

KNOWLEDGE, ATTITUDE AND PRACTICE ON DISPOSAL OF SHARP WASTE,  
USED FOR HOME MANAGEMENT OF TYPE-2 DIABETES MELLITUS IN NEW  
DELHI, INDIA

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A Thesis Submitted in Partial Fulfillment of the Requirements  
for the Degree of Master of Public Health Program in Public Health.

College Of Public Health Sciences

Chulalongkorn University

Academic Year 2010

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ความรู้ ทักษะ และพฤติกรรมเกี่ยวกับการกำจัดขยะมีคมที่ผู้ป่วยเบาหวานประเภทที่ 2 ใช้ที่บ้าน ใน  
กรุงเทพมหานคร ประเทศไทย



นายจิต พอล ชิงห์

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วิทยานิพนธ์เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต  
สาขาวิชาสาธารณสุขศาสตร์

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ปีการศึกษา 2553

ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

Thesis Title                    KNOWLEDGE, ATTITUDE AND PRACTICE ON DISPOSAL  
OF SHARP WASTE, USED FOR HOME MANAGEMENT OF  
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By                                    Ajit pal Singh Raina

Field of Study                    Public Health

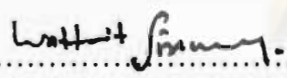
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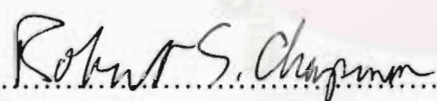
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Partial Fulfillment of the Requirements for the Master's Degree.

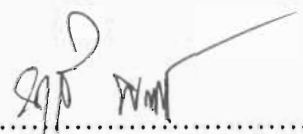
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การศึกษากาหนดคขวางนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่มีผลต่อพฤติกรรมกากำจัดขยะมีคมที่บ้านของผูผู้ป่วยเบาหวานประเภทที่สองในกรุงนิวเดลีประเทศอินเดียเก็บข้อมูลโดยใช้แบบถามแบบตอบด้วยตนเองข้อคำถามประกอบด้วยข้อมูลทั่วไปลักษณะการจัดการเกี่ยวกับเบาหวานที่บ้านความรู้ทัศนคติพฤติกรรมและปัจจัยที่มีผลต่อพฤติกรรมกากำจัดขยะของมีคมกลุ่มตัวอย่างคือผูผู้ป่วยเบาหวานประเภทที่สองที่ใช้อินซูลินที่บ้านโดยสุ่มจากผูที่มารับบริการของคลินิกจำนวน20แห่งในกรุงนิวเดลีจำนวนกลุ่มตัวอย่างทั้งสิ้น303คนโดยมีอายุ18ปีขึ้นไปใช้สถิติไควสแคว์เพื่อหาความสัมพันธ์ของปัจจัยที่เกี่ยวข้องกับพฤติกรรมกากำจัดขยะมีคมที่บ้าน ผลการวิจัยพบว่าเพียง3.6%ของกลุ่มตัวอย่างมีความรู้ที่ถูกต้องเกี่ยวกับการใช้เข็มที่ปลอดภัยเพียง14.3%ของกลุ่มตัวอย่างได้รับความรู้เกี่ยวกับการกำจัดขยะมีคมจากเจ้าหน้าที่สาธารณสุขนอกจากนี้ส่วนใหญ่84.4%ของกลุ่มตัวอย่างทิ้งเข็มลงในถังขยะที่บ้านทุกวันการได้รับความรู้จากเจ้าหน้าที่สาธารณสุขเภสัชกรและเพื่อนมีความสัมพันธ์กับพฤติกรรมกากำจัดขยะมีคมในกลุ่มผูใช้อินซูลินที่บ้านอย่างมีนัยสำคัญทางสถิติ (p-value<.001) การศึกษานี้ไม่พบความสัมพันธ์อย่างมีนัยสำคัญทางสถิติระหว่าง ข้อมูลพื้นฐานของกลุ่มประชากร, ลักษณะการใช้ของมีคมของกลุ่มตัวอย่าง, ความรู้ และทัศนคติต่อพฤติกรรมกาจัดการของมีคมในบ้าน ผลการศึกษานี้ระบุว่ามีความจำเป็นในเรื่องของการให้ความรู้ของการกำจัดของมีคมต่อคนที่ใช้สารอินซูลินในบ้าน ทั้งนี้มีข้อเสนอแนะในการวิจัยคือกาให้ความรู้โดยเจ้าหน้าที่สาธารณสุขและการได้รับความรู้จากแหล่งอื่นๆ เป็นสิ่งสำคัญในการส่งเสริมให้เกิดพฤติกรรมกากำจัดขยะมีคมที่บ้านอย่างถูกวิธี

สาขาวิชา สาธารณสุขศาสตร์  
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ลายมือชื่อนิสิต .....  
ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก



Robert S. Chagnon

##5179204353: MAJOR PUBLIC HEALTH

KEYWORDS: HOUSEHOLD SHARP WASTE, NEEDLES, LANCETS, KNOWLEDGE, ATTITUDE, PRACTICES, DELHI.

AJIT PAL SINGH RAINA: KNOWLEDGE, ATTITUDE AND PRACTICE ON DISPOSAL OF SHARP WASTE, USED FOR HOME MANAGEMENT OF TYPE-2 DIABETES MELLITUS IN NEW DELHI, INDIA. ADVISOR: ROBERT S. CHAPMAN, M.D., M.P.H., 69 pp.

This cross-sectional study explored the present practices on household sharp waste management among Type 2 diabetics in Delhi, India. A self-administered questionnaire was used to collect and describe the socio-demographic parameters, diabetes home management characteristics, knowledge, attitude, practices and influencing factors towards household sharp waste management. Twenty diabetic clinics in Delhi enrolled a total of 303 type 2 diabetics, who were above 18 years of age and administering insulin at home. Chi-square and correlation were used to assess the associations of factors with level of practice on sharp management at home.

Only 3.6 % of respondents stated correct knowledge about safe disposal method. The study showed that 43(14.2%) of responders had any kind of information on sharp waste management from their healthcare provider. Regarding practices, (84.4%) of respondents threw away their sharps in household garbage bins every day. Influencing factors like education from healthcare provider and pharmacist/friends were significantly associated with good disposal practices by home insulin users (p-value <.001). Education, garbage pick-up by someone, duration of insulin use, type of device to inject, number of needle used per week, number of lancets disposed per week, frequency of home blood glucose monitoring and frequency of visit to physician were associated with level of knowledge and attitude towards household waste management. The study did not find significant association between socio demographic, sharp use characteristics, knowledge and attitude with practices on sharp management at home. This research indicates that there is an urgent need for imparting correct knowledge regarding sharp disposal to home insulin users. Results also suggested that education by healthcare provider or other source is the single most important factor associated with good practice on sharp waste management at home. Further research is needed to support appropriate policies to educate and promote safe and appropriate management of sharps at the household level.

Field of Study : Public Health

Academic Year : 2010

Student's Signature \_\_\_\_\_

Advisor's Signature Robert S. Chapman

## ACKNOWLEDGEMENTS

It is a pleasure to thank those who helped and supported me in this study. First and foremost, I would like to thank my kind and supportive advisor, Dr Robert Chapman M.D. M.P.H., whose encouragement, advice and valuable suggestions enabled me to develop this thesis until finish.

I want to express my gratitude and special thanks to Dr. Rajesh Jain Ph.D., Panacea Biotech Ltd. for allowing me to take study leave and sponsor MPH study for me. I am also grateful to Dr. Arani Chatterjee who kindly permitted me to have numerous workdays off for my stay and study in Bangkok and supported in many ways.

I would like to thank to Professor Dr. Surasak Taneepanichsakul, Dean of the College of Public Health Sciences, and all lecturers and staff of College of Public Health Sciences, Chulalongkorn University, for their invaluable guidance and support.

No words can capture all wonderful time and many unforgettable memories that I have spent together with all my friends during my study duration. I feel deeply grateful to the entire administrative staff and our energetic librarians who were always available for out of way effort and support to me

Last, but not least, my deepest regards and appreciation goes to my family who define every aspect of my life. I would like to thank my family and parents for their unending love and support.

## CONTENTS

	Page
ABSTRACT IN THAI.....	iv
ABSTRACT IN ENGLISH.....	v
ACKNOWLEDGEMENTS.....	vi
TABLE OF CONTENTS.....	vii
LIST OF TABLES.....	x
LIST OF FIGURES.....	xii
LIST OF ABBREVIATIONS.....	xiii
<b>CHAPTER I: INTRODUCTION.....</b>	<b>1</b>
1.1 Background and Rationale.....	1
1.2 Expected Benefits and applications.....	4
1.3 Research Question.....	5
1.4 Research Objective.....	5
1.4.1 General Objectives.....	5
1.4.2 Specific Objectives.....	5
1.5 Research Hypothesis.....	6
1.6 Study Variables.....	6
1.7 Conceptual Framework.....	7
1.8 Operational Definition.....	8
1.8.1 Independent Variable.....	8
1.8.2 Intermediate Variable.....	8
1.8.3 Dependent Variable.....	9
1.8.4 Keywords.....	9
<b>CHAPTER II: REVIEW OF LITERATURE.....</b>	<b>11</b>
2.1 Medical Household Waste.....	11
2.1.1 Definition.....	11
2.2 Knowledge, Attitude and Behavior.....	12

2.2.1	Knowledge.....	12
2.2.2	Attitude.....	13
2.2.3	Behavior.....	13
2.3	Relevant Research.....	14
<b>CHAPTER III: RESEARCH METHODOLOGY .....</b>		<b>20</b>
3.1	Research Design.....	20
3.2	Study Area.....	20
3.3	Study Population.....	20
3.4	Sample Size.....	20
3.5	Sampling Technique.....	21
3.5.1	Inclusion Criterion.....	21
3.5.2	Exclusion Criterion.....	22
3.6	Research Instrument.....	22
3.6.1	Steps in construction of Questionnaire.....	22
3.6.2	Pre Testing.....	22
3.7	Data collection.....	23
3.8	Data Analysis.....	24
3.9	Limitation.....	26
3.10	Ethical Consideration.....	26
3.11	Benefit of the Study.....	26
<b>CHAPTER IV: RESULTS</b>		<b>28</b>
4.1	General Socio demographic characteristics.....	28
4.2	Subjects with diabetes management and sharp usage characteristics.....	31
4.3	Knowledge towards household waste disposal.....	34
4.4	Perception towards household waste disposal.....	36
4.5	Practice towards household waste disposal.....	38
4.6	Influencing factors on sharp disposal practices household.....	40
4.7	Association between Socio-demographic, insulin therapy use	



	characteristics with knowledge and attitude on sharp disposal at home.....	40
4.8	Association between Socio-demographic, insulin therapy use characteristics with practice on sharp disposal at home.....	45
4.9	Association between Knowledge, attitude and practice on sharp disposal at home.....	45
4.10	Correlation between Knowledge and attitude.....	46
4.11	Correlation between Influencing factors and practice on sharp waste disposal at home.....	46
<b>CHAPTER V: DISCUSSION, CONCLUSION AND RECOMMENDATIONS.....</b>		<b>48</b>
5.1	Discussion.....	48
5.2	Conclusion.....	50
5.3	Recommendations.....	51
<b>REFERENCES.....</b>		<b>55</b>
<b>APPENDICES.....</b>		<b>56</b>
	Appendix A: Questionnaire.....	57
	Appendix B: Time table.....	63
	Appendix C: Budget.....	64
<b>VITAE.....</b>		<b>65</b>

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

## LIST OF TABLES

		Page
Table 1.	Categories and types of infectious waste.....	14
Table 2	Types of analysis and analytical test used.....	26
Table 3	General Socio-demographic Characteristics.....	30
Table 4	Subjects diabetes management and sharp usage characteristics.....	33
Table 5.	Frequency and percentage of respondents who answered true and false to each question about knowledge towards household sharp waste disposal.....	34
Table 6	Level of knowledge of respondents towards household sharp waste.....	35
Table 7.	Frequency and percentage towards respondents' perception towards household sharp waste disposal.....	36
Table 8.	Level of attitude towards household sharp waste disposal.....	38
Table 9.	Frequency and percentage of practices of the respondents regarding household sharp waste disposal.....	38
Table 10.	Level of practice on household waste disposal.....	39
Table 11.	Frequency and percentage of influencing factors of the respondents regarding household sharp waste disposal.....	40
Table 12.	Association between Socio-demographic factors and Knowledge.....	42
Table 13.	Association between Socio-demographic factors and Attitude.....	45
Table 14.	Association between socio demographic, insulin therapy use and practice level.....	47
Table 15.	Association between independent (knowledge and attitude) and dependent (practice) variables.....	47

Table 16	Correlation between knowledge and attitude.....	48
Table 17	Association between influencing factors and practice using correlation.....	49
Table 18	Association between Socio-demographic factors and Attitude Chi square Test.....	49



ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

**LIST OF FIGURES**

		Page
Figure 1	Conceptual framework.....	7
Figure 2	Classification of Health care Waste.....	11



ศูนย์วิจัยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

**LIST OF ABBREVIATIONS**

EPA	Environmental Protection Agency
HCW	Health Care Worker
HCP	Health Care Professional
HHW	Household Hazardous Waste
HHMC	Home Health and Medical Care
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
KAP	Knowledge Attitude Practice
WHO	World Health Organization



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# CHAPTER I

## INTRODUCTION

### 1.1 Background & Rationale

Type 2 diabetes is the commonest form of diabetes constituting 90% of the diabetic population. The global prevalence of diabetes is estimated to increase, from 4% in 1995 to 5.4% by the year 2025 (Wild, 2004). The World Health Organization has predicted that the major burden will occur in the developing countries. There will be an estimated 42% increase from 51 to 72 million in the developed countries and 170% increase from 84 to 228 million, in the developing countries. The countries with the largest number of diabetic people are, and will be in the year 2030, India, China and United States (King, 1998).

Epidemiological studies among migrant Asian Indians in many countries showed higher prevalence of type 2 diabetes compared with the local populations and other migrant ethnic groups (Zimmet, 1999). Studies conducted in India in the last decade have highlighted that not only is the prevalence of type 2 diabetes is high, but also that it is increasing rapidly in the urban population (Misra, 2001). The period between 1989 and 1995 showed a 40% rise in the prevalence and subsequently a further increase of 16.4% was seen in the next 5 years. A national survey of diabetes conducted in six major cities in India in the year 2000 showed that the prevalence of diabetes in urban adults was 12.1% with high prevalence of IGT up to 14.0%. In this survey, the onset of diabetes occurred before the age of 50 years in 54.1% of cases, implying that these subjects developed diabetes in the most productive years of their life and had a greater chance of developing chronic complications of diabetes (Ramachandran, 2001). Also, younger age for onset of diabetes had been noted in Asian Indians in several other studies (Ramaiya, 1990).

Cardiovascular disease is the major cause of morbidity and mortality in patients with diabetes. (National Institutes of Health: *National diabetes statistics 2007*) In experimental models, prolonged exposure to hyperglycemia has been shown to result in glucotoxicity (Prentki, 2006) and oxidative stress (Ceriello, 1999)

culminating in  $\beta$ -cell destruction and microvascular and macrovascular complications. (Steppel, 2001) Thus, strict and aggressive glyceemic control has become the primary therapeutic goal in the management of type 2 diabetes. Tight glyceemic control is crucial for reducing the incidence of retinopathy, nephropathy, and neuropathy in patients with diabetes, and evidence suggests that early control prevents vascular events many years down the road. Results from the U.K. Prospective Diabetes Study (UKPDS) showed that aggressive glyceemic control, with insulin in patients with newly diagnosed with type 2 diabetes significantly reduced the risk of vascular endpoint compared to conventional treatment (relative risk [RR] reduction 25%;  $P = 0.0099$ ). (UKPDS 33, 1998)

Due to substantial benefit of early insulin therapy over oral pharmaceutical drugs for control of Type 2 diabetes and lesser side effects, aggressive use of insulin by physicians is seen in past years, in India. Availability of new and convenient home blood monitoring devices, insulin formulations to suits different patients requirement and availability of smaller gauge needles has improved the acceptance of patients for insulin therapy at home. (Acta Med Austriaca, 1998). As a result, thousands of needles and blood stained lancets are being generated daily by diabetic patients.

The US EPA has guidelines (EPA, 1993) for proper disposal of sharp which are used at home. American diabetes Association (ADA, 1996) came up with similar recommendations regarding sharp disposal and management at home. These practices include breaking off needle or capping the needle before disposal and always disposing the sharps in puncture proof boxes. The Similar guidelines are available in UK on safe disposal of household sharps (Diabetes UK, 2001).

Yet in studies done in US and Europe found that large population is disposing household sharp in unsafe way. In a study on syringe disposal practice of insulin users it was found that only half of the home insulin users are disposing the sharps in proper container though most of them have knowledge about the safe disposal methods (Berkowitz, 1996). To address this problem, coalition for safe community needle disposal, a nonprofit organization was formed in 2002 in US. The

coalition goal is to develop and promote techniques for removing needles from household garbage and provide safe options and solutions for sharp disposal to the community (Coalition for Safe Community Needle Disposal, 2007). Availability of bleach bottles, sharp box, and *safe-clip* device in developed countries now facilitate safe disposal of sharps at home along with various sharp pick up programs (Macalino, 1998).

India is home to 30.8 million diabetics, making it the world's unchallenged diabetes capital. And the number is expected to go up to a 87 million, 8.4% of the country's adult population by 2030 (WHO, 2001). If even 0.5% of our diabetic population uses just two insulin syringes and one lancet per day, 3 billion syringes and 1.5 billion lancets are being discarded annually. Home users of sharps dispose used sharp objects as household waste in unsafe manner in the community which is the cause of concern. Unfortunately, in India, insulin syringe manufacturers, lancet makers and health authority have not effectively addressed this issue. The unsafe disposal of sharps in household waste can pose a problem to anyone who can come in contact with them. These improperly discarded sharps can cause injuries to children, neighbors, pets, rag pickers, sewer disposal workers, recycling industry employees, waste collectors and entire community. These tiny (30 or 31G) needles are then a danger to the poor rag-pickers who are often children, and certainly cannot afford expensive treatment to remove embedded needles (Virmani, 2009). In one study it was found that unsafe sharps at household are disposed in trash, toilet or in many public places like restaurants, sports facilities and other public places (Macalino 1998). The problem in India is enormous and requires increased attention by physicians and health authorities.

The medical waste produced at home in the past is of least concern earlier as the amount produced was usually very small as compared to produced in health care setting. Further, the sharps in the household trash are more likely to be contaminated with blood borne pathogens than in hospital waste as they may be properly treated and stored.



The practices on sharps generated in healthcare setting have been well documented and healthcare providers Knowledge and attitude well studied in India. In a recent study was carried in 428 HCWs of various categories in a big multi-specialty hospital in Delhi to determine occurrence of NSI and causal factors (Muralidhar 2010). There are many studies done in hospital setting on needle stick and sharp injuries in other countries like Korea (Park 2008) and Australia (Whitby 2008). The Knowledge, Attitude and practices of care giver is also evaluated at health care facility (Laraqui 2008) and at home on home health care registered nurses (Rogyn 2008) on percutaneous injuries and blood exposure. Practices on sharp waste disposal at home were studied in a few studies in US (Berkowitz 1996) and (McConville 2002). There are some studies on UK [(Babatunde 2003) and (Crawshaw 2002)] which documented practices of home insulin users. To the best of my knowledge, no study in India has been conducted so far to know the practices of household sharp waste disposal by insulin users.

## **1.2 Expected Benefits & Application**

There is increasing recognition worldwide on improving the hazardous waste management and their impact on health of people, specially poor. Understanding of the socio-cultural and economic aspects of the context in which hazardous or sharp waste is handled in India is important. India is a developing country and it may not be feasible to use expensive sharp waste management tools and programs. The Knowledge and Attitude of insulin users in India may vary drastically with that of developed world. Such information is typically been gathered through various types of cross-sectional surveys, the most popular and widely used being the knowledge, attitude, and practice (KAP) survey, also called the knowledge, attitude, behavior and practice (KABP) survey (Nichter, 2008). The KAP surveys will be used to assess the extent of insulin user's knowledge about sharp waste concepts and related management programs. Investigation of other types of knowledge, such as overall medical waste knowledge, risks associated with household medical waste or knowledge related to safe medical waste disposal systems e.g. guidelines, available material, and cost involved etc. will lead to

planning of some interventions for successful household sharp waste management in future.

Presently there is lack of information on current practices on disposal of sharp household waste. Information on present sharp disposal at household can be used to assess the actual burden of problem and explain the logic behind safe disposal practices.

### **1.3 Research Questions**

- 1.3.1** What are the knowledge and attitude of type 2 diabetes mellitus patients who are on treatment with insulin at home in proper management of sharp household medical waste?
- 1.3.2** What is the practice towards sharp household waste disposal among type 2 diabetes mellitus patients who are on treatment with insulin at home?
- 1.3.3** What are the factors influencing the practice towards safe sharp household waste disposal among type 2 diabetes mellitus patients who are on treatment with insulin at home?

### **1.4 Research Objectives**

#### **1.4.1 General Objective**

To Study the factors influencing the practice towards household waste management among type 2 diabetes mellitus patients who are on treatment with insulin at home

#### **1.4.2 Specific Objective**

1. To describe the socio-demographic characteristics of type 2 diabetes mellitus patients, who are on treatment with insulin at home?
2. To indicate the level of knowledge on safe disposal of household sharp waste.
3. To elaborate the level of attitude on safe disposal of household sharp waste.

4. To Study the factors influencing the practice towards household waste management among type 2 diabetes mellitus patients who are on treatment with insulin at home.

### **1.5 Research Hypothesis**

1. There is association between the influencing factors and the practice towards sharp household waste disposal among type 2 diabetes mellitus patients who are on treatment with insulin at home.
2. There is correlation between the level of knowledge and attitude with influencing factors in type 2 diabetes mellitus patients who are on treatment with insulin at home.
3. There is association between the level of knowledge and attitude with practice on safe sharp household waste disposal among type 2 diabetes mellitus patients.

### **1.6 Study Variables**

The present has practice on sharp waste disposal as dependent variable. This dependent variable is dependent on independent and intermediate variables. The study has knowledge and attitude as intermediate variable as these variables will also be analyzed and presented as dependent variable for socioeconomic and history of insulin use.

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## 1.7 Conceptual framework

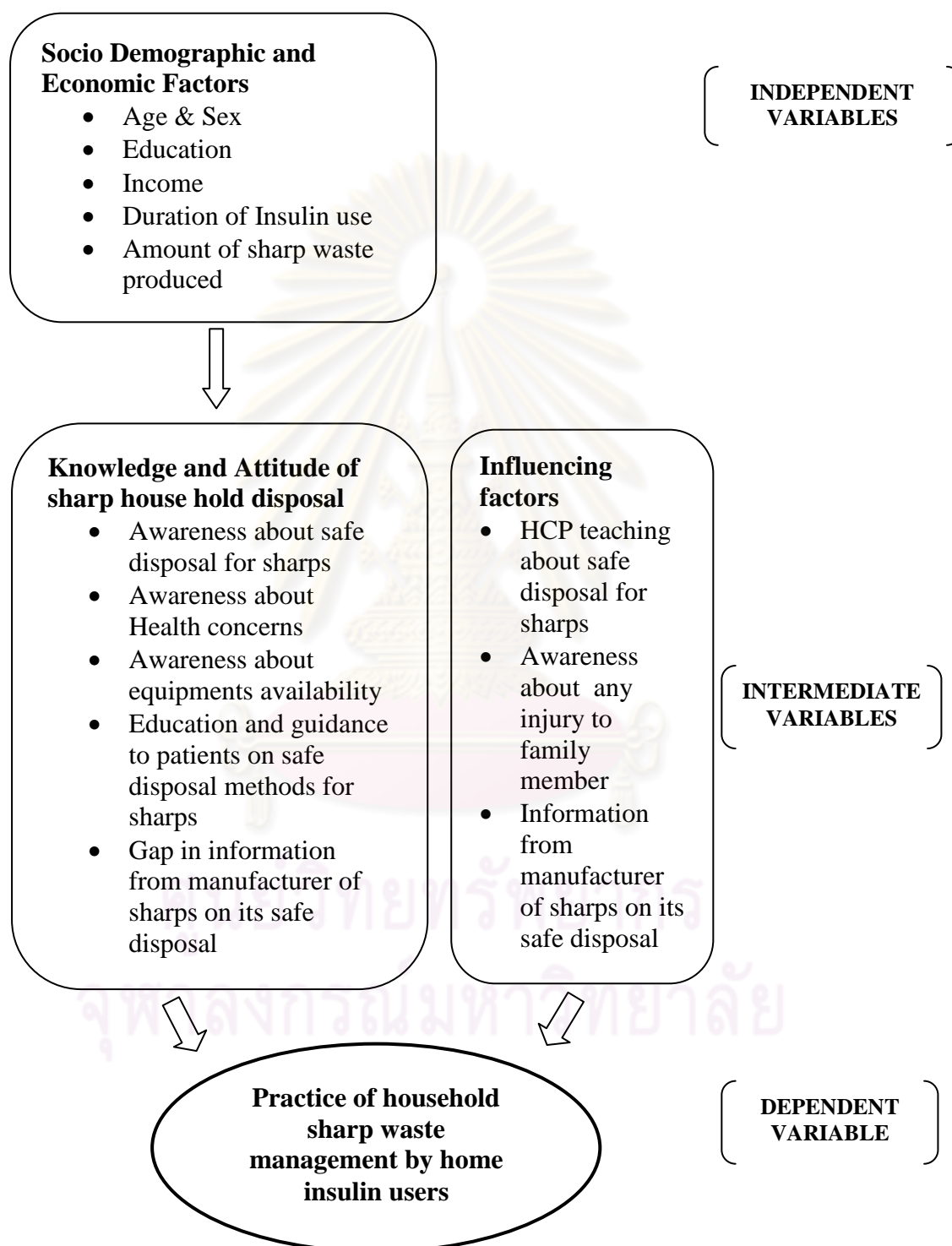


Figure 1: Conceptual framework

## 1.8 Operational Definitions

### 1.8.1 Independent Variables

#### Socio-Demographic Characteristics

- Age: refers to how old the participant is at the time of conduct of interview
- Gender: refers to male and female
- Educational level: refers to the level of education that participant has completed at the time of the interview.
- Marital Status: refers to the civil status of the participant at the time of the interview.
- Occupation: refers to the occupation of the patients
- Household income: average total monthly income

#### Subject History of Insulin use

- Duration of Insulin use: number of completed months insulin is being used for diabetes management
- Type of device used: insulin pen with replaceable needle, of needle attached with syringe or needle with separate syringe.
- Schedule of insulin treatment: How many time insulin is administered per day.
- Number of syringed used: How many needles used per week.
- Blood glucose monitoring method: whether monitor at home of go to lab or both.
- Frequency of Blood glucose monitoring: home monitoring by lancets per week.
- Physician visit for Diabetes Management: frequency of physician visit per month.

### 1.8.2 Intermediate Variable

Intermediate variables are those variables that would be dependent variable in some analyses and independent variable in other analyses. Influencing factors can impact knowledge and attitude or may act independently to cause change in behavior and practice of sharp disposal. The influencing factor can also depend on the duration of insulin use. Therefore the present study will analyze knowledge, attitude and influencing factors as both independent and dependent factors.

- Knowledge about safe disposal of sharps
  - Safe disposal methods: knowledge about recommended safe disposal method for sharp disposal
- Attitude of Diabetes patients on safe sharp disposal method
  - Safe disposal methods: Attitude about recommended safe disposal method for sharp disposal
  - Unsafe disposal methods: Attitude for unsafe disposal methods
- Influencing factors for safe disposal practice
  - Education from HCP: education from health care providers on safe disposal of sharps
  - Adverse experience: any incident in past or experience with sharp injury to self or known at home.

### **1.8.3 Dependent Variables**

Practice of safe disposal of sharps generated at home by diabetes patients who are on insulin therapy.

### **1.8.4 Keywords**

- NSI: A needlestick injury is a percutaneous piercing wound typically set by a needle point, but possibly also by other sharp instruments or objects. Commonly encountered by people handling needles in the medical setting, such injuries are an occupational hazard in the medical community. These events are of concern because of the risk to transmit blood-borne diseases through the passage of the hepatitis B virus (HBV), the hepatitis C virus (HCV), and the Human Immunodeficiency Virus (HIV), the virus which causes AIDS.
- HCP/HCW: A health professional is a qualified person who delivers proper health care in a systematic way professionally to any individual in need of health care services. A health care provider may refer to a health professional, or an organization that provides services of a health professional. Professionals are by their nature regulated by their professional body and/or the state in each individual country.

- Medical household waste : The medical waste arising of home base treatment of patients is called Medical household waste include used and unused medicines, syringes, glass vials, gauze, bandages and other blood stained material. This medical waste is part of Household hazardous waste (HHW) is the term for common household chemicals and substances for which the owner no longer has a use.
- Type 2 Diabetes: is a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. Diabetes is often initially managed by increasing exercise and dietary modification. As the condition progresses, medications may be needed.
- EPA: The U.S. Environmental Protection Agency (EPA or sometimes USEPA) is an agency of the federal government of the United States charged with protecting human health and the environment, by writing and enforcing regulations based on laws passed by Congress.
- WHO: The World Health Organization (WHO) is a specialized agency of the United Nations (UN) that acts as a coordinating authority on international public health. Established on April 7, 1948, with its headquarters in Geneva, Switzerland, the agency inherited the mandate and resources of its predecessor, the Health Organization, which was an agency of the League of Nations.
- Delhi: It is the eighth largest metropolis in the world by population with more than 12.25 million inhabitants in the territory

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## CHAPTER II

### Literature Review

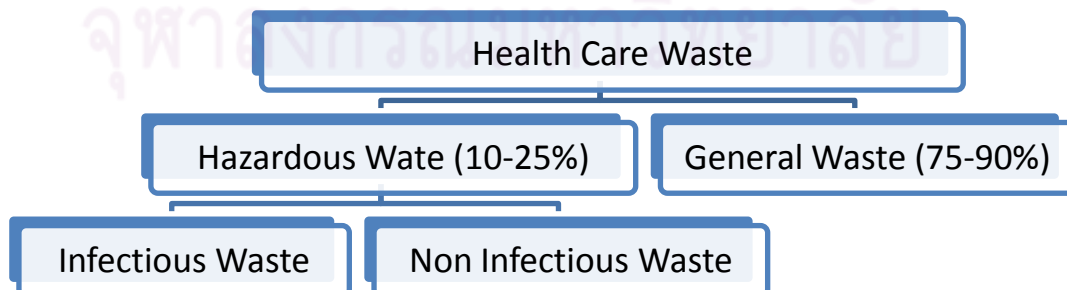
This section reviews the literature on books, articles, research papers and information on web related to safe sharp waste management at home. The literature review has been put into seven main areas of concern. The first section mentions about the definition of sharp health care waste. The second section will give overview on universal precautions for its management. Subsequent section will focus on theory of behavior which arises due to knowledge and attitude. Finally, the last section will describe various relevant researches conduct so far in the area of concern research.

### 2.1 Medical Household Waste

#### 2.1.1 Definition

**Health care waste** is waste that is generated by health care providing establishments, research facilities, laboratories and clinics. It also includes waste produced at home for health care purposes. Major part of this waste is of no risk and can be regarded as general waste which is comparable to domestic waste. This waste can be dealt by municipal waste disposal system. The remaining 10-25% of this waste is regarded as hazardous and can create health risk for the community (WHO, 1999).

**Figure 2: Classification of Health care Waste**





In India, this infectious waste management is governed by Ministry of Environment & Forest notification on the Biomedical Wastes (Management and Handling) Rules (The Gazette of India, 1998). The ministry introduced the term biomedical waste for all types of waste generated from HCUs and veterinary establishments.

Household medical waste is any waste that is generated as a result of health care activities in the home. It may include bandages, hypodermic needles, and lancets, among other things.

Sharp waste is any device or item having corners, edges, or projections capable of cutting or piercing the skin is called sharp. Because of its characteristics, it may cause or significantly contribute to an increase in serious irreversible or incapacitating reversible illness or pose a potential hazard to the human health or the environment when improperly treated, stored, transported, disposed off, or otherwise managed (US department of energy, 1991).

Sharps waste is usually not a concern form household as it is use to be of quite low amount and easily dealt as municipal waste.

## **2.2 Knowledge, Attitude and Behavior**

### **2.2.1 Knowledge**

Knowledge is simply defined as the understanding of the subject and known information related to it. A person gathers this based on the facts and experiences faced by him and is also passed on to others through various mediums (Collins, 1993). Knowledge is also a reflection of immediate or general issues, methods, procedures, or situations (Bloom, et al. 1971). In this study the knowledge about the sharp household medical waste information and the understanding about the hazards, segregation, collection, storage, and safe disposal of waste are being studied. There are many knowledge measuring and testing tools for different types of knowledge. Testing knowledge through a questionnaire or exam is regarded as a stimulant and the test takers express their knowledge through certain actions for example: speaking,

writing, acting (Kijpredaborisuthi, 1998). These actions can be transformed in numbers that can quantify the level of knowledge. Out of the three forms of tests: oral, written and practical; the present research has chosen written multiple choice questions to test the knowledge on sharp waste disposal by type II DM patients using insulin at home.

### **2.2.2 Attitude**

Attitude is defined as the ways a person views and think of something or tends to behave towards it, often in an evaluating way (Collins, 1993). Attitude can be in the form of likes and dislikes, biases, views, feelings concerning a situation or issue (Thurston, 1967). Attitude can also be classified as normal, specific, positive and negative depending upon the information shared by others. There are many scales used to measure attitudes e.g. Therstone, Likert, Guttman and Osgood's measurement scales. In the present research Likert scale will be used to measure the attitude of the type II DM patients using insulin at home in the safe disposal of sharp household medical waste.

### **2.2.3 Behavior**

The word "behavior" is generally defined as the way people act, react or behave especially in relation to a situation they are in or the people they are with and it is the typical way in which they functions (Collin, 1993). Behavior of a person is his psychological action or response to action; interaction to internal or external stimulus; and activities with observable objectives; or activities upon discretion or unconsciousness (Longman, 1984). Hence, behavior is defined as action or expression of a person in response to mental and external stimulus. These actions can be conscious or subconscious and noticeable by other living creatures including the person himself. Behavior can be divided into two major types:

- a. Overt behavior-which is noticeable from outside.
- b. Covert behavior-which is unnoticeable with eyes thus requires tool in measuring and examining. It consists of feelings, perceiving, remembering and thinking and making decisions.

Behavior of a person changes and develops over time in line with gaining knowledge and change in attitude. Sudden changes in behavior can be brought about by force ( like social laws, regulations), imitation of role models (parents, teachers and actors) and acceptance of its merit by himself. The noticeable overt behavior can be studied by both direct and indirect observations. The unnoticeable covert behavior can be studied by indirect methods only like interviews, tests and experiments. The study of behavior of type II DM patients using insulin at home consists of both overt and covert behaviors. Due to time constrains this research will involve only indirect behavioral study with questionnaire as research tool.

### 2.3 Relevant Research

Waste materials are classified as industrial and general household or municipal wastes. Industrial waste materials are generated as a result of industrial activities whereas and general household waste materials are referred to as “household waste materials”. Medical waste from hospital and clinics is characterized industrial waste and are included in the hazardous category of waste classification in type of industrial waste (EPA, 1991).

In India, the medical waste management is governed by *the Biomedical Wastes Management & Handling Rules, (1998)*. The biomedical waste was categorized into ten categories listed below.

**Table 1: Categories and types of infectious waste**

No.	Category	Type of waste
1	Human anatomical waste	Human tissues, organs, body parts
2	Animal wastes	Animal tissues, organs, body parts, carcasses, fluid, blood; experimental animals used in research, waste generated by veterinary hospitals
3	Microbiology and biotechnology wastes	Waste from laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research, infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used to transfer of cultures
4	Waste sharps	Needles, syringes, scalpels, blades, glass, etc., capable of causing punctures and cuts. This includes both used and unused sharps
5	Discarded medicines and cytotoxic drugs	Waste comprising outdated, contaminated and discarded drugs and medicines
6	Soiled wastes	Items contaminated with blood fluids including cotton, dressings, soiled plaster casts, linens, bedding
7	Solid wastes	Disposable items other than the waste sharps, such as tubing, catheters, IV sets etc.
8	Liquid wastes	Waste generated from laboratories, washing, cleaning, house-keeping and disinfection activities
9	Incineration ash	Ash from incineration of any medical wastes
10	Chemical wastes	Chemicals used in production of biologicals, disinfection, insecticides, etc.

Source: *The Gazette of India (1998)*.

These guidelines and regulations make generators of waste liable for segregation, packing, storage, transportation and disposal of the waste so that there is no health risk to the community. The bio medical waste management has received a great attention in past years due to lack of earlier guidelines and mixing of medical waste with municipal waste (Patil, 2001).

But there no guidelines available for medical waste which is being generated at home in India. Even in developed country like Japan, waste materials originating from home health and medical care services (HHMC wastes) are still included in general household waste materials. The management of such infectious waste materials, disposed from private homes, is not regulated (Miyazaki, 2001).

So far, this medical waste which is being generated at home is not of a concern as the amount produced is very little or low. As per US guidance on infectious household waste management guidelines (Nebraska Department of Environmental Quality, 2007), household medical waste is considered a solid waste and must be disposed in a permitted municipal solid waste landfill like any other type of household waste. It leaves the responsibility on the citizens who are generating medical waste in their home should either treat the waste in a way that makes it no longer infectious, or properly package the waste to reduce the risk of exposing others to possible infection. In case the household medical waste is properly treated or packaged, it can be added to general household waste which is picked up by garbage hauler and transported to a permitted municipal solid waste landfill. At present, there is no specific system in India ensuring separation of medical waste at source. This results in mixing of sharp wastes with others which are normally disposed of along with municipal waste leading to various types of hazards to garbage pickers (Virmani, 2009).

The disposal of used sharp by diabetic patients living at home was studied by Babatunde and colleagues, in South Staffordshire, an English health district (Babatunde, 2003). Samples of 1348 patients were selected randomly from the South Staffordshire health district database of home insulin users. A previously piloted self

administered questionnaire was mailed to all selected subjects along with an invitation letter to participate. Non responders were sent reminders via post up to two times. Home insulin users were asked to respond on the practice they follow for disposal of sharps generated at home as the result of home management of diabetes. This included disposal of needles, syringes, lancets and other blood stained material. Their satisfaction level on disposal method and whether they received any advice from HCP was also asked.

The results of the survey showed that the lancets were the most frequently disposed into the household waste. 29.5% of the respondents indicated throwing lancets in loose household trash. The needles and syringes were thrown in household waste by 11.5% and 24.3% of subjects. Household containers were used by 35% of subjects for safe disposing of needles or syringes. Almost 44% of respondents use *safe clip* device for safe disposal of sharps. On receiving advice for safe disposal of sharp, 64.6% subjects confirmed receiving any advice from their HCPs. Only 3.8% of subjects reported receiving written material or advice in this aspect. On satisfaction for sharp disposal practice, a high proportion of subjects (82.2%) showed satisfaction on their sharp disposal practice.

This was the largest community based study on sharp disposal practice in a district located in a country like UK. It was estimated that at that time around 2.5 million sharps were being generated in South Staffordshire health district by diabetic patients. It was concluded by the study that safe disposal methods were not adequately communicated or were misunderstood or ignored as majority of patients only received verbal information rather than writing.

In another study the syringe disposal practice of individuals with diabetes who take insulin was studied along with the attitude and the effect of previous education on proper syringe disposal (McConville, 2002). The study was done in adults who were recruited from endocrinology practice and were given 2 questionnaires concerning syringe disposal practice and attitude towards safe disposal. The study used a descriptive design for “mapping” of behavior and attitude of home

insulin users in safe disposal of sharps. Subjects who were self injecting insulin and were above 18 years of age were recruited in the study. Both Type 1 and Type 2 diabetes subjects were included in the study.

The study used validated questionnaire to evaluate various syringe disposal practices. The questionnaire was developed using guidelines from EPA and ADA for determining safe practices. In this study 10 questions on disposal practices were measured on a 5-point Likert scale (5 for always use disposal practice and 1 for never use disposal practice). Attitude was measured in the study as intend to use safe disposal methods. Ten statements about disposal practices representing those desired to ensure safe disposal and containment of used syringes were provided. Each statement was scored on 5-point scale, 5 for strongly agree and 1 for strongly disagree.

Attitude was found to be significantly correlated with disposing of syringe in puncture proof container at home and away from home. The study showed that men with higher income used the household trash for syringe disposal more than lower income men. Older women and those who received previous information on safe disposal showed highest positive attitude for proper syringe disposal. Having received previous information about proper syringe disposal practices played a significant role in actual practices for syringe disposal. The study concluded that diabetes educator can improve the syringe disposal practices of their patients through education at each office visit. Health professionals were identified as the major (> 56%) source of information for the respondents.

A study to investigate practices on disposal of syringes, needles and lancets used by diabetic patients in North East Essex was done in 2002 (Crawshaw, 2002). 144 home insulin users were surveyed for practices on disposal of sharps at home. The study found that 93.1% used lancets and 97.1% used needles for their management of Diabetes. There was high number of sharps generated per user at almost 70.6% used at least one lancet and 65.7% used at least two needles every day. The study subjects also showed lack of information on safe disposal of sharps. The

study found statistical difference in practices between patients receiving and not receiving advice on sharps disposal (odds ratio [OR] 6.36 [95% CI 2.04-23.28]  $p = 0.0007$  for needle disposal and OR 15.41 [95% CI 3.57-90.12]  $p = 0.00001$  for lancet disposal). Most of the subjects received advice from diabetes nurse specialists. The study also found statistically significant differences among needle users using and not using needle clippers and/or sharps bins according to the interval since diagnosis and the frequency of needle use per day. The study concluded that a standardized approach to sharps disposal supported by an effective method of disseminating information is an immediate requirement for the community.

The home users of needle and sharp are not aware of safe disposal practices. Some of the home needle users who gets medical treatment at home, are though, aware of safe disposal practices but home user for Diabetes are not guided for safe disposal of waste. In a study done in France to ascertain how injection material used by HCV-positive patients for interferon treatment are disposed of in comparison with material used by patients injecting insulin for insulin-dependent diabetes mellitus (IDDM) or low-molecular-weight heparin (LMWH) for thromboembolism showed significantly more patients being aware of recommendations for disposal of injection material in the HCV group (89%) than in the IDDM (67%) or LMWH (26%) groups ( $P < 0.01$ ). Injection material was discarded with household waste less often by patients in the HCV group (6%) than in the IDDM (32%) or LMWH (29%) groups ( $P < 0.001$ ) and more often collected in a safety box prior to incineration (73% in the HCV group versus 63% and 14% in the IDDM and LMWH groups respectively) (Causse, 2005).

In another study was done in France to analyze the situation concerning the management of used syringes of insulin by diabetic patients (Dallel, 2005). This study was conducted in a clinic for diabetics on 100 diabetic patients who are on treatment with insulin. The results of this study showed inadequate management of needles and syringes used for insulin injection by diabetic patients. The study concluded an inadequate education and emphasized on consciousness-raising of diabetic patients on management and safe disposal needles and syringes.

To review issues related to discarded syringes in the community and to describe community-based programs for the safe disposal of used needles and syringes, Macalino and colleagues did analysis of medical literature and chain referral to identify community-based syringe disposal programs other than syringe exchange programs (Macalino, 1998). They held a workshop involving staff from disposal programs; manufacturers of syringes, sharps containers, and other disposal devices; solid waste companies; public health staff; and researchers. They identified 12 programs which are being run for diabetics for safe disposal of sharps. The results concluded that these disposal programs should involve pharmacists, physicians, waste disposal companies, public health departments, hospitals, diabetes educators and persons with diabetes who use insulin for successful implementation.



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## **CHAPTER III RESEARCH METHODOLOGY**

This chapter explains the method and tools used in this research. The various sections will explain the design, duration, population and methods used for selection of research participants. This section will also cover the data collection and analysis methods including the expected benefits of the research.

### **3.1 Research Design**

This research was a cross-sectional study to determine factors associated with safe household sharp waste disposal practices among type II diabetes patients, who were above 18 years of age and on treatment with insulin.

### **3.2 Study Area**

The study was conducted in 20 Diabetes Mellitus clinics across Delhi.

### **3.3 Study Population**

The study population consisted of type II diabetes mellitus patients of both sexes who are visiting diabetes clinics and are on insulin therapy for at least three month.

### **3.4 Sample size**

According to Cochran's formula for sample size calculation;

$$n = \frac{Z^2 pq}{d^2}$$

n = sample size;

Z = standard value for 95% confidence interval = 1.96;

d = error allowance (0.05);

p = proportion of subjects who practice safe household sharp disposal.

q = proportion of subjects who do not practice safe household sharp disposal (1-p)

Sample size required for present research is

$$\text{Sample Required} = \frac{1.96^2 (.5) (1 - .5)}{(.05)^2}$$

Assuming an estimated prevalence of safe sharp disposal practices in 50% of population in order to have the maximum sample sizes, a sample size of 384 subjects was calculated using 'PS' software, as there are no specific and similar studies conducted before. Rounding up this number, a sample of 400 subjects is chosen and approached in diabetic clinics across Delhi. A total of 303 subjects gave consent and completed the study questionnaire to their healthcare provider.

### 3.5 Sampling Technique

The sampling technique used in this study was purposive sampling of the study site and systematic continuous sampling at the study sites. Out of all Diabetics Clinics of Delhi region, 20 clinics were selected and approached for participation in the study. Each participating clinic was allowed to enroll 20 patients for self administered questionnaire.

The sampling technique at the individual study sites was consecutive sampling. From the sampling timeframe, first 20 consecutive subjects were approached for participation in the study. Due to lack of time and budgetary constraints, this method enabled to enroll all study subjects within two weeks period, which is a fair representative of population of diabetic at that clinic.

#### 3.5.1 Inclusion Criterion:

- Subjects who are willing to give consent and participate in this research
- Both male and female type II DM patients who were above 18 years of age.
- Patients on insulin therapy at home for at least 3 month

### **3.5.2 Exclusion Criterion**

- Subjects who are unable to comprehend questionnaire
- Not self administering or unable to administer insulin at home
- Past user of insulin

### **3.6 Research Instrument**

Self administered questionnaire was used for collection of aforementioned independent and dependent variables. Self administered questionnaire was given to patients who were visiting Diabetes Mellitus clinics. In case subject is not able to understand or read questionnaire, the HCP explained the questionnaire to subject and facilitate the subject's response.

#### **3.6.1 Steps in construction of Questionnaire**

Literature review was done to define the parameters of the study, learn what others have done and recommended before on medical sharp waste management. Some standard questionnaires were adapted from other studies and some were constructed as per the conceptual framework of the study as mentioned in the earlier section. The Berkowitz and colleagues questionnaire included questions related to syringe use. Dichotomous (yes/no) scoring was used on the practice of safe disposal of sharps. A similar scale was used for practice in the present study. This questionnaire had reported to have good reliability and validity (Berkowitz, 1996). Knowledge questions related to sharp reuse and sharp waste disposal were asked on Dichotomous (yes/no) scale. For attitude, a 5-point scale was used by McConville et al (McConville, 2002). Present study also used a similar 5 point Likert scale to assess attitude of type 2 diabetic patients on safe disposal of sharps. A pilot qualitative study was conducted with one diabetes specialists who is treating diabetes patients and frequent prescribers of insulin. Final questionnaire was developed using all of the above methods.

#### **3.6.2 Pre testing**

For validity and clarity the questionnaire was circulated to 3 content experts for comments, suggestions and necessary changes were incorporated with the help of advisor.

In order to ensure questionnaire reliability, a pre test was conducted in one of the selected clinic in Delhi. There were 30 subjects whose responses were pre tested for questionnaire using Cronbach alpha to test the internal reliability and consistency of questions for the knowledge and attitude section of the questionnaire.

$$\text{Formula for Cronbach alpha} = \alpha = \frac{k}{k-1} \left\{ \frac{1 - \sum Si^2}{Sx^2} \right\}$$

Where k = the number of questions in the knowledge section and the attitude section of the questionnaire

Si = the variance of score in each item

Sx = the variance of score in the questionnaire

The 30 pre test questionnaire were analyzed in the statistics Package for the SPSS version 16 to arrive at Cronbach alpha value. The Cronbach alpha value of .74 was obtained for attitude and .67 for knowledge questions for reliability. Bryman and Cramer (2005) stated that Cronbach alpha value of 0.7 or more is acceptable for reliability test for questionnaire. The subjects who participate in the pre test were not included in the full scale study.

### **3.7 Data Collection**

This study employed the questionnaire (quantitative) by home insulin users at 20 research sites. The researcher, at each site, thoroughly explained the objective of the research, the components of the questionnaire and the technique that are expected to employ while with the questionnaire for quantitative evaluation of patients with type II diabetes mellitus, to health care providers. All study respondents were asked by their healthcare provider to sign a consent form stating that they understand the purpose of the research and are willing to be a part of this study. They were later asked to fill a study questionnaire. If any questions or clarification came during the questionnaire filling process, health care provider explained it to the respondent, to the best of their ability without facilitating the response.

The questionnaire was divided in five separate parts. The first part was intended to gather personal and socioeconomic information such as age, gender, education, marital status, work status, duration of diabetes, duration of insulin use etc. The second part would measure the knowledge of safe household sharp waste management. The third part was intended to evaluate the attitude of Diabetes Mellitus patients toward sharp household waste disposal. Finally, fourth section of questionnaire collected various practices on household sharp waste disposal. The fifth section collected the information on presence of influencing factors of practice towards household sharp waste management at home.

### 3.8 Data Analysis

The completed questionnaire was coded and entered into SPSS version 16 program. The test for knowledge had 13 questions. The right answer cored 1 point and wrong answer got zero point

For the scoring part, it is planned as follows:

1. Knowledge: the scoring method

Right answer : 1 point

Wrong answer : 0 point

The obtained score were converted in terms of score level and were classified into 3 levels (low, moderate and high knowledge). Possible scores ranged between 0-10 points. A mean score and standard deviation of the group were used to classify subjects into 3 groups as follow:

Good level : scores  $>$  Mean + S.D

Moderate level : scores = Mean + S.D

Low level : score  $<$  Mean - S.D

2. The questions on attitude towards household sharp waste management comprised of 12 questions and following scoring criterion was followed:

Strongly agree answer: 5 points

Agree answer : 4 points

Not certain answer : 3 points

Disagree answer : 2 points

Strongly disagree : 1 point

Vice versa marking was done for negative statement. The obtained score was converted in terms of score level and classified as low attitude, medium attitude and high attitude.

High attitude : scores  $>$  Mean +S.D

Medium attitude : scores = Mean+\_S.D

Low attitude : score  $<$  Mean-S.D

3. The influencing factors were evaluated by 3 questions for their presence in respondents. Each question had either yes or no response. The score was added to arrive at total influence score for the subject.

4. The test on practice of sharp waste consisted of 12 questions and the answers had 2 levels: the scoring method

Right Practice : 1 point

Do not practice or wrong practice : 0 point

And vice versa scoring was used for negative statement.

The obtained score was converted in terms of score level and classified as good or bad practice. The results of the scores were entered into statistical software for following:

- Descriptive Statistics: All independent variables were described in mean and proportions. Knowledge and attitude were measured as both continuous and ordinal scale. For practice and influencing factors, ordinal scale was used for descriptive statistics.
- Analytical Statistics: Association of behavior with the independent and intermediate variables was analyzed using chi square and correlation method. Test for association on Knowledge attitude and practice were analysed using correlation and Chi square method. Table below denotes the test used to analyze dependent variables in relation to independent variables.

**Table 2: Types of analysis and analytical test used**

<b>Analysis</b>	<b>Dependent Variable (type)</b>	<b>Independent Variable (type)</b>
Chi square	Knowledge level Attitude level Practice level	Socio-demographic Characteristics
Chi square	Practice (dichotomous)	Influencing Factors Knowledge Level Attitude Level
Correlation	Knowledge score Practice Score	Attitude score Influence

### 3.9 Limitations

Since this research collected sharp disposal knowledge, attitude and practice information based on the sample subjects living in capital city of Delhi, the results of the research cannot represent the whole Diabetes Mellitus Type II insulin users in India. Also, being a cross sectional study and due to time constrains, researcher was unable to directly observe the waste disposal practice and relied on the response to the questionnaire. Patients who were leaving in the remote area and not visiting the clinics regularly were not available for this research. The research also did not evaluate the KAP of health care providers which can influence the behavior of patients to a significant extent.

### 3.10 Ethical Consideration

The research had been approved by Independent Research Board in India. Each individual participant was asked to sign an informed consent stating that the information obtained from the questionnaire will be utilized purely for this study and confidentiality of the respondents will be maintained.

### 3.11 Benefit of the study

Presently there is lack of information on current practices on disposal of sharp household waste. Information on present sharp disposal at household will be used to assess the actual burden of problem and explain the logic behind safe disposal practices. This study has indicated knowledge and awareness gap in insulin users who rely on information from their healthcare providers for sharp household waste management practices.





## **CHAPTER IV RESULTS**

This chapter includes the descriptive and analytic findings on demographic, knowledge, attitude and practice. The descriptive findings on the general information and management of Type 2 Diabetes Mellitus subjects who use insulin at home in New Delhi, India are presented followed by descriptive characteristic on amount of sharps used and disposed as household waste; Knowledge on sharp waste and its disposal; attitude towards its safe management; present practices being followed for its disposal and influencing factors. Analytic findings on correlation of all independent variables on dependent variables are present later in this section.

A total of 303 subjects gave informed consent to participate and completed the study questionnaire. All the participants were above 18 years of age and are resident of New Delhi, India, at the time of study. The respondent in the study were the subjects who came to their physician for routine follow up and were given questionnaire in choice of their language to provide best suited response to each question.

### **4.1 General Socio-demographic Characteristics**

This part shows frequency distribution of selected variables describing background characteristics of the respondents. Table 1 reveals general information such as age, sex, marital status, education, occupation, and type & duration of stay in current household in New Delhi. A level of house hold income is arrived by indirect method after assessing number of vehicles the household have.

Regarding age, all respondents were in the age ranged from 24 to 76. The mean age was 47.88 and standard deviation was 12.231.

Regarding sex, the study population comprises of 112 (37%) females and 119 (63%) males.

For marital status, all subjects living with their spouse or partners were grouped together. Subjects who were divorced, single or widowed are grouped as subjects living without any partner. Majority of the respondents were living with their partners or spouses 258 (85.4%) while the rests were not living with their partners 44 (14.6%).

Since safe disposal practices require higher level of understanding of subject, for education attainment, the participants with the primary education level were grouped together with no education. There were 67 (22.5%) of respondents who had either no or primary level of education. Subjects with secondary or graduate level of education were 165 (55.4%) while subjects with post graduate degree or higher were 66 (22.1%).

Around three-fourth of the respondents were working for private company 102 (34.5%); for government 25 (8.4%); self employed 55(18.6%) and 32 (10.8%) in other kind of jobs. There were 82 (27.7%) of respondents who were not actively working and usually stay at home during most of their time

Most of the subjects 270 (89.7%) in the study were permanent residents of New Delhi. There were 25 (8.3%) subjects who were staying temporarily while 6(2%) of subjects were visitors from other part of India at the time of survey. The length of stay in their current household ranged from 6 months to 63 years. There were 162 (63.2%) subjects who have lived in the present household for less than 1 year; 14 (5.5%) with 1 up to 5 years of stay; 66 (25.8%) with 5 to 10 years of stay and 14 (5.5%) with more than 10 years of stay.

The level of economic status of the respondents had been assessed on the basis of indirect assessment of household vehicles. The subjects with household vehicles as two wheelers only and any other vehicle other than car were 138 (45.4%) while subjects with both two-wheeler and at least a car were 122 (40.1%). Subjects who have no vehicle in the household are 43 (14.1%)

**Table 3: General Socio-demographic Characteristics**

Socio-demographic Characteristics	Number (n)	Percentage (%)
<b>Age (n=303) age in years</b>		
Mean = 47.88, Median = 46.00		
SD = 12.231, Range = 24-76		
<b>Sex (n=303)</b>		
Female	112	37
Male	191	63
<b>Marital Status (n=303)</b>		
Single/widowed/divorced	44	14.6
Married/living with partner	258	85.4
<b>Education (n=298)</b>		
Illiterate/primary education	67	22.5
Secondary/graduate	165	55.4
Post graduate and higher	66	22.1
<b>Religion (n=303)</b>		
Hindu	197	68.4
Islam	74	24.3
Others	32	10.5
<b>Occupation (n=296)</b>		
Private Employee	102	34.5
Govt. Employee	25	8.4
Self Employed	55	18.6
Others	32	10.8
House wife/ retired	82	27.7
<b>Type of stay in current household (n=301)</b>		
Permanent resident	270	89.7
Temporary stay	25	8.3
Visitor	6	2
<b>Type of accommodation (n =289)</b>		
Own accommodation	110	36.2
Rented accommodation	179	58.9

Socio-demographic Characteristics	Number (n)	Percentage
		(%)
<b>Duration of stay in current household (n=256)</b>		
Less than 1 year	162	63.2
1-5 year	14	5.5
5-10 year	66	25.8
More than 10 years	14	5.5
<b>Vehicles owned by household</b>		
No Vehicle	43	14.1
Only two wheeler	138	45.4
Four wheeler	122	40.1

#### 4.2 Subjects diabetes management and sharp usage characteristics

This part shows frequency distribution of selected variables describing characteristics of the respondents with respect to diabetes management at home and amount of sharps used in management of diabetes. Table 4 reveals information such as level of physician care, visits to physician for management of diabetes, frequency of home monitoring of blood glucose level, duration of insulin use, type of device used for insulin injection, and amount of sharps (booth needles and lancets) produced at home.

##### Level of physician care

Regarding level of physician care, there were 109 (36%) of respondents were visiting hospital; 83 (27.4%) to small hospital or nursing home and 111 (36.6%) visiting private clinic for follow up on their diabetes management.

##### Frequency of follow up with physician

There were 197 (65%) responders who were visiting their health care providers every month. The subjects who were being followed by their physician once every 3 months were 67 (22.1%) ; and once every six months were 29 (12.9%) respectively.

### **Duration of insulin therapy**

There were maximum numbers of respondents who are using insulin between 1 to 5 years. The use of insulin was 47 (15.5%) for less than 3 months; 62 (20.4%) between 3 months to 1 year; 109 (35.9%) between 1 to 5 years and 85 (28.1%) who were using insulin for more than 5 years.

### **Frequency of home blood glucose monitoring**

All the respondents in the study were using home monitoring device for checking their blood glucose level. There were 38 (12.5%) of responders who responded checking blood glucose everyday; 109 (36%) once per week and majority 156 (51.5%) less than once per week.

### **Type of insulin injection device used**

Majority of the responders in the study were using insulin syringe. Insulin syringe is used by 203 (68.1%) as compared to insulin pen which is used by 79 (26.5%) of subjects. A few subjects (5%) use separate needle and syringe for insulin injection.

### **Dosing schedule of insulin**

There were 215 (71.9%) of responders who were on twice a day insulin dosage. Seventy (23.4%) reported once a day insulin only and 14 (4.7%) were on more than 2 times a day insulin.

### **Use and reuse of insulin needle and their disposal**

Two third of the responders said that they reuse insulin needle more than once. Only 75 (24.9%) of responders are using needle only once. Majority of the respondents (71%) were disposing up to 7 needles per week.

### **Use and reuse of lancet and their disposal**

Lancets were used multiple times by 112 (37%) of responders and only once by 191 (63%) of responders. Majority of the respondents (89.4%) were disposing up to

7 lancets per week.

**Table 4: Subjects diabetes management and sharp usage characteristics**

Diabetes Management Characteristics	Number (n)	Percentage
		(%)
<b>Level of physician care (n=303)</b>		
Hospital	109	36
Nursing Home and small hospital	83	27.4
Private Clinic	111	36.6
<b>Frequency of physician visit (n=303)</b>		
Once per month	197	65
Once every 3 months	67	22.1
Once every 6 months	39	12.9
<b>Duration of Insulin therapy (n=303)</b>		
Less than 3 months	47	15.5
3 months to 1 year	62	20.4
1 to 5 years	109	35.9
More than 5 years	85	28.1
<b>Frequency of home glucose monitoring (n=303)</b>		
Everyday	38	12.5
Once per week	109	36
More than once per week	156	51.5
<b>Type of insulin injection device used (n=298)</b>		
Insulin Pen	79	26.5
Insulin syringe	203	68.1
Syringe with separate needle	16	5.4
<b>Dosing schedule of insulin (n=299)</b>		
Once a day	70	23.4
Twice a day	215	71.9
More than twice a day	14	4.7
<b>Use and reuse of insulin needle (n=301)</b>		
Use needle only once	75	24.9
Use needle for 1 day	85	28.2
Use needle for 2-6 day	138	45.8

<b>Diabetes Management Characteristics</b>	<b>Number (n)</b>	<b>Percentage</b>
		<b>(%)</b>
Use for 7 days or more	3	1
<b>Number of needle disposed(n=303)</b>		
Up to 7 per week	215	71
7 -14 per week	81	26.7
More than 14 per week	7	2.3
<b>Use and reuse of lancets</b>		
Use only once	191	63
Use multiple times	112	37
<b>Number of lancets disposed</b>		
Up to 7 per week	270	89.4
More than 7 per week	32	10.6

#### 4.3 Knowledge towards household waste disposal

Questions were asked to explore the respondents' knowledge about household sharp waste disposal including 12 questions for knowledge which consisted of both positive and negative questions. Another question on knowledge on safe disposal and destruction was asked and only right answers were scored 1. For positive questions, the respondents got 1 scores for correct answer and 0 score for wrong answer. For negative questions, they got 0 score for true answer and 1 scores for false answer.

The description of the frequency and percentage of respondents who answered true and false to each question about knowledge towards household sharp waste disposal was shown in details in below table 5.

**Table 5: Frequency and percentage of respondents who answered true and false to each question about knowledge towards household sharp waste disposal (n=303)**

<b>No.</b>	<b>Statement</b>	<b>True</b>	<b>False</b>
		<b>n(%)</b>	<b>n(%)</b>
1.	The sharp waste produced at home is infectious.	209 (69)	94 (31)
2.	One can reuse needles and lancets if they are still	87 (28.7)	216 (71.3)

No.	Statement	True n(%)	False n(%)
	sharp and clean		
3.*	The needles and lancets can be cleaned by spirit swab and reused.	104 (34.3)	199 (65.7)
4.*	One can also use someone else needle for injecting insulin after cleaning with spirit.	46 (15.2)	256 (84.8)
5.	Needle should be recapped after use and before throwing away in bin.	251 (82.8)	52 (17.2)
6.	Needle should be broken away from syringe and collected in puncture proof bottles.	237 (78.2)	66 (21.8)
7.	Lancets should not be recapped after use and before throwing in waste bin.	157 (51.8)	146 (48.2)
8.	One should bend the lancet tip after use and before throwing in waste bin.	240 (79.2)	63 (20.8)
9.	Sharps like needles and lancets can cause injury if disposed in public places like parks, streets etc.	261 (86.1)	42 (13.9)
10.*	The sharps in household waste can never cause injury to rag pickers and garbage handlers.	76 (25.1)	227 (74.9)
11.	Used needles and syringes can be misused by rag pickers.	257 (84.8)	46 (15.2)
12.*	Sharps like needles can be recycled like plastics	154 (50.8)	149 (49.2)
13.	Knowledge on at least one sharp collection and destruction method	11 (3.6)	292 (96.4)

\* Negative Statement

The obtained score is converted in terms of score level and is classified into 3 levels (low medium and high knowledge). Possible scores ranged between 0-13 points. A mean score of 8.384 and standard deviation of 1.546 is used to classify subjects into 3 groups as follow (Srisaard, 1992; Suchat, 1997):

Good level : Score of 10 or more

Moderate level : Score between 7 to 9

Low level : Score of 6 or below

**Table 6: Level of knowledge of respondents towards household sharp waste disposal (n=302)**

Level of knowledge	Frequency	Percentage
High knowledge (10 or more)	72	23.8
Moderate knowledge (7-9)	199	65.9
Low knowledge ( 6 or less)	31	10.3



In order to summarize the knowledge level of the respondents, the distribution of knowledge towards household waste disposal was shown in table 6. About two-thirds of the participants (65.9%) had moderate level of knowledge while less than one-third of them (23.8%) had the high knowledge. There were 31(10.3) respondents had low knowledge level about household sharp waste disposal.

#### 4.4 Perception towards household waste disposal

In order to know the attitude towards household waste disposal, all the respondents were asked about their opinions to either agree or disagree the statements for perception/attitude of household sharp waste disposal. The perception part had 12 questions which consisted of both positive and negative statements. For all positive questions, the score was given 5 for strongly agree answer, 4 for agree answer, 3 for uncertain answer, 2 for disagree answer and 1 for strongly disagree answer. A reverse score is given for negative statements.

The number and percentage of respondents' perception towards household waste disposal was shown in details in table 7 as below.

**Table 7: Frequency and percentage towards respondents' perception towards household sharp waste disposal (SD=Strongly disagree; D=Disagree; UN=Uncertain; A=Agree; SA=Strongly agree)**

No.	Statement	Frequency (Percentage)				
		SD	D	UN	A	SA
1.*	Sharp waste produced at home is very small and is no cause of concern.(n=303)	76 (25.1)	108 (35.6)	30 (9.9)	75 (24.8)	14 (4.6)
2.*	Household garbage pickers should be responsible for any injury caused by sharps in waste. (n=302)	59 (19.5)	132 (43.7)	23 (7.6)	80 (26.5)	8 (2.6)

No.	Statement	Frequency (Percentage)				
3.*	Sharp injuries is a cause of concern only in hospitals etc. (n=294)	38 (12.9)	139 (47.3)	59 (20.1)	53 (18)	5 (1.7)
4.*	Household sharp waste can not cause any harm or injury. (n=303)	63 (20.8)	124 (40.9)	45 (14.9)	62 (20.5)	9 (3)
5.*	It is the responsibility of the sharp manufacturer for providing safe disposal methods. (n=301)	18 (6)	50 (16.6)	29 (9.6)	115 (38.2)	89 (29.6)
6.*	It is the responsibility civic agency for providing safe disposal methods for sharps. (n=303)	14 (4.6)	20 (6.6)	53 (17.5)	135 (44.6)	81 (26.7)
7.	I want to know more about safe sharp disposal practices. (n=301)	7 (2.3)	31 (10.1)	48 (15.9)	127 (42.2)	88 (29.2)
8.	I want to spend extra effort and money on safe management of household sharps. (n=301)	19 (6.3)	50 (16.6)	85 (28.2)	96 (31.9)	51 (16.9)
9.*	Buying and extra equipment for safe disposal of sharps may cost huge money. (n=302)	19 (6.3)	70 (23.2)	71 (23.5)	96 (31.8)	46 (15.2)
10.	I want to protect anyone from any injure due to my sharp waste. (n=301)	12 (4)	20 (6.6)	21(7)	124 (41.2)	124 (41.2)
11.*	By reusing needles and lancets I can save a lot of my medical cost. (n=302)	66 (21.9)	78 (25.8)	34 (11.3)	83 (27.5)	41 (13.6)
12.	I want to know about needle disposal program and mechanism by my physician, chemist or hospital. (n=302)		17 (5.6)	48 (15.9)	149 (49.3)	73 (24.2)

\* Negative Statement

The obtained attitude score is converted in terms of attitude-score level and is classified into 3 levels (low, moderate and good attitude). Possible scores ranged

between 0-60 points. A mean score of 39.70 and standard deviation of 4.60 is used to classify subjects into 3 groups as follow (Srisaard, 1992; Suchat, 1997):

Good level : Score of 45 or more  
 Moderate level : Score between 36 to 44  
 Low level : Score of 35 or below

**Table 8: Levels of attitude towards household sharp waste disposal (n=389)**

Level of perception	Frequency	Percentage
High-level perception (45 or more)	48	16.6
Moderate-level perception (36-44)	194	67.1
Low-level perception (35 or low)	15.5	16.3

Level of attitude towards sharp household waste of the respondents and its distribution is shown in table 8. Majority of the respondents 194 (67.1%) has moderate attitude level while very low (16.3%) perceived as low level attitude. About 16.6% of the participants have shown high attitude towards household sharp disposal.

#### 4.5 Practices towards household waste disposal

For practice on household sharp waste disposal, all the respondents' practices were asked 12 questions which consisted of both positive and negative questions. For positive questions, the respondents got 1 scores for true answer and 0 score for false answer. For negative questions, they got 0 score for true answer and 1 scores for false answer.

The detailed distributions of frequency and percentage of practices regarding household waste disposal were shown in the following table 9.

**Table 9: Frequency and percentage of practices of the respondents regarding household sharp waste disposal (n=303)**

No.	Statement	Yes	No
1.	I recap the needle after injecting insulin. (n=302)	254 (84.1)	48 (15.9)

No.	Statement	Yes	No
2.*	I throw away insulin needle and lancets into the household garbage bags. (n=302)	255 (84.4)	47 (15.6)
3.	Sometimes I collect sharp waste in plastic containers or tin cans. (n=303)	130 (42.9)	173 (57.1)
4.	I sometimes re-use needle if the condition seems right to use again. (n=303)	164 (54.1)	139 (45.9)
5.	If I go out, I bring my used needles back home. (n=302)	76 (25.2)	226 (74.8)
6.*	I throw sharps on street if I am travelling outside or in a party. (n=302)	88 (29.1)	214 (70.9)
7.	I bend the needle and sharp after use so that it cannot be reused by anyone else. (n=301)	197 (65.4)	104 (34.6)
8.	I keep my unused needles and lancets at a place not reachable to children and others (along with my used medicine) (n=302)	246 (81.5)	56 (18.5)
9.	I collect all sharps and dispose at one particular day. (n=302)	32 (10.6)	270 (89.4)
10.	I have informed my garbage picker of sharps in my garbage. (n=301)	51 (16.9)	250 (83.1)
11.	I have asked my doctor for disposal of insulin syringes. (n=303)	51 (16.8)	252 (83.2)
12	I have asked my chemist for disposal of insulin syringes. (n=301)	99 (32.9)	202 (67.1)

\* Negative Statement

The obtained practice score is converted in terms of score level and is classified into 2 levels (good practice and bad practice). Possible scores ranged between 0-12 points. A mean score of 5.175 and standard deviation of 1.757 is used to classify subjects into 2 groups as follows (Suchat, 1997):

Good practice : Score of 6 or more

Bad Practice : Score below 5

**Table 10: Level of practice on household waste disposal (n=291)**

Level of practice	Frequency	Percentage
Good practice	105	36.1
Bad practice	186	63.9

The distribution of level of practice towards household waste disposal is shown in table 10. Majority of respondents (66.9%) are following bad practice.

#### 4.6 Influencing factors on sharp disposal practices

Influencing factors like advice received from subjects' health care provider or any other source and any injury due to sharp waste in their household was assessed using positive questions. Respondents were asked two separate questions for source on information and knowledge on sharp disposal practice from any health care provider or friend. Another question on injury caused by sharp at home to anyone known to them was asked. Presence of any influencing factor was scored 1 and absence was scored 0 for the individual responses. The description of the frequency and percentage of respondents who answered 1 and 0 to each question on presence of influencing factors was shown in details in table 11 below. Only 43(14.2%) of responders had any kind of information on sharp waste management from their healthcare provider while 62 (20.5%) had similar information through their needle sellers, chemists and or friends. The sharp injury to any family member or pet were experienced by 27 (8.9%) of respondents.

**Table 11: Frequency and percentage of influencing factors of the respondents regarding household sharp waste disposal (n=303)**

No.	Statement	Yes	No
1.	Do you any receive kind of advice from your doctor or educator on household sharp waste management?	43 (14.2)	260 (85.8)
2.	Do you receive any kind of information from needle seller/ chemist/ friend on household sharp waste management?	62 (20.5)	241 (79.5)
3.	Are there any people or pet in your house that have been injured with sharp medical waste?	27 (8.9)	276 (91.1)

#### 4.7 Association between Socio-demographic, insulin therapy use characteristics with knowledge and attitude on sharp disposal at home

The present study has practice on sharp waste disposal as dependent variable. The safe practice of household sharp is dependent on knowledge and attitude of the subjects who use sharp to manage their diabetes at home. The knowledge and

attitude of responders is considered as intermediate variable and associated between dependent variable (practice on household sharp disposal) for socioeconomic and use of insulin therapy is presented in table 12 and 13 below.

The association between socio demographic, duration and use of insulin therapy with knowledge towards household waste management was analyzed using Chi square test and presented in table 12 below. We presented the socio demographic and insulin therapy use characteristics which showed significant association with level of knowledge with Chi-square test (p-value < 0.05). We found that marital status (p-value < 0.001), education (p-value = 0.001), type of accommodation of household (p-value = 0.022), Duration of Stay (p-value = 0.025), Duration of Insulin use (p-value = 0.041), number of needle used (p-value < 0.001), number of lancets used (p-value < 0.001), home blood glucose monitoring frequency (p-value < 0.001) and frequency of visit to physician (p-value = 0.008) were related to level of knowledge towards household waste management.

The respondents who were living with their spouse or partners had 69.3% moderate level knowledge as compared to unmarried or living alone respondents who had 47.7% with moderate level knowledge. Low knowledge level was more (27.2%) in unmarried than married (7%) respondents.

Education level is directly associated with knowledge level as 39.4% of responders with post graduate or higher degree showed good knowledge level which gradually decreases as level of education went down to primary or no education.

Living in own house with higher duration of stay is associated with good and moderate knowledge level whereas rented accommodation is associated with low knowledge level.

The knowledge level was lower in responders who were using insulin for longer duration and using more number of needles. There were 71.4% of responders

who used 14 or more needles per week with low knowledge level as compared to 16 % who use between 7-14 needles and 6.1% who use less than 7 needles per week.

Respondents who used lancets only once for blood glucose monitoring and performed blood monitoring everyday have higher level of knowledge as compared to one who used lancets multiple times with lesser frequency of glucose monitoring.

Responders with frequent visit to their healthcare provider had higher level of knowledge as compared to responders with less frequency of visit.

**Table: 12 Association between Socio-demographic factors and Knowledge**

Socio demographic and diabetes management parameters		Count	Knowledge n (%)			P-value
			Good	Moderate	Low	
Marital Status	Married or with Partner	257	61(23.7)	178 (69.3)	18 (7.0)	<.001*
	Unmarried or living alone	44	11(25.0)	21 (47.7)	12 (27.3)	
Education	Post Graduate and above	66	26 (39.4)	35 (53.0)	5 (7.6)	.001
	Secondary school up to Graduate	164	40 (24.4)	106 (64.6)	18 (11)	
	No education and primary education	67	5 (7.5)	55 (82.1)	7 (10.4)	
Type of Accommodation	Own	110	25 (22.7)	81 (73.6)	4 (3.6)	.022
	Rented	178	44 (24.7)	111 (62.4)	23 (12.9)	
Duration of Stay	> 10 year	14	4(28.6)	8(57.1)	2(14.3)	.025
	5-10 year	66	17(25.8)	37(56.1)	12(18.2)	

Socio demographic and diabetes management parameters		Count	Knowledge n (%)			p-value
			Good	Moderate	Low	
	1-5 year	13	0(0.0)	12(92.3)	1(7.7)	
	< 1 year	162	45(27.8)	108(66.7)	9(5.6)	
Duration of Insulin use	< 3 months	47	18(38.3)	24(51.1)	5(10.6)	.041
	3month- 1yr	62	15(24.2)	37(59.7)	10(16.1)	
	1 yr-5 yr	108	18(16.7)	79(73.1)	11(10.2)	
	more than 5 yr	85	21(24.7)	59(69.4)	5(5.9)	
Needle Use	0-7 in wk	214	44(20.6)	157(73.4)	13(6.1)	<.001
	7-14 in wk	81	28(34.6)	40(49.4)	13(16.0)	
	more than 14 in wk	7	0(.0)	2(28.6)	5(71.4)	
Lancet Use	once only	191	58(30.4)	121(63.4)	12(6.3)	<.001*
	upto 1 week	111	14(12.6)	78(70.3)	19(17.1)	
Blood Glucose Monitoring	everyday	38	14(36.8)	15(39.5)	9(23.7)	<.001*
	once in week	109	41(37.6)	61(56.0)	7(6.4)	
	more than week	155	17(11.0)	123(79.4)	15(9.7)	
Visit to Physician	1in month	196	54(27.6)	129(65.8)	13(6.6)	.008
	1 in 3 month	67	15(22.4)	40(59.7)	12(17.9)	
	1 in 6 month	39	3(7.7)	30(76.9)	6(15.4)	

\*Fisher exact test for significance

The association between socio demographic, duration and use of insulin therapy characteristics with attitude towards household waste management was analyzed using Chi square test and presented in table 13 below. We presented the socio demographic and insulin therapy use characteristics which showed significant



association with level of attitude with Chi-square test ( $p$ -value  $< 0.05$ ). We found that education ( $p$ -value  $< 0.001$ ), garbage pick-up person ( $p$ -value = 0.002), duration of insulin use ( $p$ -value  $< 0.001$ ), type of device to inject insulin ( $p$ -value = 0.015), number of needle used ( $p$ -value = 0.02), number of lancets disposed ( $p$ -value = 0.019), home blood glucose monitoring frequency ( $p$ -value  $< 0.001$ ) and frequency of visit to physician ( $p$ -value  $< 0.001$ ) were related to level of attitude towards household waste management.

Education level is directly associated with attitude level as 27.7% of responders with post graduate or higher degree showed good knowledge level which gradually decreases as level of education went down to primary or no education.

Duration of stay is associated with good and moderate attitude level. There were no responders with low attitude, who have stay in current household for more than 10 years as compared to 9.5% with 5-10 years stay, 15.4% with 1-5 years of stay and 22.9% with less than 1 year of stay.

Responders who pick-up and dispose their own garbage have low attitude as compared to responders for whom someone else pick up the garbage.

Responders who were on insulin therapy between 3 months to 1 year have highest attitude level followed by 3 months of use. There were 29.6% responders for low attitude level in more than 5 years of insulin use followed by 17.8% in 1-5 years of insulin use group.

Insulin pen users have high attitude in 28.2% as compared to syringe used who have only 13% responders with high attitude.

Respondents who performed blood glucose monitoring everyday have higher level of attitude as compared to one who performed blood monitoring at lesser frequency of once per week.

The responders who were using less than 7 lancets per week had high attitude as compared to the responders who were using more than 7 lancets per week.

Responders who were visiting their healthcare provider more often have high level of attitude in 28.9% as compared to 23% and 12.1% in responders who were visiting once in 3 months and 1 month, respectively.

**Table: 13 Association between Socio-demographic factors and Attitude**  
**Chi square Test**

Socio-demographic factors			Attitude Level			P-value
			Good	Moderate	Low	
Education	Post graduate	65	18(27.7)	43(66.2)	4(6.2)	<.001
	Secondary to Graduate	158	24(15.2)	118(74.7)	16(10.1)	
	No or primary school	61	5(8.2)	31(50.8)	25(41.0)	
Duration of stay in present household	More than 10 yr	13	1(7.7)	12(92.3)	0(0)	.072*
	5-10 yr	63	12(19.0)	45(71.4)	6(9.5)	
	1-5 yr	13	2(15.4)	9(69.2)	2(15.4)	
	less than 1 yr	157	17(10.8)	104(66.2)	36(22.9)	
Garbage pick-up	Someone pick up	222	45(20.3)	147(66.2)	30(13.5)	.002
	Self pick up	65	3(4.6)	45(69.2)	17(26.2)	
Duration of insulin therapy	of less than 3 months	46	7(15.2)	36(78.3)	3(6.5)	<.001
	3mt- 1yr	61	16(26.2)	43(70.5)	2(3.3)	
	1 yr-5 yr	101	13(12.9)	70(69.3)	18(17.8)	
	more than 5 yr	81	12(14.8)	45(55.6)	24(29.6)	

Socio-demographic factors		Attitude Level			p-value	
		Good	Good	Good		
Type of device used for injection	pen	78	22(28.2)	46(59.0)	10(12.8)	.015*
	syringe	192	25(13.0)	133(69.3)	34(17.7)	
	needle with syringe	14	0(.0)	11(78.6)	3(21.4)	
Frequency of needles used	only once	73	15(20.5)	50(68.5)	8(11.0)	.020*
	for 1 day	79	9(11.4)	53(67.1)	17(21.5)	
	2-6 days	132	23(17.4)	90(68.2)	19(14.4)	
	more than 7 days	3	0(.0)	0(.0)	3(100.0)	
Frequency of blood glucose monitoring	everyday	37	15(40.5)	18(48.6)	4(10.8)	<.001
	once in week	108	9(8.3)	83(76.9)	16(14.8)	
	more than week	144	24(16.7)	93(64.5)	27(18.8)	
Lancet disposal frequency	Up to 7 per wk	258	47(18.2)	166(64.3)	45(17.4)	.019*
	> 7 per wk	30	1(3.3)	27(90.0)	2(6.7)	
Frequency of physician visit	Once a month	190	23 (12.1)	131 (68.9)	36 (18.9)	<.001
	Once in 3 months	61	14 (23.0)	39 (63.9)	8 (13.1)	
	Once in 6 month	38	11 (28.9)	24 (63.2)	3 (7.9)	

\*Fisher exact test for significance

#### 4.8 Association between Socio-demographic, insulin therapy use characteristics with practice on sharp disposal at home

The association between socio demographic, duration and use of insulin therapy characteristics with practice level on household waste management was analyzed using Chi square test and presented in table 14 below. We presented the

socio demographic and insulin therapy use characteristics which showed significant association with level of practice with Chi-square test (p-value < 0.05). We found that religion (P-value = 0.011), duration of stay in present household (P-value = 0.026) and frequency of lancet use (P-value = 0.024) were related to level of practice towards household waste management. Hindu religion, higher duration of stay in present household and use of lancet only once is positively associated with good practice.

**Table 14: Association between socio demographic, insulin therapy use and practice level**

Socio demographic and diabetes management parameters		n	Practices level		P-value
			Good practice	Bad practice	
Religion	Hindu	190	79 (41.6%)	111(58.4%)	.011
	Islam	70	15(21.4%)	55(78.6%)	
	Other	31	11(35.5%)	20(64.5%)	
Duration of Stay	more than 10 yr	13	4(30.8%)	9(69.2%)	.026
	5-10 yr	63	33(52.4%)	30(47.6%)	
	1-5 yr	13	6(46.2%)	7(53.8%)	
	less than 1 yr	157	49 (31.2%)	108 (68.8%)	
Lancet Use	once only	186	76(40.9%)	110(59.1%)	.024
	upto 1 week	105	29(27.6%)	76(72.4%)	

#### 4.9 Association between Knowledge, attitude and practice on sharp disposal at home

There is no or weak association between the knowledge level and attitude level with the type of practice.

**Table 15: Association between intermediate (knowledge and attitude) and dependent (practice) variables**

		Count	Practice level		p-value
			Good practice	Poor practice	
Knowledge	Good	69	21(30.4)	48(69.6)	.072
	Moderate	192	77(40.1)	115(59.9)	

		Count	Practice level		p-value
			Good practice	Poor practice	
Attitude	Poor	29	6(20.7)	23(79.3)	.057
	Good	47	14(29.8)	33(70.2)	
	Moderate	186	71(38.2)	115(61.8)	
	Poor	45	9(20.0)	36(80.0)	

#### 4.10 Correlation between Knowledge and attitude

The correlation between the knowledge and attitude scores were analyzed using spearman correlation as spearman correlation is appropriate for both normally and non-normally distributed data. This is a more conservative approach to show association between the two independent variables in the study. The spearman correlation was found to be significant ( $P = .047$ ) signifying a positive weak correlation, but statistically significant, for knowledge with attitude.

**Table 16: Correlation between knowledge and attitude**

			Attitude	Knowledge	P-value
Spearman's Correlation	Attitude	Correlation	1.000	.117*	.047*
		Coefficient			
	Knowledge	Correlation	.117*	1.000	.047*
		Coefficient			
		n	289	288	
		n	288	302	

\*. Correlation is significant at the 0.05 level (2-tailed).

#### 4.11 Correlation between Influencing factors and practice on sharp waste disposal at home

The correlation between the influencing factors and practice scores were analyzed using spearman correlation as it is assumed that the scores on influencing factors and practice in this group of respondents to be non parametric in distribution. This is a more conservative approach to show association between the two variables

in the study. The spearman correlation was found to be positive and significant ( $P < .001$ ) signifying a correlation of influencing factors and practice scores.

**Table 17: Association between influencing factors and practice using correlation**

Correlation		Influence Score	Practice Score	P-value
Spearman's rho	Influence Score	1.000	.217**	< .001
	n	303	291	
	Practice Score	.217**	1.000	< .001
	n	291	291	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The direction of correlation with influencing score was found to be positive for education by HCP, pharmacist and friend. There were 69% of respondents who had education by HCP with good level of practice as compared to 30.5% respondents who did not have any education by HCP with good level of household sharp waste practices. Similarly, education by sharp seller, pharmacist and friend are also positively associated with good practice level. Respondents who had any education form sharp sellers or friends had good practice level in 51.7% as compared to 32% of respondents who had no education.

**Table 18: Association between influencing factors and practice using Chi square test**

Chi square test	n	Practice Level (%)		P-value
		Good practice	Bad practice	
Education by Health care provider <sup>a</sup>	No (249)	76 (30.5)	173(69.5)	<.001
	Yes (42)	29(69.0)	13(31.0)	
Education by pharmacist or friend <sup>b</sup>	No (231)	74(32.0)	157(68.0)	.006
	Yes (60)	31(51.7)	29(48.3)	
Any past injury to pet or someone in family or friend <sup>c</sup>	No (267)	99(37.1)	168(62.9)	.274
	Yes (24)	6(25.0)	18(75.0)	

## **CHAPTER V**

### **DISCUSSION, CONCLUSION AND RECOMENDATIONS**

#### **5.1 Discussion**

This study was a cross-sectional study to explore the factors influencing practice of household sharp waste management among type 2 diabetics in Delhi by using self-administered questionnaires addressing socio-demographic, diabetes home management characteristics, knowledge, attitude and practice towards household sharp waste management.

The study found that higher education, duration of stay in present household, not reusing needle and lancet and more frequent blood glucose monitoring at home are the characteristics which were positively associated with knowledge and attitude level of responders, towards safe household sharp disposal. The study did not find any association of knowledge and attitude level with practices towards household sharp waste disposal. Influencing factors like education form healthcare provider, pharmacist and friends were only factors which were significantly associated with good sharp disposal practices by home insulin users.

People with diabetes comprise of largest group of patients using lancets, needles and syringes on a consistent basis in the community. Other conditions that require self administration injections include type 1 diabetes, osteoporosis, multiple sclerosis, HIV, hepatitis C infection, cancer and allergies etc. are very less as compared to number of diabetics. The present study is done in type 2 diabetics, which presently comprise of largest community of home sharp users followed by type 1 diabetics. Some of the diabetics may require two different types of insulin treatment which cannot be mixed necessitating the use of up to four separate insulin syringes per day. New hormones and biological are being used by patients with diabetes which may require additional 1 to 3 injections per day. In present study, there were 4.7% of subjects who administered insulin more than 2 times per day, additionally increasing burden of household sharp waste. Moreover 45.9% of respondents reported no

repeated use of their needles and lancets which further contributed to additional sharp waste burden.

India is home to 30.8 million diabetics, making it the world's unchallenged diabetes capital. And the number is expected to go up to 87 million, 8.4% of the country's adult population by 2030 (WHO 2001). Home monitoring of diabetes is common practice and type 2 diabetics are often advised to monitor blood glucose at home. The patients, who are on insulin therapy, are trained by their health care providers to administer insulin at home using different available injection devices. These patients and users of sharps (needles and lancets) dispose used sharp objects as household waste in unsafe manner in the community which is the cause of concern. It is estimated that around 3 billion needles and 1.5 billion lancets are being discarded annually in India in unsafe manner (Virmani 2010). It is essential to reduce this burden, and the ultimate goal of this survey is to contribute to the reduction of this burden.

In present survey, we found that only 3.6 % of respondents have knowledge about any safe disposal method whereas 96.4% of respondents have no knowledge about correct sharp disposal method. Survey showed a mean score 8.38 (out of total 13) with standard deviation of 1.55, showing majority of respondents had knowledge level of below 80% (10.4 score) which is considered as good knowledge level (Bloom 1956).

The attitude towards household waste management is the important determinant of practicing the household waste management. Regarding attitude on safe disposal practice, the present study found 83.7% of subjects with high and moderate level attitude, but it was not associated with sharp disposal practices. Though, attitude was significantly correlated with disposing of syringe in puncture proof container at home and away from home in earlier studies (McConville, 2002), this was not shown by the respondents in present study. Without knowledge, attitude alone cannot bring good behavior and practices towards sharp waste management.



The US EPA has guidelines (EPA 1993), American diabetes Association (ADA 1996) and various coalitions groups in Europe (Diabetes UK, 2001) have recommended guidelines for safe disposal of sharp which are used at home. These practices include breaking off needle or capping the needle before disposal and always disposing the sharps in puncture proof boxes. Yet in studies done in US and Europe found that large population is disposing household sharp in unsafe way. In a study on syringe disposal practice of insulin users it was found that only half of the home insulin users are disposing the sharps in proper container though most of them have knowledge about the safe disposal methods (Berkowitz 1996). Almost 44% of respondents use *safe clip* device for safe disposal of sharps in study done in Europe (Babatunde, 2003). Regarding practices on sharp waste disposal, the present study showed that 84.4% of sharp users dispose their sharps in household garbage. As compared to an earlier study done by Babatunde and colleagues, in South Staffordshire, an English health district which found 29.5% of the respondents throwing lancets and 11.5% throwing needles in loose household trash.

Regarding influencing factors, only 14.2% of respondents received any advice or education about sharp waste management from their HCPs as compared to 64.6% subjects confirmed receiving any advice from their HCPs in earlier study conducted in England (Babatunde, 2003). The education from HCP played a very important role as we found significant correlation ( $p\text{-value} < .0001$ ) for influencing factors on sharp disposal practices. The percentage respondents with good disposal practice of sharps were 31% for responders who have no safe disposal advice and 87% who had advice from their HCPs. Previous information about proper syringe disposal practices played a significant role in actual practices for syringe disposal. Study conducted in USA (McConville, 2002) also identified Health professionals as major ( $> 56\%$ ) source of information for the respondents and concluded that the syringe disposal practices of their patients can improve through education at each office visit. Another study confirmed the importance of education by healthcare provider and found statistical difference in practices between patients receiving and not receiving advice on sharps disposal [OR 6.36 (95% CI 2.04-23.28) for needle disposal and OR 15.41 (95% CI 3.57-90.12) for lancet disposal] (Crawshaw, 2002).

## 5.2 Conclusion

Healthcare professionals, if anyone, understand that improperly discarded needles and sharps present a potential health concern for anyone who may come in contact with them. These improperly discarded needles and sharps can spread pathogens and infectious diseases and can also cause injury to children, rag pickers, solid waste workers, recycling industry employees, neighbors and animals. The present study showed low knowledge and attitude on sharp waste management.

In the present study, being married, higher education level, living in rented accommodation, higher duration of stay, longer duration of insulin use, use of more needle and lancet per week, high frequency of home blood glucose monitoring and frequent visit to physician had significant positive association with knowledge level of respondents. Similarly, higher education, longer duration of stay in present household, garbage pick-up by someone else, longer duration of insulin therapy, use of insulin pen and syringes, use of more needles, high frequency of home blood glucose monitoring, more number of lancets disposed in per week and frequent visit to physician had significant positive association with attitude.

Most of the socio demographic characteristics were not associated with practice level of respondents other than religion, duration of stay and number of lancets used. No association was found between knowledge-attitude levels with practice level. Significant association was found between influencing factors and level of practice on household sharp waste disposal. Education by healthcare provider or any other source is the single most important factor associated with good practice on sharp waste management at home.

In present survey, we did not performed multivariate analysis for factors influencing good household sharp practices. The socio demographic variables which were found to be associated with practice level, multivariate statistics would have allowed examining the relationship between them, simultaneously. Since influencing factors were found to be significantly associated with practice level, multivariate analysis of socio demographic factors were not performed.

### 5.3 Recommendations

The awareness on safe disposal of sharp at home, including health care professionals and local government bodies is low which is the reason for no education and informational program for home sharp users by neither healthcare providers nor sharp manufacturers. To achieve the goal of safe disposal practices for sharps in household waste, awareness, education and importance of safe needle-disposal program should be initiated for both users and healthcare professionals.

Currently there are no needle-disposal laws either by local government or Ministry of Environment and Forest. The local government and central ministry should amend laws on infectious waste management and include infectious and sharp waste generated at home. The law should ensure that the safe disposal programs are available and that the sharps are no longer to be discarded in the household trash or public locations like parks, buildings or streets. In present study 29.1% of respondents answered that they sometimes dispose their sharps on streets. Around 75% of respondents do not bring back their used sharps back home, if they are travelling. These laws should be publicized on sharp (needle and lancet) packs and safe disposal methods should be adequately promoted and advertised. India being a developing country, low-cost, user friendly programs should be designed that will ensure the participation of home based users without incurring extra cost. It is very important that healthcare providers and professionals become involved because they play a vital role in promoting awareness of sharp disposal, formulating stakeholder partnerships and changing laws, policies and regulations to increase access to safe disposal programs. Household sharp waste disposal programs can only be achieved through collaborative efforts from local governments, environmental ministry, solid waste authority, pharmacist, diabetes advocacy groups, healthcare facilities and sharp manufacturers. All above stakeholders should be involved to chalk a strategy and most effective program in this regard.

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ศูนย์วิทยุทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย





**APPENDICES**

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

**APPENDIX A**  
**QUESTIONNAIRE**

**Questionnaire for knowledge, perception and practices on household sharp waste disposal.**

**Identify No.** \_\_\_\_ **Date** \_\_\_\_/\_\_\_\_/\_\_\_\_ **Physician Name** \_\_\_\_\_

**Part A: General information and household information**

1. How old are you now? ----- Years
2. Gender:
  1.  Male
  2.  Female
3. Ethnicity:
  1.  Resident
  2.  Temporary stay
  3.  Visitor
  4.  others (specify) -----
4. Religion:
  1.  Hindu
  2.  Christian
  3.  Islam
  4.  others (specify) -----
5. Marital status:
  1.  married
  2.  separated,divorced
  3.  co-habit
  4.  single
  5.  widowed
  6.  others (specify) -----
6. Education status:
  1.  never went to school
  2.  primary education (1-5 years of school)
  3.  secondary education (10 years of school)
  4.  Graduate (degree/diploma) level (2-3 yrs college)
  5.  Post Graduate education (Master and above)
  6.  others (specify) -----
7. Current occupation:
  1.  housewife/retired
  2.  govt. servant
  3.  student
  4.  business /self employed
  5.  Private company employee
  6.  others (please specify) -----

8. How long have you been living in current household?  
-----Years, Is it  rented or  your own (please tick appropriate)
9. How many vehicles you have in your house. (Indicate number)
1.  Two wheeler                      2.  Four wheeler
10. How many trash bins/garbage containers are there in your house?
1.  with wide lids (cover)  
2.  without lids (without cover)
11. Who pick up your trash bins?
1.  self  
2.  garbage boy  
3.  govt. pick up  
4.  Others (please specify) -----
12. How long you have been on insulin therapy?
1.  3 months  
2.  3 months to 1 year  
3.  more than 1 year  
4.  more than 5 years -----
13. What type of insulin device do you use?
1.  insulin pen  
2.  insulin syringe  
3.  needle with separate syringe  
4.  Others (please specify) -----
14. What is dosing schedule for insulin?
1.  Once a day  
2.  twice a day  
3.  more than 2 times per day  
4.  Others (please specify) -----
15. How often do you use one needle?
1.  Once  
2.  1 day  
3.  2-6 days  
4.  More than 7 days

16. How many needles you throw away in one week?

1.  0 to 7
2.  7-14
3.  more than 14
4.  Others (please specify) -----

17. How often do you perform blood test at home?

1.  Every day
2.  At least once in week
3.  At least once in month
4.  Once in more than 1 month

18. How often do you use one lancet?

1.  Once
2.  Upto 1 week
3.  1-4 weeks
4.  More than 1 month

19. How many lancets you throw away in one week?

1.  0 to 7
2.  7-14
3.  more than 14

20. How often do you visit your physician?

1.  once in month
2.  once in 3 months
3.  once in 6 months



### Part C: Attitude towards the household sharp waste disposal

**Instruction** Please mark in the box for your opinion about attitude of household waste disposal. How do you think about following? SD= Strongly Disagree; D= Disagree; A= Agree; SA= Strongly Agree; U= Uncertain

	Statement	SD	D	U	A	SA
1.	Sharp waste produced at home is very small and is no cause of concern.					
2.	Household garbage pickers should be responsible for any injury caused by sharps in waste.					
3.	Sharp injuries is a cause of concern only in hospitals etc					
4.	Household sharp waste can not cause any harm or injury					
5.	It is the responsibility of the sharp manufacturer for providing safe disposal methods					
6.	It is the responsibility civic agency for providing safe disposal methods for sharps					
7.	I want to know more about safe sharp disposal practices.					
8.	I want to spend extra effort and money on safe management of household sharps.					
9.	Buying and extra equipment for safe disposal of sharps may cost huge money					
10.	I want to protect anyone from any injure due to my sharp waste					
11.	By reusing needles and lancets I can save a lot of my medical cost					
12.	I want to know about needle disposal program and mechanism by my physician, chemist or hospital					

### Part D: Practice towards the household sharp waste management

**Instruction** Please mark in the box that you think is the most correct.

	Statement	Yes	No
1.	I recap the needle after injecting insulin.		
2.	I throw away insulin needle and lancets into the household garbage bags.		
3.	Sometimes I collect sharp waste in plastic containers or tin cans.		
4.	I sometimes re-use needle if the condition seems right to use again.		
5.	If I go out, I bring my used needles back home.		
6.	I throw sharps on street if I am travelling outside or in a party.		
7.	I bend the needle and sharp after use so that it cannot be reused by anyone else.		
8.	I keep my unused needles and lancets at a place not reachable to children and others (along with my used medicine)		
9.	I collect all sharps and dispose at one particular day		
10.	I have informed my garbage picker of sharps in my garbage		
11.	I have asked my doctor for disposal of insulin syringes.		
12.	I have asked my chemist for disposal of insulin syringes.		

### Part E: Influencing Factors

1. Do you any kind of advice from your doctor or educator on household sharp waste management? 1.  Yes 2.  No

If yes, write in few words \_\_\_\_\_

2. Do you any kind of information from needle seller/ chemist/ friend on household sharp waste management? 1.  Yes 2.  No
3. Are there any people or pet in your house who have been injured with sharp medical waste? 1.  Yes 2.  No

## APPENDIX B

## Time Schedule

ACTIVITY	Nov 2010	Dec 2010	Jan 2011	Feb 2011	Mar 2011	April 2011	May 2011
Preparation of protocol	←→						
Defense of thesis protocol			←→				
Data collection				←→			
Data analysis					←→		
Report writing						←→	
Presentation of thesis report							←○

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**APPENDIX C**  
**Budget of Study**

<b>S. No</b>	<b>Activity</b>	<b>Unit Cost</b>	<b>Total Unit</b>	<b>Total Amount</b>
1	Airfare	6000	2	12000
2	IRB, local help	8000	1	18000
3	Subject incentive	100	400	40000
4	Printing (Questionnaire), Informed consent, Patient information sheet	10	400	4000
5	Misc stationary	1000	1	1000
6	Local Travel	6000	1	6000
<b>TOTAL (THB)</b>				<b>81,000.00</b>

ศูนย์วิทยทรัพยากร  
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**VITAE**

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University College of Medical Science,  
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Guru Teg Bahadur Hospital, Delhi, India  
January 1997 – June 1998
- Manager Clinical Research and Training  
Panacea Biotech Ltd, New Delhi, India  
January 2003 – November 2003
- Director: Medical Affairs,  
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April 2005 – Present

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