 (51.3)	
No	35 (38.0)	111 (53.4)	146 (48.7)	
Exercise unsafe sex				11.716, 0.001
Yes	37 (40.2)	128 (61.5)	165 (55.0)	
No	55 (59.8)	80 (38.5)	135 (45.0)	
Participation on HIV/AIDS seminar				16.419, 0.000
Yes	50 (54.3)	62 (29.8)	112 (37.3)	
No	42 (45.7)	146 (70.2)	188 (62.7)	
Sex abused passing through the profession				40.407, 0.000
Yes	40 (43.5)	167 (80.3)	207 (69.0)	
No	52 (56.5)	41 (19.7)	93 (31.0)	
Use condom in sexual relation				51.914, 0.000
Yes	87 (94.6)	107 (51.4)	194 (64.7)	
No	5 (5.4)	101 (48.6)	106 (35.3)	
Influence to taking drugs in this profession				36.093, 0.000
Yes	62 (67.4)	195 (93.8)	257 (85.7)	
No	30 (32.6)	13 (6.2)	43 (14.3)	

Note: () indicates the percentages

The results of logistic regression analysis are presented in Table 5.2.2 that presents the odds ratios, regression coefficients (β) and 95% confidence interval as well as significance level (ρ value) by some independent variables. Table 5.2.2 shows that female smugglers who know the way to protect from HIV/AIDS have significantly 0.392 times less risks of HIV/AIDS contamination than those who do not know. As expected, knowledgeable smugglers may be more health conscious and hence healthier behaviors are to be expected from them. However, studies conducted in Armenia found that

knowledge of students had no significant contribution to use of condoms (Babikian et al., 2004) and in Kenya no association was found between knowledge of HIV transmission and sexual behavior (Akwara, 2003). In this survey, respondents having unsafe sex are significantly more risks of HIV/AIDS contamination (OR= 3.229) than others.

Participation on HIV/AIDS seminar has also effects on the likelihood of HIV/AIDS contamination. The analysis shows that the odds ratio of respondents' participation on HIV/AIDS seminar is 0.927. That means participation on HIV/AIDS seminar of smugglers have 7.3% lower risks of HIV/AIDS contamination as compared with the reference category. In case of sexually abused, the odds ratio is 7.045. That means, if the female smugglers are sexually abused by their male colleagues and others passing through the profession, the risks of HIV/AIDS contamination increase 7.045 times more than those who are not abused.

In regard to condom use during sexual relation, the odds ratio of logistic regression analysis is 0.034. Therefore, respondents who use condom are significantly having 0.034 times less risks of HIV/AIDS contamination than those who do not use.

Conversely, the respondents who are influenced to take drugs by their colleagues and others passing through the profession are significantly 6.983 times more likely to be at risk of contamination of the HIV/AIDS than others.

Table 5.2.2: Results of Logistic Regression Analysis for Risks of HIV/AIDS Contamination by Some Vulnerability Related Variables

Variables	β	S.E. (β)	ρ value	Odds ratio	95% C.I.
Knows the way to protect from HIV/AIDS					
No (r)	…	…	…	1.000	
Yes	-0.936	0.427	0.028	0.392	(0.170, 0.906)
Having unsafe sex					
No (r)	…	…	…	1.000	
Yes	1.172	0.367	0.001	3.229	(1.573, 6.627)
Participation on HIV/AIDS seminar					
No (r)	…	…	…	1.000	
Yes	-0.076	0.424	0.858	0.927	(0.404, 2.127)
Sexually abused passing through the profession					
No (r)	…	…	…	1.000	
Yes	1.952	0.436	0.000	7.045	(3.000, 16.542)
Use condom during sexual relation					
No (r)	…	…	…	1.000	
Yes	-3.370	0.615	0.000	0.034	(0.010, 0.115)
Influence to take drugs passing through the profession	…	…	…	1.000	
No (r)	1.944	0.613	0.002	6.983	(2.099, 23.233)
Yes					
Constant	0.366	0.796	0.646	1.442	
-2 Log likelihood = 237.863					

Note: r represents the reference category

5.3 Differentials and Determinants of Sexually Abused through Smuggling

In this section, it has been tried to identify the differentials and determinants of sexually abused through smuggling for females in Hilli port, Bangladesh. To do so, the Chi-square test and binary logistic regression analysis have been used. The Chi-square test has been utilized to identify the association of sexually abused with some selected factors and to find out the determinants of sexually abused through smuggling, the binary logistic regression analysis has been performed which plays an important role to assess the vulnerability to HIV infection of female smugglers in Hilli port of Bangladesh. The dependent variable is categorized as-

$$Y = \begin{cases} 1, \textit{ if the female smugglers have been sexually abused through smuggling} \\ 0, \textit{ otherwise} \end{cases}$$

and the category of independent variables are presented in respective table.

The results of association of sexually abused with some selected socio-demographic, economic and HIV/AIDS related factors have been demonstrated in Table 5.3.1. From Table 5.3.1, it is found that sexually abused through smuggling is significantly associated with smuggler's age, fathers' education, marital status, reasons of coming to the smuggling, monthly income through smuggling and unsafe sex respectively. Again, respondent's education, mother's education and types of drug affecting are insignificantly associated with sexually abused through smuggling in this study.

Table 5.3.1: Association of Sexually Abused through Smuggling with Some Selected Factors

Characteristics	Sexually abused through smuggling		Total (%)	Calculated value of χ^2 (ρ value)
	No (%)	Yes (%)		
Age group				
≤20 years	26 (8.7%)	41 (13.7%)	67 (22.3%)	12.407 (0.006)
21-25 years	30 (10%)	71 (23.7%)	101 (33.7%)	
26-30 years	13 (4.3%)	65 (21.7%)	78 (26%)	
>30 years	9 (3%)	45 (15%)	54 (18%)	
Total	78 (26%)	222 (74%)	300 (100%)	
Educational status				
Illiterate and primary level	26 (8.7%)	93 (31%)	119 (39.7%)	1.823 (0.402)
Secondary level	30 (10%)	72 (24%)	102 (34%)	
SSC pass	22 (7.3%)	57 (19%)	79 (26.3%)	
Total	78 (26%)	222 (74%)	300 (100%)	
Father's education				
Illiterate	30 (10%)	111 (37%)	141 (47%)	3.085 (0.079)
Literate	48 (16%)	111 (37%)	159 (53%)	
Total	78 (26%)	222 (74%)	300 (100%)	
Mother's education				
Illiterate	45 (15%)	148 (49.3%)	193 (64.3%)	2.026 (0.155)
Literate	33 (11%	74 (24.7%)	107 (35.7%)	
Total	78 (26%)	222 (74%)	300 (100%)	
Marital status				
Currently married	23 (7.3%)	67 (22.3%)	90 (30%)	11.530 (0.003)
Unmarried	32 (10.7%)	50 (16.7%)	82 (27.3%)	
Divorced or widowed	23 (7.7%)	105 (35%)	128 (42.7%)	
Total	78 (26%)	222 (74%)	300 (100%)	
Reasons of coming to smuggling				
Own willingness	12 (4%)	24 (8%)	36 (12%)	10.480 (0.005)
Pressure of family	49 (16.3%)	104 (34.7%)	153 (51%)	
Poverty	17 (5.7%)	94 (31.3%)	111 (37%)	
Total	78 (26%)	222 (74%)	300 (100%)	
Monthly income through smuggling				
≤1000 Tk	53 (17.7%)	136 (45.3%)	189 (63%)	6.544 (0.038)
1001-1500 Tk	7 (2.3%)	48 (16%)	55 (18.3%)	
>1500 Tk	18 (6%)	38 (12.7%)	56 (18.7%)	
Total	78 (26%)	222 (74%)	300 (100)	
Unsafe sex				
Yes	59 (19.7%)	106 (35.3%)	165 (55%)	18.145 (0.000)
No	19 (6.3%)	116 (38.7%)	135 (45%)	
Total	78 (26%)	222 (74%)	300 (100%)	
Types of drug affecting				
Modd	63 (22.7%)	185 (66.5%)	248 (89.2%)	0.419 (0.518)
Injection or others	6 (2.2%)	24 (8.6%)	30 (10.8%)	
Total	69 (24.8%)	209 (75.2%)	278 (100%)	

The result of binary logistic regression model has been presented in Table 5.3.2. This table contains the estimate of logistic regression coefficients (β), standard error of estimates {S.E.(β)}, significance (ρ), relative risks or odds ratio {EXP(β)} and 95% confidence interval (C.I.) for EXP(β) that are calculated for each of the categorical variable. According to the fitted model, there are five variables out of nine variables appeared as the significant predictors in case of sexually abused through smuggling of females in Hilli port, Bangladesh. In accordance with their importance, respondent's age, reasons of coming to smuggling, monthly income through smuggling, unsafe sex and types of drug affecting have statistically significant effect on sexually abused. On the other hand, respondent's education, father's education, mother's education and marital status have no any statistically significant effect on sexually abused in this study.

Age of the female smuggler has also been appeared as an important factor affecting on sexually abused. The regression coefficients corresponding to age group of 21-25, 26-30 and >30 years are 0.544, 1.288 and 1.078 respectively and the corresponding relative risks are 1.723, 3.626 and 2.938. It implies that the female smugglers having 21-25, 26-30 and >30 years of age groups have been sexually abused 1.723, 3.626 and 2.938 times more than that of the female smugglers who are belonged to ≤20 years of age groups respectively. Clearly, female smugglers are more vulnerable of sexually abused after 25 years of their ages.

The reasons of coming to smuggling plays also a vital role in case of sexually abused. The regression coefficients for those female smugglers whose reasons of coming to this profession are pressure of family and poverty are 0.488 and 1.157 with corresponding relative risks 1.628 and 3.180 respectively. It means that female smugglers who came to this profession due to pressure of family and poverty have been sexually abused 1.628

and 3.180 times more than that of the smugglers who came to this profession due to own willingness respectively. Therefore, it may be concluded that poverty plays an important role to coming this profession which is also an important reason of sexually abused.

Monthly income through smuggling is also another important significant factor of sexually abused. It is observed that the regression coefficients of the female smugglers whose monthly income through smuggling is 1001-1500 Tk and >1500 Tk are -0.248 and -1.124 and the corresponding relative risks are 0.780 and 0.325 respectively. It indicates that female smugglers whose monthly income through smuggling is 1001-1500 Tk and >1500 Tk have been sexually abused 22% and 67.5% less than that of the reference category respectively. The chance of sexually abused is decreasing with increasing the monthly income through smuggling. It also clarifies that the higher the monthly income, the lower the sexually abused.

Unsafe sex plays a vital role in case of HIV infection particularly for vulnerable groups (especially female smugglers in Hilli port, Bangladesh) which is also a significant factor of sexually abused in this study. It is found that the regression coefficients of female smugglers who have no habit of unsafe sex is -0.859 with corresponding relative risks 0.424, which implies that the female smugglers not having the habit of unsafe sex have been sexually abused 57.6% less than that of the respondents who have the habit of unsafe sex.

Drug affected persons have the higher risks of HIV infection. In this study, the regression coefficients of female smugglers who have taken the injection or other types of drug is -1.416 with corresponding relative risks 0.243 which clarifies that the female smugglers

who have taken the injection or other types of drug have been sexually abused 75.7% less

than that of the reference category.

Table 5.3.2: Results of Binary Logistic Regression Analysis of Sexually Abused through Smuggling by Some Selected Factors

Explanatory variables	Coefficients (β)	S.E. of estimates {S.E.(β)}	ρ value	Relative risks {EXP(β)}	95% C.I. for EXP(β)	
					Lower	Upper
Age group						
≤20 years [ref.]	…….	…….	…….	1.000		
21-25 years	0.544	0.437	0.213	1.723	0.732	0.4053
26-30 years	1.288	0.568	0.023	3.626	1.191	11.033
>30 years	1.078	0.674	0.110	2.938	0.784	11.011
Educational status						
Illiterate and primary level [ref.]	…….	…….	…….	1.000		
Secondary level	-0.173	0.422	0.681	0.841	0.368	1.921
SSC pass	0.021	0.490	0.966	1.021	0.391	2.670
Father's education						
Illiterate [ref.]	…….	…….	…….	1.000		
Literate	0.237	0.335	0.480	1.267	0.657	2.445
Mother's education						
Illiterate [ref.]	…….	…….	…….	1.000		
Literate	-0.162	0.350	0.643	0.851	0.429	1.688
Marital status						
Currently married [ref.]	…….	…….	…….	1.000		
Unmarried	0.106	0.444	0.811	1.112	0.466	2.655
Divorced or widowed	0.045	0.507	0.929	1.046	0.388	2.823
Reasons of coming to smuggling						
Own willingness [ref.]	…….	…….	…….	1.000		
Pressure of family	0.488	0.452	0.281	1.628	0.671	3.951
Poverty	1.157	0.588	0.049	3.180	1.005	10.057
Monthly income through smuggling						
≤1000 Tk [ref.]	…….	…….	…….	1.000		
1001-1500 Tk	-0.248	0.445	0.576	0.780	0.326	1.864
>1500 Tk	-1.124	0.477	0.018	0.325	0.128	0.828
Unsafe sex						
Yes [ref]	…….	…….	…….	1.000		
No	-0.859	0.313	0.006	0.424	0.229	0.783
Types of drug affecting						
Modd [ref.]	…….	…….	…….	1.000		
Injection or others	-1.416	0.371	0.000	0.243	0.117	0.502

-2 Log likelihood = 302.876
Cox & Snell R square = 0.254
Nagelkerke R square = 0.342

5.4 Differentials and Determinants of Perpetrators of Sexually Abused through Smuggling

To find out the differentials and determinants of perpetrators of sexually abused through smuggling for females in Hilli port, Bangladesh, Chi-square test and multinomial logistic regression analysis have been utilized in this section. The Chi-square test has been used to identify the association of perpetrators of sexually abused through smuggling with some selected factors. Moreover, to find out the determinants of perpetrators of sexually abused through smuggling, the multinomial logistic regression analysis has been performed which plays an important role to assess the vulnerability to HIV infection of female smugglers in Hilli port of Bangladesh. In this model, perpetrators of sexually abused through smuggling for females are considered as dependent variable which has more than two options, in which, male colleagues of smuggling are considered as reference of dependent variable. Thus, the dependent variable is classified into the following way:

$$Y = \begin{cases} 1, \textit{ if the female smugglers have been sexually abused by male colleagues} \\ 2, \textit{ if the female smugglers have been sexually abused by Indian track drivers} \\ 3, \textit{ if the female smugglers have been sexually abused by BSF / BGB} \end{cases}$$

and the category of independent variables are mentioned in respective table.

The results of association of perpetrators of sexually abused with some selected socio-demographic, economic and HIV/AIDS related factors have been presented in Table 5.4.1. From Table 5.4.1, it is found that perpetrators of sexually abused through smuggling is significantly associated with smuggler's educational status, fathers' education, mothers' education, marital status, reasons of coming to the smuggling, monthly income through smuggling, unsafe sex and types of drug affecting respectively.

On the other hand, respondent's age is insignificantly associated with perpetrators of sexually abused through smuggling in this study.

Table 5.4.1: Association of Perpetrators of Sexually Abused through Smuggling with Some Selected Factors

Characteristics	Perpetrators of sexually abused through smuggling			Total (%)	Calculated value of χ^2 (ρ value)
	Male colleague of smuggling (%)	Indian track driver (%)	BSF/BGB (%)		
Age group					
≤20 years	21 (9.7%)	15 (6.9%)	5 (2.3%)	41 (18.9%)	4.725
21-25 years	38 (17.5%)	24 (11.1%)	8 (3.7%)	70 (32.3%)	(0.579)
26-30 years	32 (14.7%)	19 (8.8%)	13 (6%)	64 (29.5%)	
>30 years	25 (11.5%)	9 (4.1%)	8 (3.7%)	42 (19.4%)	
Total	116 (53.5%)	67 (30.9%)	34 (15.7%)	217 (100%)	
Educational status					
Illiterate and primary level	45 (20.7%)	21 (9.7%)	24 (11.1%)	90 (41.5%)	23.368
Secondary level	44 (20.3%)	19 (8.8%)	9 (4.1%)	72 (33.2%)	(0.000)
SSC pass	27 (12.4%)	27 (12.4%)	1 (0.5%)	55 (25.3%)	
Total	116 (53.5%)	67 (30.9%)	34 (15.7%)	217 (100%)	
Father's education					
Illiterate	64 (29.5%)	26 (12%)	18 (8.3%)	108 (49.8%)	4.713
Literate	52 (24%)	41 (18.9%)	16 (7.4%)	109 (50.2%)	(0.095)
Total	116 (53.5%)	67 (30.9%)	34 (15.7%)	217 (100%)	
Mother's education					
Illiterate	83 (38.2%	37 (17.1%)	25 (11.5%)	145 (66.8%)	5.925
Literate	33 (15.2%)	30 (13.8%)	9 (4.1%)	72 (33.2%)	(0.052)
Total	116 (53.3%)	67 (30.9%)	34 (15.7%)	217 (100%)	
Marital status					
Currently married	33 (15.2%)	14 (6.5%)	16 (7.4%)	63 (29%)	17.015
Unmarried	23 (10.6%)	25 (11.5%)	2 (0.9%)	50 (23%)	(0.002)
Divorced or widowed	60 (27.6%)	28 (12.9%)	16 (7.4%)	104 (47.9%)	
Total	116 (53.3%)	67 (30.9%)	34 (15.7%)	217 (100%)	
Reasons of coming to smuggling					
Own willingness	6 (2.8%)	7 (3.2%)	9 (4.1%)	22 (10.1%)	14.773
Pressure of family	55 (25.3%)	35 (16.1%)	11 (5.1%)	101 (46.5%)	(0.005)
Poverty	55 (25.3%)	25 (11.5%)	14 (6.5%)	94 (43.3%)	
Total	116 (53.3%)	67 (30.9%)	34 (15.7%)	217 (100%)	
Monthly income through smuggling					
≤1000 Tk	75 (34.6%)	48 (22.1%)	13 (6%)	136 (62.7%)	11.836
1001-1500 Tk	21 (9.7%)	12 (5.5%)	11 (5.1%)	44 (20.3%)	(0.019)
>1500 Tk	20 (9.2%)	7 (3.2%)	10 (4.6%)	37 (17.1%)	
Total	116 (53.3%)	67 (30.9%)	34 (15.7%)	217 (100%)	
Unsafe sex					
Yes	43 (19.8%)	48 (22.1%)	13 (6%)	104 (47.9%)	21.858
No	73 (33.6%)	19 (8.8%)	21 (9.7%)	113 (52.1%)	(0.000)
Total	116 (53.3%)	67 (30.9%)	34 (15.7%)	217 (100%)	
Types of drug affecting					
Modd	112 (54.9%)	41 (20.1%)	28 (13.7%)	181 (88.7%)	23.256
Injection or others	4 (2%)	16 (7.8%)	3 (1.5%)	23 (11.3%)	(0.000)
Total	116 (56.9%)	57 (27.9%)	31 (15.2%)	204 (100%)	

Again, the results of multinomial logistic regression analysis have been depicted in Table 5.4.2 which contains the estimate of multinomial logistic regression coefficients (β), standard error of estimates {SE(β)}, ρ-value and odds ratio with 95% confidence interval (C.I.) calculated for each of the categorical variable (dependent and independent). According to the fitted model, there are seven variables out of nine variables appeared as the significant predictors in case of perpetrators of sexually abused for female smugglers in Hilli port, Bangladesh. In accordance with their importance, it is identified that father's education, marital status, unsafe sex and types of drug affecting have statistically significant effect on Indian track driver; and respondent's educational status, marital status, reasons of coming to smuggling and monthly income through smuggling have statistically significant effect on BSF/BGB by whom female smugglers are sexually abused. On the other hand, the remaining factors have no any statistically significant effect in case of this data. Again, it is found from the Table 5.4.2 that -2 Log likelihood is 259.635, Cox and Snell R square is 0.406, Nagelkerke R square is 0.476 in this model. It implies that 40.6% (according to Cox and Snell R square) variation is explained on perpetrators of sexually abused by the selected regressors or variables. Again, there is 47.6% variation on perpetrators of sexually abused by the selected socio-demographic and smuggling related variables according to the value of Nagelkerke R square in this model.

Education plays a pivotal role in case of HIV vulnerability, in particular, sexually abused especially in under developed countries like Bangladesh. In case of sexually abused by BSF/BGB, the regression coefficients of the female smugglers whose educational status is secondary level and SSC pass are -0.134 and -2.650 and the corresponding odds ratios are 0.874 and 0.071 respectively. It implies that the likelihood of sexually abused by

BSF/BGB relative to male colleague of smuggling are 12.6% and 92.9% less for female smugglers whose educational status is secondary level and SSC pass compared to those are illiterate and having primary level of education respectively. It is clear that the vulnerability of sexually abused decreases with increasing the level of their education. Therefore, it may conclude that education may reduce these types of vulnerability which plays a vital role in case of reducing and preventing HIV infections.

Again, father's education also plays an important role in case of perpetrators of sexually abused for female smugglers. In case of sexually abused by Indian track drivers, it has been found that the regression coefficients of the female smugglers whose fathers are illiterate is 1.022 with corresponding odds ratio 2.778, which indicates that the likelihood of sexually abused by Indian track drivers as against male colleague of smuggling is 2.778 times more for female smugglers whose fathers are illiterate relative to those smugglers whose fathers are literate.

In case of perpetrators of sexually abused for female smugglers, marital status plays a significant role. The regression coefficients corresponding to currently married female smugglers who are sexually abused by Indian track drivers and BSF/BGB are -1.519 and 2.277 and the corresponding odds ratios are 0.219 and 9.748 respectively. It means that the currently married female smugglers compared to unmarried female smugglers are 78.1% less and 9.748 times more likelihood of sexually abused by Indian track drivers and BSF/BGB as against male colleague of smuggling respectively. Again, the regression coefficients for the female smugglers who are divorced/widowed and who are sexually abused by Indian track drivers and BSF/BGB are -0.455 and 0.053 and the corresponding odds ratios are 0.634 and 1.055 respectively. It implies that the likelihood of sexually abused by Indian track drivers and BSF/BGB as against male colleague of smuggling are

36.6% less and 5.5% more for divorced/widowed female smugglers compared to unmarried female smugglers respectively.

Again, in case of sexually abused by BSF/BGB, the regression coefficients of the female smugglers who have come to this profession due to pressure of family and poverty are -2.350 and -1.248 and the corresponding odds ratios are 0.095 and 0.287 respectively. It indicates that the female smugglers who have come to this profession due to pressure of family and poverty compared to own willingness are 90.5% and 71.3% less likelihood of sexually abused by BSF/BGB as against male colleagues of smuggling respectively.

Monthly income through smuggling plays a vital role in case of sexually abused. In case of sexually abused by BSF/BGB, the regression coefficients of the female smugglers whose monthly income through smuggling is 1001-1500 Tk and >1500 Tk are -0.001 and -1.745 and the corresponding odds ratios are 0.999 and 0.175 respectively. It clarifies that the likelihood of sexually abused by BSF/BGB as against male colleague of smuggling are 0.1% and 82.5% less for female smugglers whose monthly income through smuggling is 1001-1500 Tk and >1500 Tk compared to those having ≤1000 Tk of monthly income through smuggling respectively. Clearly, the vulnerability of sexually abused has decreased with increasing their monthly income through this profession.

In this study, unsafe sex also plays a significant role in case of perpetrators of sexually abused as well as HIV infection. The regression coefficients of the female smugglers having the habit of unsafe sex who are sexually abused by Indian track drivers are 0.931 with corresponding odds ratio 2.536 which clarifies that the likelihood of sexually abused by Indian track drivers compared to male colleague of smuggling is 2.536 times more for female smugglers whose have the habit of unsafe sex relative to those not having the habit of unsafe sex respectively.

Again, the regression coefficients of the female smugglers who are affected by modd through Indian track drivers is -2.782 and the corresponding odds ratio is 0.062 which indicates that female smugglers who have been affected by modd relative to injections or others types of drug is 93.8% less likelihood of sexually abused by Indian track drivers as against male colleagues of smuggling respectively.

Table 5.4.2: Results of Multinomial Logistic Regression Model of Perpetrators of Sexually Abused by Smuggler's Socio-demographic and Smuggling Related Characteristics with Male Colleague of Smuggling as Reference

Explanatory variables	Indian track driver				BSF/BGB			
	β	SE(β)	ρ-value	OR [95% C.I.]	β	SE(β)	ρ-value	OR [95% C.I.]
Age group								
≤20 years [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
21-25 years	0.410	0.642	0.524	1.506 [0.428, 5.303]	-0.474	1.122	0.673	0.622 [0.069, 5.615]
26-30 years	0.524	0.807	0.516	1.689 [0.347, 8.220]	0.139	1.138	0.902	1.150 [0.124, 10.694]
>30 years	0.354	1.071	0.741	1.424 [0.175, 11.623]	-1.054	1.335	0.430	0.349 [0.025, 4.770]
Educational status								
Illiterate and primary [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Secondary level	-0.487	0.608	0.423	0.614 [0.186, 2.024]	-0.134	0.679	0.843	0.874 [0.231, 3.310]
SSC pass	0.321	0.642	0.617	1.379 [0.392, 4.856]	-2.650	1.291	0.040	0.071 [0.006, 0.887]
Father's education								
Literate [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Illiterate	1.022	0.498	0.040	2.778 [1.047, 7.368]	-0.605	0.673	0.369	0.546 [0.146, 2.043]
Mother's education								
Illiterate [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Literate	0.755	0.485	0.119	2.129 [0.823, 5.503]	-0.269	0.661	0.684	0.764 [0.209, 2.792]
Marital status								
Unmarried [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Currently married	-1.519	0.691	0.028	0.219 [0.056, 0.849]	2.277	1.122	0.042	9.748 [1.081, 87.904]
Divorced or widowed	-0.455	0.810	0.574	0.634 [0.130, 3.101]	0.053	1.493	0.971	1.055 [0.057, 19.687]
Reasons of coming to smuggling								
Own willingness [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Pressure of family	0.673	0.783	0.416	1.890 [0.407, 8.774]	-2.350	1.213	0.053	0.095 [0.009, 1.028]
Poverty	0.010	0.988	0.992	1.010 [0.146, 7.002]	-1.248	1.553	0.422	0.287 [0.014, 6.026]
Monthly income through smuggling								
≤1000 Tk [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
1001-1500 Tk	0.828	0.829	0.318	2.289 [0.451, 11.613]	-0.001	0.795	0.999	0.999 [0.210, 4.750]
>1500 Tk	0.459	0.808	0.570	1.582 [0.324, 7.712]	-1.745	0.836	0.037	0.175 [0.034, 0.900]
Unsafe sex								
No [ref]	…….	…….	…….	1.000	…….	…….	…….	1.000
Yes	0.931	0.432	0.031	2.536 [1.087, 5.916]	0.326	0.565	0.563	1.386 [0.458, 4.192]
Types of drug affecting								
Injection or others [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Modd	-2.782	0.700	0.000	0.062 [0.016, 0.244]	-0.543	0.976	0.578	0.581 [0.086, 3.936]
Intercept	**-0.332**	**1.403**	**0.813**		**1.588**	**1.651**	**0.336**	

-2 Log likelihood = 259.635
Cox and Snell R square = 0.406
Nagelkerke R square = 0.476

Note: [ref.] refers to reference category; β implies regression coefficients, SE presents standard error, OR means odds ratio and C.I. indicates confidence interval

5.5 Differentials and Determinants of Perpetrators of Drug Affecting for Female Smugglers

To find out the differentials and determinants of perpetrators of drug affecting through smuggling for females, Chi-square test and multinomial logistic regression analysis have been utilized. In this section, the Chi-square test has been used to identify the association of perpetrators of drug affecting through smuggling with some selected factors. Furthermore, to find out the determinants of perpetrators of drug affecting through smuggling, the multinomial logistic regression analysis has been employed which plays an important role to assess the vulnerability to HIV infection of female smugglers in Hilli port, Bangladesh. In this model, perpetrators of drug affecting through smuggling for females are considered as dependent variable which has more than two options, in which, BSF/BGB is considered as reference of dependent variable. Thus, the dependent variable is classified into the following way:

$$Y = \begin{cases} 1, \textit{ if the female smugglers are in fluened to take drugs by male colleagues} \\ 2, \textit{ if the female smugglers are in fluened to take drugs by Indian track drivers} \\ 3, \textit{ if the female smugglers are in fluened to take drugs by BSF / BGB} \end{cases}$$

and the category of independent variables are mentioned in respective table.

The results of association of perpetrators of drug affecting with some selected socio-demographic, economic and HIV/AIDS related factors have been demonstrated in Table 5.5.1. From Table 5.5.1, it is seen that perpetrators of drug affecting is significantly associated with smuggler's age, educational status, fathers' education, mothers' education, marital status, reasons of coming to the smuggling, monthly income through smuggling, unsafe sex and types of drug affecting respectively.

Table 5.5.1: Association of Perpetrators of Drug Affecting for Female Smuggler with Some Selected Factors

Characteristics	Perpetrators of drug affecting for female smugglers			Total (%)	Calculated value of χ^2 (p value)
	Male colleague of smuggling (%)	Indian track driver (%)	BSF/BGB (%)		
Age group					
≤20 years	16 (5.8%)	40 (14.4%)	8 (2.9%)	64 (23.1%)	21.398
21-25 years	37 (13.4%)	42 (15.2%)	9 (3.2%)	88 (31.8%)	(0.002)
26-30 years	27 (9.7%)	32 (11.6%)	15 (5.4%)	74 (26.7%)	
>30 years	30 (10.8%)	12 (4.3%)	9 (3.2%)	51 (18.4%)	
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	
Educational status					
Illiterate and primary level	46 (16.6%)	39 (14.1%)	23 (8.3%)	108 (39%)	13.404
Secondary level	40 (14.4%)	40 (14.4%)	11 (4%)	91 (32.9%)	(0.009)
SSC pass	24 (8.7%)	47 (17%)	7 (2.5%)	78 (28.2%)	
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	
Father's education					
Illiterate	66 (23.8%)	43 (15.5%)	23 (8.3%)	132 (47.7%)	17.136
Literate	44 (15.9%)	83 (30%)	18 (6.5%)	145 (52.3%)	(0.000)
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	
Mother's education					
Illiterate	75 (27.1%)	72 (26%)	31 (11.2%)	178 (64.3%)	5.815
Literate	35 (12.6%	54 (19.5%)	10 (3.6%)	99 (35.7%)	(0.055)
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	
Marital status					
Currently married	42 (15.2%)	31 (11.2%)	14 (5.1%)	87 (31.4%)	27.763
Unmarried	18 (6.5%)	53 (19.1%)	4 (1.4%)	75 (27.1%)	(0.000)
Divorced or widowed	50 (18.1%)	42 (15.2%)	23 (8.3%)	115 (41.5%)	
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	
Reasons of coming to smuggling					
Own willingness	5 (1.8%)	20 (7.2%)	8 (2.9%)	33 (11.9%)	16.186
Pressure of family	61 (22%)	69 (24.9%)	13 (4.7%)	143 (51.6%)	(0.003)
Poverty	44 (15.9%)	37 (13.4%)	20 (7.2%)	101 (36.5%)	
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	
Monthly income through smuggling					
≤1000 Tk	61 (22%)	86 (31%)	20 (7.2%)	167 (60.3%)	9.876
1001-1500 Tk	29 (10.5%)	16 (5.8%)	10 (3.6%)	55 (19.9%)	(0.043)
>1500 Tk	20 (7.2%)	24 (8.7%)	11 (4%)	55 (19.9%)	
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	
Unsafe sex					
Yes	41 (14.8%)	88 (31.8%)	18 (6.5%)	147 (53.1%)	26.635
No	69 (24.9%)	38 (13.7%)	23 (8.3%)	130 (46.9%)	(0.000)
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	
Types of drug affecting					
Modd	106 (38.3%)	108 (39%)	33 (11.9%)	247 (89.2%)	10.653
Injection or others	4 (1.4%)	18 (6.5%)	8 (2.9%)	30 (10.8%)	(0.005)
Total	110 (39.7%)	126 (45.5%)	41 (14.8%)	277 (100%)	

Table 5.5.2 represents the results of multinomial logistic regression analysis which also contains the estimate of multinomial logistic regression coefficients (β), standard error of estimates {SE(β)}, ρ-value and odds ratio with 95% confidence interval (C.I.) calculated for each of the categorical variable (dependent and independent). According to the fitted model, there have been found six variables out of nine variables appeared as the significant predictors in case of perpetrators of drug affecting for female smugglers in Hilli port, Bangladesh. In accordance with their importance, it has been identified that respondent's age, marital status, reasons of coming to smuggling and types of drug affecting have statistically significant effect on male colleague of smuggling; and respondent's age, father's education, marital status and unsafe sex have statistically significant effect on Indian track driver by whom female smugglers are affected by drug. On the other hand, the remaining factors have no any statistically significant effect in case of this data. Again, it is found from Table 5.5.2 that -2 Log likelihood is 407.169, Cox and Snell R square is 0.301, Nagelkerke R square is 0.347 in this model. It implies that 30.1% (according to Cox and Snell R square) variation is explained on perpetrators of drug affecting by the selected regressors or variables. Again, there is 34.7% variation on perpetrators of drug affecting by the selected socio-demographic and smuggling related variables according to the value of Nagelkerke R square in this model.

Age of female smugglers is one of most significant factors in case of perpetrators of drug affecting. From the Table 5.5.2, it is found that the regression coefficients for the female smugglers aged 21-25 years who are affected of drug by male colleagues of smuggling and Indian track drivers are 1.661 and 1.236 and the corresponding odds ratios are 5.006 and 3.442 respectively. The result depicts that the likelihood of drug affecting by male colleagues of smuggling and Indian track drivers as against BSF/BGB are 5.006 and

3.442 times more for the female smugglers aged 21-25 years compared to those aged ≤20 years respectively. Again, the regression coefficients corresponding to age group of 26-30 years who are affected of drug by male colleagues of smuggling and Indian track drivers are 1.042 and 1.144 and the corresponding odds ratios are 2.836 and 3.140 respectively. It implies that the female smugglers aged 26-30 years relative to those aged ≤20 years are 2.836 and 3.140 times more likelihood of drug affecting through male colleagues of smuggling and Indian track drivers as against BSF/BGB respectively. Nevertheless, the regression coefficients corresponding to age group of >30 years who are affected of drug by male colleagues of smuggling and Indian track drivers are 2.032 and 0.782 and the corresponding odds ratios are 7.836 and 2.185 respectively. It indicates that the female smugglers aged 26-30 years compared to those aged ≤20 years are 7.836 and 2.185 times more likelihood of drug affecting by male colleagues of smuggling and Indian track drivers relative to BSF/BGB respectively. Clearly, the tendency of drug affecting through male colleagues of smuggling increases with increasing the age of the female smugglers, but the tendency of drug affecting through Indian track drivers has increased up to 21-25 years of ages and later it is decreasing.

Father's education plays a vital role in case of perpetrators of drug affecting for female smugglers. In case of drug affecting through Indian track drivers, the regression coefficients of the female smugglers whose fathers are illiterate is 0.913 with corresponding odds ratio 2.492, which implies that the likelihood of drug affecting through Indian track drivers relative to BSF/BGB is 2.492 times more for female smugglers whose fathers are illiterate compared to those smugglers whose fathers are literate.

Marital status is another significant predictors in case of perpetrators of drug affecting for female smugglers. The regression coefficients corresponding to currently married female

smugglers who are affected of drug by male colleagues of smuggling and Indian track drivers are -1.453 and -2.289 and the corresponding odds ratios are 0.234 and 0.101 respectively. It implies that the currently married female smugglers compared to unmarried female smugglers are 76.6% and 89.9% less likelihood of drug affecting by male colleagues of smuggling and Indian track drivers relative to BSF/BGB respectively. Again, the regression coefficients for the female smugglers who are divorced/widowed and who are affected of drug by male colleagues of smuggling and Indian track drivers are -1.728 and -2.243 and the corresponding odds ratios are 0.178 and 0.106 respectively. It indicates that the likelihoods of drug affecting by male colleagues of smuggling and Indian track drivers as against BSF/BGB are 82.2% and 89.4% less for divorced/widowed female smugglers compared to unmarried female smugglers respectively.

In case of drug affecting through male colleague of smuggling, the regression coefficients of the female smugglers who have come to this profession due to pressure of family and poverty are 1.712 and 1.157 and the corresponding odds ratios are 5.539 and 3.180 respectively. It means that the female smugglers who have come to this profession due to pressure of family and poverty compared to own willingness are 5.539 and 3.180 times more likelihood of drug affecting through male colleagues of smuggling as against BSF/BGB respectively.

Unsafe sex plays a vital role in case of perpetrators of drug affecting as well as HIV infection. In this study, the regression coefficients of the female smugglers having the habit of unsafe sex who are affected of drug by Indian track drivers are 0.864 with corresponding odds ratio 2.373 which indicates that the likelihood of drug affecting through Indian track drivers relative to BSF/BGB is 2.373 times more for female smugglers whose have the habit of unsafe sex compared to those not having the habit of unsafe sex.

Again, the regression coefficients of the female smugglers affected by modd through male colleagues of smuggling is 1.966 and the corresponding odds ratio is 7.144 which implies that female smugglers who have affected by modd relative to injections or others is 7.144 times more likelihood of drug affecting through male colleagues of smuggling compared to BSF/BGB.

Table 5.5.2: Results of Multinomial Logistic Regression Model of Perpetrators of Drug Affecting by Smuggler's Socio-demographic and Smuggling Related Characteristics with BSF/BGB as Reference

Explanatory variables	Male colleague of smuggling				Indian track driver			
	β	SE(β)	ρ-value	OR [95% C.I.]	β	SE(β)	ρ-value	OR [95% C.I.]
Age group								
≤20 years [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
21-25 years	1.661	0.786	0.041	5.006 [1.072, 23.383]	1.236	0.739	0.095	3.442 [0.808, 14.654]
26-30 years	1.042	0.816	0.201	2.836 [0.573, 14.031]	1.144	0.779	0.142	3.140 [0.682, 14.448]
>30 years	2.032	0.960	0.034	7.836 [1.161, 50.095]	0.782	0.925	0.398	2.185 [0.356, 13.393]
Educational status								
Illiterate and primary [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Secondary level	0.103	0.603	0.864	1.109 [0.340, 3.614]	-0.499	0.601	0.407	0.607 [0.187, 1.974]
SSC pass	-0.055	0.735	0.940	0.946 [0.224, 4.000]	-0.386	0.707	0.586	0.680 [0.170, 2.719]
Father's education								
Literate [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Illiterate	-0.170	0.525	0.746	0.843 [0.301, 2.361]	0.913	0.511	0.074	2.492 [0.915, 6.786]
Mother's education								
Literate [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Illiterate	0.688	0.564	0.223	1.990 [0.659, 6.013]	0.697	0.549	0.205	2.007 [0.684, 5.887]
Marital status								
Unmarried [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Currently married	-1.453	0.827	0.079	0.234 [0.046, 1.182]	-2.289	0.774	0.003	0.101 [0.022, 0.462]
Divorced or widowed	-1.728	0.971	0.075	0.178 [0.026, 1.191]	-2.243	0.890	0.012	0.106 [0.019, 0.608]
Reasons of coming to smuggling								
Own willingness [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Pressure of family	1.712	0.806	0.034	5.539 [1.142, 26.868]	0.796	0.692	0.250	2.216 [0.571, 8.595]
Poverty	1.157	0.934	0.215	3.180 [0.510, 19.829]	0.428	0.800	0.593	1.534 [0.319, 7.363]
Monthly income through smuggling								
>1500 Tk [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
1001-1500 Tk	0.315	0.615	0.608	1.371 [0.410, 4.578]	0.385	0.590	0.515	1.469 [0.462, 4.671]
≤1000 Tk	0.879	0.655	0.180	2.407 [0.666, 8.698]	-0.168	0.660	0.799	0.845 [0.232, 3.082]
Unsafe sex								
No [ref]	…….	…….	…….	1.000	…….	…….	…….	1.000
Yes	-0.270	0.457	0.554	0.763 [0.312, 1.868]	0.864	0.453	0.056	2.373 [0.976, 5.764]
Types of drug affecting								
Injection or others [ref.]	…….	…….	…….	1.000	…….	…….	…….	1.000
Modd	1.966	0.721	0.006	7.144 [1.738, 29.358]	0.598	0.572	0.296	1.818 [0.593, 5.573]
Intercept	**-2.356**	**1.205**	**0.051**		**-0.140**	**1.046**	**0.894**	

-2 Log likelihood = 407.169
Cox and Snell R square = 0.301
Nagelkerke R square = 0.347

Note: [ref.] refers to reference category; β implies regression coefficients, SE presents standard error, OR means odds ratio and C.I. indicates confidence interval

Chapter 6

Conclusion

This study is an effort to assess the vulnerability to HIV infection of female smugglers in Hilli port, Bangladesh through different statistical tools in accordance with some selected socio-demographic, smuggling and HIV vulnerability related factors. The data on the aspects of socio-demographic, smuggling and HIV vulnerability related characteristics have been taken from 300 female smugglers in Hilli port, Bangladesh through purposive sampling technique. This study focuses important findings of knowledge and awareness about HIV/AIDS, HIV/AIDS contamination risks, sexually abused through smuggling, perpetrators of sexually abused and perpetrators of drug affection among female smugglers based on this data. To carry out the objectives of the study, univariate, bivariate and multivariate technique like descriptive statistics, chi-square test, binary logistic regression analysis, multinomial logistic regression analysis are used. In accordance with their importance, these techniques have been employed on this data one by one, which have been shown in the previous chapters. Therefore, the principal objectives of the present chapter are to summarize the major findings of this study and to represent summary and recommendation.

6.1 Summary of the Study

From the results, it has been observed that most of the female smugglers are Muslim (71.3%), married (33.34%) and belonged to 20-30 years of age group (59.7%). A remarkable number of female smugglers are teenager, i.e., 10-20 years aged (22.3%),

unmarried (27.3%), divorced (31.33%) and illiterate (9.7%). In addition, the majorities have primary (30%) and under secondary (31.7%) level of education. It is mentionable that 47% fathers and 64.3% mothers of female smugglers are illiterate and among the rest of them, the majorities have not completed the secondary level of education. Clearly, mother's education have downgraded compared to father's education in every level of education. However, about half of female smugglers (54.3%) are involved in 1-5 years, the majorities (63%) have earned 500-1000 Tk per month through this profession, and all of them have improved their living conditions through this profession. Yet, a female smuggler may have many reasons of involvement in this profession. In this study, poverty (95%) has been found as main cause of involvement in this profession. Besides this, pressure of family (56.3%) and absence of husband (38%) creates important role to involve in this profession.

The knowledge of susceptibility and general conception of HIV/AIDS plays an important role in case of preventing this epidemic. In this study, the majorities (95%) have been heard about HIV/AIDS but only 50% have details knowledge and 45% have awareness about HIV/AIDS. Although 70% female smugglers know that condom can protect this epidemic but only 30% use condom at the time of sex. Moreover, 55% have unsafe sexual relation and most of the female smugglers (69.3%) think that they have the risk of HIV/AIDS affecting. There are only 37.3% and 29.3% smugglers who have participated in HIV/AIDS seminar and religious seminar respectively.

Media plays an effective role in case of increasing knowledge and awareness level to the people. In this study, 64.3% respondents are known about the bad impact of HIV/AIDS through media where Radio (42.7%) and Television (46.7%) creates more awareness to the female smugglers.

The results of chi-square test indicate that respondent's educational status, awareness by person, doctor and NGO workers, knowledge about the bad impact of HIV/AIDS from media, participation in HIV/AIDS seminar and participation in religious seminar have statistically significant association with knowledge about HIV/AIDS and from the results of binary logistic regression analysis, all these variables have statistically significant effect on knowledge about HIV/AIDS of female smugglers. In this study, it has been determined that educated respondents, those have awareness by person, doctor and NGO workers, those have knowledge about the bad impact of HIV/AIDS from media, those are participated in HIV/AIDS seminar and in religious seminar are more likely to have knowledge about HIV/AIDS as compared with their counterparts respectively.

 In case of awareness about HIV/AIDS among female smugglers, there have been found statistically significant association with smuggler's age, who have awareness by person, doctor and NGO worker, who have knowledge about the bad impact of HIV/AIDS from media and who have any understanding with HIV affected persons respectively. It has been identified through binary logistic regression analysis that respondents who are belonged to >20 years of age group, those have awareness by person, doctor and NGO workers and who have any understanding with HIV affected persons are more likely to have awareness about HIV/AIDS as against with their counterparts respectively.

Among all female smugglers, it is observed that about half of them (51.3%) have knowledge about the way to protect from HIV/AIDS but the majorities (69.3%) think that they have the risks of HIV/AIDS contamination. Because, 74% female smugglers have been sexually abused by male colleagues (53.5%), Indian track drivers (30.9%), BSF (13.4%) and BGB (2.3%) through this profession, in which 55% exercise unsafe sex. In addition, 92.3% have been influenced to take drug by male colleagues (39.7%), Indian

track drivers (45.5%), BSF (11.2%) and BGB (3.6%) through the profession of smuggling.

HIV/AIDS contamination risks are an important element of assessment of vulnerability of female smugglers. On the basis of this data, there have been found the statistical significant association of HIV/AIDS contamination risks with knowledge about the way to protect from HIV/AIDS, exercise unsafe sex, participation on HIV/AIDS seminar, sexually abused passing through smuggling, using condom in sexual relation and influence to taking drugs in this profession respectively. From the results of binary logistic regression analysis, it is identified that all these variables except participation on HIV/AIDS seminar have statistically significant effect on HIV/AIDS contamination risks of female smugglers. In the present study, respondents who exercise unsafe sex, those are sexually abused and influenced to take drugs passing through smuggling have found to be having more risks of HIV/AIDS contamination as against their counterparts respectively.

Sexually abused passing through smuggling plays a significant role in case of increasing the vulnerability to HIV infection among female smugglers. In this study, sexually abused through smuggling is significantly associated with smuggler's age, father's education, marital status, reasons of coming to smuggling, monthly income through smuggling and unsafe sex. It has also been identified through binary logistic regression analysis that respondent's age, reasons of coming to this profession, monthly income through smuggling, unsafe sex and drug affecting have statistical significant effect on sexually abused. It is mentionable that female smugglers are more vulnerable of sexually abused after 25 years of their ages and poverty is one of the main reasons to coming this profession which is also significant reason of sexually abused. The chance of sexually abused is decreased with increasing the monthly income through smuggling.

However, the perpetrators of sexually abused and drug affecting through smuggling is also important issue of vulnerability to HIV infection among female smugglers. The results of chi-square test indicate that smuggler's educational status, father's education, mother's education, marital status, reasons of coming to smuggling, monthly income through smuggling, unsafe sex and types of drug affecting are significantly associated with perpetrators of sexually abused through smuggling. Moreover, it is identified from multinomial logistic regression analysis that father's education, marital status, unsafe sex and types of drug affecting have statistically significant effect on Indian track driver; and respondent's educational status, marital status, reasons of coming to smuggling and monthly income through smuggling have statistically significant effect on BSF/BGB by whom female smugglers are sexually abused. It is notable that the vulnerability of sexually abused by BSF/BGB decreases with increasing the smuggler's educational level and monthly income through this profession. Again, unmarried female smuggler and those have the habit of unsafe sex and injection or other types of drug using have been sexually abused more by Indian track driver.

There have been found the significant associations of perpetrators of drug affecting with smuggler's age, educational status, father's education, mother's education, marital status, reasons of coming to smuggling, monthly income through smuggling, unsafe sex and types of drug affecting respectively. From the results of multinomial logistic regression analysis, it is found that respondent's age, marital status, reasons of coming to smuggling and types of drug affecting have statistically significant effect on male colleague of smuggling; and respondent's age, father's education, marital status and unsafe sex have statistically significant effect on Indian track driver by whom female smugglers are affected by drug. Clearly, the tendency of drug affecting through male colleague of

smuggling and Indian track driver is increasing with increasing smuggler's age and unmarried female smugglers have more chance of drug affecting by them. The smugglers whose reasons of coming to this profession is poverty have more chance of drug affecting by male colleague of smuggling and the smugglers who exercise unsafe sex have more chance of drug affecting by Indian track driver as against their counterparts.

6.2 Recommendation

Assessment of vulnerability to HIV infection among female smugglers has great importance in case of reducing and controlling this epidemic. Realizing these issues especially in Bangladesh, the present study has been conducted in this field, in which, it has been successfully portrayed the dynamics of interrelationships that exists. In the light of the present study, some policy implications have been recommended for reducing and controlling this epidemic especially for getting healthy nation which are as follows:

➢ Education should be enhanced to vulnerable groups particularly to female smugglers. For illiterate person, a special program related to the awareness about HIV/AIDS and its effects should be taken so that the preventive and curative knowledge rises. In formal educational system especially primary and secondary level of education, topics about basic health should be included.

➢ Community based health related educational program should be strengthened through mass media, from which, they will gather correct information about various epidemic especially HIV/AIDS.

➢ Avoiding unsafe sex to reduce the HIV contamination risks, in particular, creating the habit of using condom at the time of sex with special emphasis on how to use

them effectively and on ensuring its availability and accessibility to the budding clients. In this context, various types (electronic and print) of media may play the pivotal role in making the awareness about the safe sex by using condom to female smugglers.

➢ Stopping the sexual harassment or sexually abused through smuggling and the influence to take drugs by their male colleagues or others in the profession.

➢ Since pressure of family is one of the main reasons of coming to smuggling, it is very important to empowering the female smugglers in relation to their decision making within the family.

➢ Poor female smugglers are sexually abused more and forced into selling sex for their survival. Therefore, it is essential to ensure their socio-economic security which implies better access to education, jobs etc.

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