CHAPTER – I
INTRODUCTION

1.1 BACKGROUND OF THE STUDY

History of treatment of paraplegic and spinal cord injury

Historical spinal cord injury is a severely disabling condition. Spinal cord injury was first described as “an ailment not to be treated”. Hippocrates introduces the concept of reduction through traction. Galen found out that traumatic lesions lead to motor functional loss Paulus introduced the surgical procedure, decompressive laminectomy. Summering attempted the first surgical treatment for spinal cord injuries. While Donal Munro described bladder management and social and vocational rehabilitation. In the First World War 90% of patients who suffered spinal cord injury died within one year and only 1% survived more than 20 years.

Till second world war the patients of paraplegia used to succumb to the disease within few days or a few weeks of onset. The attention of medical world was drawn to paraplegia after the Second World War which crippled many soldiers and civilians with paraplegia. This attention of medical world towards paraplegia resulted in increased longevity of such patients. Now the need for centers for training such patients to become self sufficient and independent as much as possible was felt. The first such centre/ Hospital was started in England by Sir Ludwig Guttmann. Other countries also followed it. In India first centre for paraplegia was started in the Military Hospital of Pune (Maharashtra State). In 1978 the first ever Paraplegia Hospital for civilians was started at Ahmedabad. Till today it is the only hospital for paraplegics in India.¹¹⁴

Spinal cord injuries:

Traumatic spinal cord injury (TSCI), can be defined as an acute, traumatic lesion of the neural elements of the spinal cord which results in temporary or permanent loss of sensation, motor deficit or bowel/bladder dysfunction. Because these injuries are usually permanent, they can be devastating in terms of the high costs of acute and long term care. They can also be emotionally devastating to the relatively young persons who are statistically the most frequent victims.

According to recent statistics, about 92% of the traumatic spinal cord injuries were unintentional or accidental. Motor vehicle accidents were the single largest cause of TSCI, causing approximately 42.1% of all injuries. Falls were second,
causing about 26.7% of the injuries. About 63% of all TSCI's involved persons between the ages of 15 and 44 years.

- Approximately 11,000 people have a SCI each year
- An estimated 25,000 to 96,000 people are living with SCI in the United states.
- Although SCI occur in people of all ages, they are most often seen in young adults ages 16-30.
- The majority of the injuries are due to motor vehicle crashes; other causes include acts of violence, falls and sports injuries. 

Source: National Spinal Cord Injury association (NSCIA), 2006

**Total number of people with Spinal Cord Injury**

Current estimates are 250,000 - 400,000 individuals living with Spinal Cord Injury or Spinal Dysfunction.

- 82% male, 18% female
- Highest per capita rate of injury occurs between ages 16-30
- Average age at injury - 33.4
- Median age at injury - 26
- Mode (most frequent) age at injury 19+

**Causes of Traumatic Spinal Cord Injury**

In the UK every year, there are around 1200 people paralysed from a spinal cord injury. There are currently thought to be approximately 40,000 people in the UK living with paralysis. This statistic only shows the people who have been through a spinal cord injury centre, and does not include those who have suffered paralysis and been treated in a general hospital.

In the UK, a person is paralysed every 8 hours.

In the UK, it is estimated that the current annual cost of caring for people paralysed by spinal cord injury is more than £500 million. 21% of people discharged from Spinal Cord Injury Centers go into nursing homes, hospitals or other institutionalised settings rather than their own homes. Around 20% of patients leave Spinal Cord Injury Centres clinically depressed.
Figure 1 Pie Chart Showing the Percentage of Causes of Spinal Cord Injury

Breakdown of Road Traffic Accident Statistics
Breakdown percentages are a proportion of overall number of Traumatic Spinal Cord Injuries

Figure 2: Pie chart showing the percentage of road traffic accident as a cause of Spinal Cord Injury

Figure 3: Pie chart showing the percentage of fall as a cause of Spinal
Cord Injury

(Source: Aspire, Every Eight Hours)

In India, approximately fifteen lac people live with spinal cord injury. Every year, ten thousand new cases add to this group of individuals. Majority of them (82%) are males in the age group of 16-30 years. However, this is only an estimate as there is no reliable national database.

Chacko, Joseph, Mohanty and Jacob in 1986 evaluated the problems encountered in a general hospital situated in rural India. They found that male to female ratio was 13.5:1, 60.5% of cases with neurological deficits were in the 3rd and 4th decade of life and the causes for spinal injury were falling from trees (55.2%), road traffic accidents (12.8%), weights falling on patients (18.4%) and other causes (13.6%). The infrequent occurrence of road traffic accidents was most likely due to the rural bias of the patients.

An epidemiologic study done in Harayana, by Roop Singh, have reported male to female ratio of 2.96:1 and the average age at injury of 35.4 years. Fall from height was the most common cause of trauma (44.5%), followed by motor vehicle accidents (34.7%). Most common level of injury was first lumbar vertebra among individuals with paraplegia. A hospital based study done by Agrawal P, Upadhaya P and Raja K have also reported ratio of men to women who sustained spinal injuries being 3.6:1. The maximum number of patients was in the age range of 20-39 years. Mechanisms of injury recorded were fall from height (58.9%), fall of weight (7.2%), Motor Vehicle Accident (21.3%) and non-traumatic causes (12.6%).

From casual observation, it appears that the demographic trend that Chackoetal had seen in their study is still the same even after 20 years. The author had highlighted the necessity for appropriate preventive measures and also had re-emphasized the shortcomings of treatment in general hospitals. So, it is intuitive to assume that the rescue and retrieval systems for these patients are still inadequate in India and the knowledge regarding precautions to be taken when transporting the patient is also lacking. Globally, the etiology responsible for the maximum number of SCI is road traffic accidents (RTA).
There is a lack of team approach to these individuals in various centers all over India. There are some Non-Government Organizations (NGO’s), workings for these individuals. But there is still a lack of team approach to the community from the various hospitals to give awareness programme regarding spinal cord injury, its prevention and treatment. There is also a lack of regular follow-ups.

Nalina Gupta¹, John Solomon M², KavithaRaja³ conducted A postal survey from August 2004 to May 2006. Objective was to ascertain the demographic characteristics of individuals with paraplegia in India.

Result of the study was: The return rate was 46% (276/600). Falls from height was the leading cause (25%), followed by road traffic accidents (17.4%). Fifty-three subjects (19.2% each) were in the age group of 18-<25 and 40-<50 years age group. Majority of the subjects were men (233/276), had secondary educational level (148/276) and had the lesion at the lumbar level (60.1%). They concluded fall from a height is still the leading cause for spinal cord insult in India. Traumatic lesions are common in men and non-traumatic in women. Lumbar level is the commonest level of lesion in these individuals. Survival rate and the employment after injury are still towards the lower side.³

**Concept of Rehabilitation**

WHO defines health positively as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity"

**Rehabilitation Medicine**

Rehabilitation is not just restoration of the lost body functions but the final aim is to place the disabled person back to the family and to integrate the person in the work place and to provide a meaningful altered life style.

The goals of medical sciences are:

- To promote health
- To preserve health
- To restore health
These words are embodied in the word “Prevention”

1. **Primary prevention**
   
   It can be defined as “Action taken prior to the onset of disease, which removes the possibility that a disease will ever occur.” It can be achieved through vaccines, hygiene, good nutrient food, cleanliness and good life habits, balance between activity and rest, exercise and education about potent threat to the health. The diseases, trauma are prevented and good health is maintained.

2. **Secondary prevention:**
   
   It can be defined as “action which halts the progress of a disease at its incipient stage and prevent complication”. The specific interventions are early diagnosis and adequate treatment—means treating it before irreversible changes have taken place.

3. **Tertiary prevention:**
   
   It can be defined as “All measures available to reduce or limit impairments and disabilities, minimize the suffering caused by existing departures from good health and to promote the patient’s adjustment to irremediable conditions.” Once the recovery and restoration of the lost body functions is reached to plateau- the disabled person is trained to maximize the available potentials and to retrain him “For Return to Living” back in the family, society and at work place by rehabilitation. Rehabilitation has been defined “the combined and coordinated use of medical, social, individual to the highest possible level of functional ability.” Rehabilitation medicine involves disciplines such as Physical Medicine or Physiotherapy, Occupational therapy, Speech therapy & Audiology, Psychology, Special Education, Social work, Vocational guidance etc…. 
Areas of rehabilitation for traumatic paraplegic patients.

Figure 4: Areas of rehabilitation

1. Medical Rehabilitation: Restoration of lost function.
2. Vocational Rehabilitation: Restoration of the capacity to earn a livelihood.
3. Social rehabilitation: Restoration of family and social relationships.
4. Psychological Rehabilitation: Restoration of personal dignity and confidence.
5. Sexual rehabilitation: Restoration of sexual function and desire.

The purpose of rehabilitation is to make productive person from non-productive person.

Physical rehabilitation

Physical rehabilitation has four aspects

1. IBR: Institution Based Rehabilitation

The rehabilitation measures takes place in the institution where ideal steps are taking place. It is provided by the high standard professionals to the patients. It is costly to use high technology. In the institution lots of interactive learning takes place with other medical professionals. Medical education and research also takes place.
2. **CBR: Community Based Rehabilitation**

   Here, proper study and the assessment is done of the community where the patient is going to live. The resources are found out from within the community (e.g Person and Materials). Persons are trained by professionals and low-cost appliances are used to help the disabled person.

3. **O.B.R.: Out Reached Based Rehabilitation**

   The rehabilitation medicine team reach out in the community from the I.B.R. and provide necessary assessment, treatment and guidance through camps, safari programme etc.

4. **C.A.H.D: Community Approach to Handicap in Development.**

   Generally people in the society have a low level image for the disabled person. The disabled cannot perform many tasks. He needs only custodial care and the person has to live a vegetative life. Instead of giving sympathy these people are to be considered as “differently abled” and “Empathy” is to be provided to them in their resettlement. Necessary mass education is needed to be given through media, handouts etc. to increase awareness about disability and its management and also provide support to the disabled by the abled ones.

**Impairment, Disability & Handicap**

The world health organization’s international classification of impairment, disabilities and Handicaps (ICDH-1980) defines these terms as follows:

**Impairment:**

Any loss or abnormality of physiological, psychological, anatomical structure or function. Examples—loss of a finger, loss of conduction of impulses in the heart, or loss of certain chemicals in the brain leading to Parkinsonism. Not all impairments leads to disability, for example, loss of Pinna of ear would not lead to loss of hearing but merely results in cosmetic deficiency.

**Disability:**

Any restriction or loss of ability to perform an activity in the manner or within the range considered normal for a human being resulting from impairment, for example, difficulty in walking after lower limb amputation. To be considered disabled, a person should not be able to perform day to day activities considered normal for his age, sex or physique.
Handicap:

In the context of health experience, a handicap is a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfillment of a role that is normal (depending on age, sex, social and cultural factors) for that individual.

Impairment is a manifestation of a problem at the tissue or organ level, disability at the level of individual, while handicap is the translation of the problem at the social level. Spinal cord injury (SCI) is an injury to the spinal cord resulting in a change, either temporary or permanent, in its normal motor, sensory, or autonomic function.

Spinal cord injury is a low incidence, high cost disability requiring tremendous changes in an individual lifestyle.

The effect of SCI has an impact not only on the lives of the client and family but also on society as a whole.

The prognosis for the patient sustaining Spinal Cord Injury (SCI) was poor until the later part of the 20th century. An unknown Egyptian physician of 2500BC described SCI as ‘an ailment not to be treated’ (Grundy & Swain 1996). Sir Ludwig Guttmann pioneered a positive approach to the treatment of spinal cord lesions at Stoke Mandeville Hospital in the mid-1940, most people died of resultant complication(Guttmenn 1946).
1.2 NEED OF THE STUDY:

The Spinal Cord Injury

32 injuries are reported per million population or 7800 injuries in the US each year. Most researchers feel that these numbers represent significant under-reporting. Injuries not recorded include cases where the patient instantaneously or soon after the injury, cases with little or no remaining neurological deficit, and people who have neurologic problems secondary to trauma, but are not classified as SCI. Researchers estimate that an additional 20 cases per million (4860 per year) die before reaching the hospital.

Total Number of People with SCI

- 82% male, 18% female
- Highest per capita rate of injury occurs between ages 16-30
- Average age at injury - 33.4
- Median age at injury - 26
- Mode (most frequent) age at injury 19
- Motor vehicle accidents are the leading cause of SCI (44%), followed by acts of violence (24%), falls (22%) and sports (8%), other (2%)
- 2/3 of sports injuries are from diving
- Falls overtake motor vehicles as leading cause after age 45
- Acts of violence and sports cause less injuries as age increases
- Acts of violence have overtaken falls as the second most common source of spinal cord injury
- Marital status at injury:
  - Single 53%
  - Married 31%
  - Divorced 9%
  - Other 7%
- 5 years post-injury:
  - 88% of single people with SCI were still single vs. 65% of the non-SCI population
- 81% of married people with SCI were still married vs. 89% of the non-SCI population

- Employment status among persons between 16 and 59 years of age at injury:
  - Employed- 58.8%
  - Unemployed-41.2%
    (includes: students, retired, and homemakers)

- Employed 8 years post-injury:
  - Paraplegic 34.4%
  - Quadriplegic 24.3%

People who return to work in the first year post-injury usually return to the same job for the same employer. People who return to work after the first year post-injury either worked for different employers or were students who found work.85

**Most Frequent Neurological Category of SCI Patients**

- Tetraplegia – 16.9% complete; 38.3% incomplete
- Paraplegia – 22.9% complete; 21.5% incomplete

**Causes of Death among SCI Patients**

The most common cause of death is pneumonia, septicemia and pulmonary emboli, whereas, in the past, it was renal failure. An increasing number of people with SCI are dying of unrelated causes such as cancer or cardiovascular disease, similar to that of the general population. Mortality rates are significantly higher during the first year after injury than during subsequent years.

The NSCIA is continually finding out about people who have lived 30, 40, and even 50 years after their injuries.

**MORBIDITY**

Characteristics of Morbidities in Individuals With Paraplegia Living In Various Environments In India A Descriptive Study.NainaGuptal, John Solomon M2, Kavitha Raja 3Purpose of the study was to ascertain the morbidity trends in individuals with paraplegia who are living in different environments.

An ailment not to be treated was the description given to spinal cord injury, approximately 5000 years ago. Before 1970’s renal complications were the leading
cause of mortality among individual with SCI and after 1970’s respiratory complications became more prevalent. Unlike western countries mortality and mobility rates have not come down in India in spite of more technologies and rehabilitation facilities. Many of these individual gets readmission with preventable complication like respiratory complication, continuous use of catheters, pressure sore, postural hypotension spasticity, pain, fracture etc. these details are from the Medical records Section of our hospital which is a tertiary referral centre catering to an approximate population of twenty five million in south western India. The higher incidence of morbidity can be explained by the poverty line and rare unable to afford the cost of rehabilitation. A survey of 53 centers in India reports that in 37.5% of the institutions, less than 50% of total patients got an adequate rehabilitation during the hospitalization whereas 81.82% of the institutions had no facilities for a pre discharge home visit by the staff to suggest home modification and 73.9% institutions had no facilities for follow up home care services in India, the variation in the morbidity trends among SCI can be attributed to the financial resources, health care access including rehabilitation services, community set ups socio-cultural characteristics the support delivery system vary from centre to centre. In general the paraplegics can be found in armed correct run centers, centers run by NGOs and the community dwellers the deport delivery system of these three settings are distinctly different. This study aims to determine the morbidity trends in individuals with paraplegia living in different environments viz. centers run by the armed forces, specialized centers or non government organization and community.

Conclusion:

Pain was the leading cause of morbidity followed by spasticity and pressure sore. Though the pattern or morbidity remained the same, irrespective of the environment, the incidence was more among individuals in the community.

As per the literature the morbidity rated for paraplegics, pain is the leading cause of morbidity followed by spasticity , pressure sore, postural hypotension, fracture and respiratory complications.

The higher incidence of morbidities in the community may be explained by the fact that these subjects were spending more time in bed, low education level; lack of awareness regarding complications, lack of follow-ups, socio-cultural restraints or
lack of motivation can also be some of the reasons. Fracture incidence was the highest among individuals living in the centers run by armed forces, probably because they were involved in sports related activities were employed independence and were doing repetitive transfers. Overall, they found the incidence of morbidities being higher among individual living in the community followed by by individuals living in the centers run by armed forces and then individuals living in the specialized center or non-government organization.

**Mortality**

According to study on “mortality following spinal cord injury” the projected men life expectancy of spinal cord injured people compared to that of whole population was then estimated to approach 70% of normal for individuals with complete tetraplegia and 84% of normal for complete paraplegia. Patient with an incomplete lesion and motor functional capabilities are projected to have a life expectancy of at least 92?% of the normal population.

**1.3 PROBLEM STATEMENT:**

“Follow Up Study to Assess Effectiveness of Rehabilitation Therapy of the Patient with Traumatic Paraplegia.”

**1.4 OBJECTIVES OF THE STUDY:**

- To assess the Nursing Care received by the traumatic paraplegic patients.
- To compare the Barthel Index Score and the Nursing care received by the traumatic paraplegic patients.
- To assess the Effectiveness of Physical Rehabilitation Therapy of the traumatic paraplegic patients.
- To assess the Effectiveness of Social Rehabilitation Therapy of the traumatic paraplegic patients.
- To assess the Effectiveness of Psychological Rehabilitation Therapy of the traumatic paraplegic patients.
- To assess the Effectiveness of Vocational and Occupational Rehabilitation Therapy of the traumatic paraplegic patients.
• To assess the Effectiveness of Sexual Rehabilitation Therapy of the traumatic paraplegic patients.
• To find out the association between Barthel Index Score and Score of the Effectiveness of Social Rehabilitation therapy of the traumatic paraplegic patient.
• To find out association between the Barthel Index Score and Score of the Effectiveness of Psychological Rehabilitation of the traumatic paraplegic patient.
• To find out the association between the Barthel Index Score and Score of the Effectiveness of Vocational And Occupational Rehabilitation of the traumatic paraplegic patient.
• To find out association between the Barthel Index Score and Score of the Effectiveness of Sexual Rehabilitation of the traumatic paraplegic patient.

1.5 HYPOTHESES OF THE STUDY.
H1: There is significant association between score of Nursing Care received by the patient and Barthel Index Score of traumatic paraplegic patient.
H2: There is significant association between Operative Procedure performed and Barthel Index Score of traumatic paraplegic patient.
H3: Score of Effectiveness of Physical Rehabilitation Therapy of the traumatic paraplegic patient is statistically significant.
H4: There is significant association between score of Social Rehabilitation Therapy received by the patient and score of Effectiveness of Social Rehabilitation of traumatic paraplegic patient.
H5: Score of Effectiveness of Social Rehabilitation Therapy of the traumatic paraplegic patient is statistically significant.
H6: There is significant association between score of Psychological Rehabilitation Therapy received by the patient and score of Effectiveness of Psychological Rehabilitation of traumatic paraplegic patient.
H7: Score of Effectiveness of Social Rehabilitation Therapy of the traumatic paraplegic patient is statistically significant.
H8: There is significant association between score of Vocational and Occupational Rehabilitation Therapy received by the patient and score of Effectiveness of Vocational and Occupational Rehabilitation of traumatic paraplegic patient.
H9: Score of Effectiveness of Vocational and Occupational Rehabilitation Therapy of the traumatic paraplegic patient is statistically significant.

H10: There is significant association between score of Sexual Rehabilitation Therapy and score of Effectiveness of Sexual Rehabilitation of traumatic paraplegic patient.

H11: Score of Effectiveness of Sexual Rehabilitation of the traumatic paraplegic patient is statistically significant.

H12: There is significant association between Barthel Index Score and Score of Effectiveness of Social Rehabilitation of the traumatic paraplegic patient.

H13: There is significant association between Barthel Index Score and Score of Effectiveness of Psychological Rehabilitation of the traumatic paraplegic patient.

H14: There is significant association between Barthel Index Score and Score of Effectiveness of Vocational and Occupational Rehabilitation of the traumatic paraplegic patient.

H15: There is significant association between Barthel Index Score and Score of Effectiveness of Sexual Rehabilitation of the traumatic paraplegic patient.

1.6 OPERATIONAL DEFINITION:

Follow up Study

Assess:
It refers to determine effectiveness of the rehabilitation therapy by finding association between the rehabilitation therapy received by the patient and score of the effectiveness of rehabilitation therapy.

Effectiveness:
Statistical Positive relationship between score of rehabilitation therapy and score of effectiveness of rehabilitation therapy measured by semi structured tool to assess effectiveness of rehabilitation therapy.

Rehabilitation Therapy:
Services given by health team working at Government Spine institute, Ahmedabad to the traumatic paraplegic patient admitted in the Spine institute for Medical, Social, Psychological, Vocational and Occupational, and Sexual rehabilitation, measured by questionnaire to assess rehabilitation therapy received by the patient.
Patient:
Person admitted in Government Spine Institute, Ahmedabad for the treatment of traumatic paraplegia.

Traumatic paraplegia
Paralysis of both lower limbs due to spinal cord injury by trauma.

1.7 DELIMITATION OF THE STUDY:
This study is limited to:
→ Patient with traumatic paraplegia.
→ Patient admitted and got discharge from the Government Spine Institute, Ahmedabad, India.
→ Age of patient 18-65 years.
→ Sample size 200.

1.8 CONCEPTUAL FRAMEWORK
The conceptual framework is a group of related ideas, statements or concepts. The term conceptual model is often used interchangeably with conceptual framework and sometimes with grand theories those that articulate a broad range of the significant relationship among the concepts of a discipline, Kozeir Barbar,(2005).

The conceptual framework for this study was derived from general system given by Ludwig Von Bertanlaffy’s(1968). According to this theory, a system is a set of components or units interacting with each other within a boundary that filters the type and rate of exchange with the environment. All living systems are open in that there is a continual exchange of matters, energy and information. In open system, there are varying degree of interaction within the environment from which the system receives input and gives back output in the form of matter, energy and information.

The present study aims to assess the Effectiveness of Rehabilitation therapy of the Patient with Traumatic Paraplegia.

General system theory is useful in breaking the whole process into sequential tasks to ensure goal realization. Betalanffy explained that the system has three major aspects.
1. Input
2. Through put
3. Output
INPUT

Input is any form of energy, information, material or human that enters into the system through its boundaries. Though the process of selection the system regulates the type and amount of Input received.

In this study, the input consists of demographic variables such as Age, Gender of patient, and Income before injury, Income Present, Education status, marital status, Type of family and information about injury.

THROUGH PUT

It is the process that occurs between the input and output, which enables the input to be transformed as output in such a way that can be readily used by the system.

The through put consists of different types of Rehabilitation therapy. After processing the input, the systems output to the environment is in an altered state.

OUTPUT

It is any energy information & material that is transferred to the environment. After processing the input, the system’s output to the environment is in an altered state.

The outcome of Rehabilitation therapy improved overall wellbeing of Patient with Traumatic Paraplegia
**FIGURE: 5 MODIFIED LUDWIG VON BERTalanffys GENERAL SYSTEM MODEL (1968)**

**DEMOGRAPHIC VARIABLES**
- Age
- Gender
- Income before injury
- Income Present
- Education status
- Marital status
- Type of family
- Information about injury

**INPUT**

**ASSESSMENT**

**OUTPUT**

- Identify Nursing Care
- Effectiveness of Physical Rehabilitation
- Effectiveness of Social rehabilitation
- Effectiveness of Psychological rehabilitation
- Effectiveness of Vocational and Occupational rehabilitation
- Effectiveness of Sexual rehabilitation

**Identifying problems**