A Cross Sectional Study on The Type of Patients And Treatment Intervention in A Neurosurgery Department of A Tertiary Hospital in Bangladesh.

Submitted by

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Under the Guidance of

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Declaration by the candidate

I, **Sabber Masrur** (ID- 2013-3-79-028), hereby declare that the dissertation entitled 'A Cross Sectional Study on The Type of Patients And Treatment Intervention in A Neurosurgery Department of A Tertiary Hospital in Bangladesh' submitted by me to the Department of Pharmacy , East West University, in the partial fulfillment of the requirements for the degree of Masters of Pharmacy. This is a genuine and authentic thesis work carried out by me during Fall 2014- Spring 2015 under the supervision and guidance of **Dr. Repon Kumer Saha**, Assistant Professior, Department of Pharmacy, East West University.

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Certificate by the Supervisor

This is to certify that the dissertation entitled **"A cross sectional study on the type of patients and treatment intervention in a neurosurgery department of a tertiary hospital in Bangladesh"** is a complete record of original research work done by **Sabber Masrur,** in partial fulfillment of the requirement for the Degree of Masterts of Clinical Pharmacy and Molecular Pharmacology.

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Endorsement by Head of the Department

This is to certify that the dissertation entitled **"A cross sectional study on the type of patients and treatment intervention in a neurosurgery department of a tertiary hospital in Bangladesh"** is a complete record of original research work done by **Sabber Masrur,** under the guidance of **Dr. Repon Kumer Saha,** Assistant professor ,Department of pharmacy, East West university, Dhaka.

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List of Abbreviations

TBI=Traumatic brain injury;

ICH=intracerebral hemorrhage;

ND=neoplastic diseases;

SP=spinal pathology;

SAH=subarachnoid hemorrhage;

HAI=hydrocephalus.

cSDH =chronic subdural hematoma;

INF=infection; MSC=miscellaneous

C= cervical lesion;

CE=cauda equine syndrome;

HD=high dorsal lesion (D1–D6);

L=lumbar lesion;

LD=low dorsal Lesion (D7–D12);

OPLL=ossified posterior longitudinal ligament;

PIVD=prolapsed inter-vertebral disc

NTSCL= Non-traumatic spinal cord lesions

TSCL = Traumatic spinal cord lesions

OR= Odd ratios

MRI= Magnetic resonance imaging

CT = Computed tomography

CSF= Cerebro-spinal fluid

Abstract

Background: Neurosurgery is a very special field among the many branches of medical science. It is filled with challenges and excitement. According to recent data, the foundation of the neurological and neurosurgical departments of the Massachusetts General Hospital in Boston provides $55 million/year for scientific research.

Objectives: The objective of this study to find out demographic data, diagnosis technology, diagnosis impression, surgery history, different complications and treatment intervention of the neurosurgery patients at neurosurgery department in **Bangabandhu Sheikh Mujib Medical University (BSMMU).**

Methodology: This cross sectional study was carried out among 90 patients at neurosurgery department in **Bangabandhu Sheikh Mujib Medical University (BSMMU).** Sample was selected by simple random sampling technique.

Results: The study shows that 53% patients are male, 47 % are female. 33.33% patients were within the range of 41-50 years, 24.44 %of patients were within the range of 31-40 years.57.78 % patients blood group is B(+ve) and 22.22 % O(+ve). 68.89 % patients treatment duration between 0-60 days.56.67% patients weight range between 41-60 years.66.67 % patients are in prehypertension stage. 66.67% patients blood glucose level is in normal level and 33.33% are in hyperglycemic level. 70% patients are non-smoker. 47.96% patients were prepared for surgery.

Discussion: This study creates a defined relationship between the neurosurgery patients with their demographic data, diagnosis process, diagnosis impression, duration of treatment, complications /associated disease and also treatment intervention. This study will create huge energy for further analysis of acute or chronic conditions, or to answer questions about the causes of disease or the results of intervention or post-operative follow up.

Chapter One

Introduction

1.1 Neurosurgery

Neurological surgery or, neurosurgery is the medical specialty concerned with the prevention, diagnosis, treatment, and rehabilitation of disorders which affect any portion of the nervous system including the brain, spinal cord, peripheral nerves, and extra-cranial cerebrovascular system. General neurosurgery involves most neurosurgical conditions including neuro-trauma and other neuro-emergencies such as intracranial hemorrhage. Most level 1 hospitals have this kind of practice.

Specialized branches have developed to cater to special and difficult conditions. These specialized branches co-exist with general neurosurgery in more sophisticated hospitals. To practice this higher specialization within neurosurgery, additional higher fellowship training of 1–2 years is expected from the neurosurgeon. Some of these divisions of neurosurgery are:

1.Vascular and endovascular neurosurgery

2.Stereotactic,functional and epilepsy neurosurgery

3.Oncological neurosurgery

4.Skull Base Surgery

5.Spine neurosurgery

6.Peripheral nerve surgery

7.Pediatric neurosurgery.

Mainly the patients comes in neurosurgery department in a hospital for the treatment of meningioma, low back pain, neck pain, glioma, degenerative disc disorder, CP angle tumor, ependymoma, cerebral herniation, cerebellar tumor, tubercular brain abscess, pituitary tumor, hydrocephalus etc.

1.2 History of neurosurgery

Neurosurgery is a very special field among the many branches of medical science. It is filled with challenges and excitement. Looking back into the history, it seems that the trephination was performed approximately 5000 years ago. Skulls are found in Europe, Oceania, and Tibet; some of these have a sharp-edge hole in them. However, the actual instruments used by the aboriginal people and their reasons for drilling a hole in the cranium require further exploration. Unfortunately, no formal historical record exists. Resonance angiography and three-dimensional digital subtraction angiography for diagnosis, as well as improved microsurgical skills, the operative mortality of aneurysm surgery decreased significantly .Use of the combination method of intraoperative embolization and resection in the treatment of patients with giant AVMs, brought better results. Micro machines and Micro-electromechanical Systems (MEMS) are terms that are new to neurosurgeons but certain to become "household After neurosurgery entered the computed tomography era in the early 1970s, the diagnosis of neurological diseases became much easier and more precise, thus greatly promoting the advancement of neurosurgery. In the 1980s, the emergence of MRI and advancement in microsurgical skills doubtlessly improved neurosurgical practice. Today, several "high-tech" diagnostic and therapeutic modalities, such as functional MRI, open MRI, neuronavigation, and artificial intelligence (Robotic surgery), are used in many neurosurgical centers in Japan, China and other developed Western countries. There are no longer so-called forbidden areas in brain surgery in the 21st century, the "century of the brain." With the widespread intraoperative use of the microscope in the late 1980s, the mortality and postoperative complications in patients with some common cerebrovascular diseases decreased markedly. For example, with improvements in computed tomographic angiography, magnetic terms" in neurosurgery' in the near future. These new terms serve as an introduction to a New World of sensors, actuators, and "smart systems" that will change the ways in which neurosurgeons interact with their environment. Through the use of microelectronics and micromachining technologies, MEMS will allow neurosurgeons to perform familiar tasks with greater precision, perform tasks that previously were not done at all, and monitor physiological and biochemical parameters more accurately and with greater safety. It should be stressed, however, that most of the Bangladeshi population, especially in rural areas, still does not have access to effective neurosurgical services.

The number of neurosurgeons in Bangladesh is inadequate, and in number different areas of the country an imbalance exists with regard to the availability of neurosurgeons. In the future, it will be necessary to train many more young doctors in neurosurgical practice by sending them not only to foreign countries to gain advanced skills but also to rural areas for further practical experience. According to recent data, the foundation of the neurological and neurosurgical departments of the Massachusetts General Hospital in Boston provides $55 million/year for scientific research. Without sufficient financial support, it is understandable why there has been little creative work in this field in a developing country like Bangladesh. Neurosurgery faces many future challenges. The development and acquisition of new technology naturally leads to higher costs. Already, these issues are evident in cases where the state of the art dictates multimodal therapy while patients must choose between, for example, radiosurgery and microsurgery. Furthermore, postoperative follow-up of large numbers of patients can be difficult, making problematic the translation of clinical experience into clinical research. Resource availability issues will become even direr as continued economic development of our country increases the population's standard of living and further elevates the public's expectations. Despite these challenges, the evolution of neurosurgery in Bangladesh from the recent past to its current status is indeed encouraging. It has begun to develop, and it will advance further in future (Rahman, 2010).

1.3 The development of neurosurgery in Bangladesh

Bangladesh has an average life expectancy of approximately 60 years. The chances of dying between the ages of 15 and 60 years are more than 1 in 4. Health remains an important goal and instrument of development in this ever-growing nation. The beginning of neurosurgery is not very new in Bangladesh. It started its expedition following the liberation war in 1971 in IPGMR, under the guidance and concentration of Ex. Professor Rashid Uddin Ahmed. Inspired by him, others like Professor Ata Elahi Khan and Professor L. A. Quadery had established neurosurgery ward respectively in DMCH and CMCH. Since then they had been working hard together to establish to increase the number of beds in ward, and motivated, inspired and trained new doctors to consider neurosurgery as career path. In the mean time they also established neurosurgery teaching in under-graduate level.

At that time private neurological practice was rare and undeveloped. But after a long dormant period of time, in the year 1998 neurosurgery post graduate courses started both in IPGMR and DMCH simultaneously, which has then gradually expanded to CMCH and MMCH too. Following the upgradation of post graduate courses and rapid development of skilled Neurosurgeons; neurosurgery diagnostic facilities like CT Scan, MRI, Myelography were also becoming available gradually. At that time Neurosurgeons most commonly deals with head Injuries, spinal injuries, brain tumor, spinal tumor, PLID etc.

Following year 2000, there was a rapid progression of neurosurgery further both in private and in government level. At the same time post-graduation courses also expanded much more ever than the past. Hence the neurological facilities have been becoming more available for all income level persons like the richer and poorer. Now we have CT-Angio, DSA, Transcranial doppler, good quality Microscope facilities in Bangladesh. With the available investigations, diagnostic facilities, operative facilities and good neuroanesthesia; Neurosurgeons are now also developed their skillness in vascular neurosurgery, pediatric neurosurgery, endoscopic neurosurgery and steriotactic neurosurgery.

Now all types of neurosurgical cases can be dealt in BSMMU, DMCH, and other equiped clinics and hospitals. We are still in lacking of Gamma knife radiosurgery, Neuro-navigation, Image guided surgery for super management of patient. We are no more lagging behind our relative countries. By continuous suitable training from home and abroad, we are taking hard step to decrease mortality and morbidity of neurological patient, which is a common issue for our society. Now promising new doctors are continuing to learn and devote in taking neurosurgery following residency postgraduation in BSMMU, MS courses and more other postgraduation courses in respective Hospitals. Neurologic trainees and the Neurologists are now also much more enthusiast to do clinical research.

Neurosurgeons now-a-days are dealing with critical cases like head injuries, brain disorders, spinal pathologies and peripheral nerve problems. We are also hopeful that, very soon we would be able to achieve and develop our standard of neurosurgery to an International level by our determination and continuous effort, and by suitable and update learning, teaching and training. Though, Government and private sectors are now more attentive regarding to the development of neurosurgery as an emergency and critical care. But it is still need more throughout our country hospitals for cancer and heart disease have sprung up (Alams & Khaira, 2010).

1.4 Cross-sectional study:

A cross-sectional study examines the relationship between diseases (or other health related state) and other variables of interest as they exist in a defined population at a single point in time or over a short period of time (e.g. calendar year).

Cross-sectional studies can be thought of as providing a snapshot of the frequency of a disease or other health related characteristics (e.g. exposure variables) in a population at a given point in time. Cross-sectional studies are used to assess the burden of disease or health needs of a population and are particularly useful in informing the planning and allocation of health resources.

1.4.1 Types of cross-sectional study

Descriptive

A cross-sectional survey may be purely descriptive and used to assess the burden of a particular disease in a defined population. For example a random sample of schools across London may be used to assess the prevalence of asthma among 12-14 year olds.

Analytical

Analytical cross-sectional surveys may also be used to investigate the association between a putative risk factor and a health outcome. However this type of study is limited in its ability to draw valid conclusions as to the association between a risk factor and health outcome. In a cross-sectional survey the risk factors and outcome are measured simultaneously, and therefore it may be difficult to determine whether the exposure proceeded or followed the disease.

In practice, cross-sectional studies will include an element of both types of design.

1.4.2. Potential bias in cross-sectional studies

Non-response is a particular problem affecting cross-sectional studies and can result in bias of the measures of outcome. This is a particular problem when the characteristics of non-responders differ from responders.

1.4.3. Analysis of cross-sectional studies

In a cross-sectional study all factors (exposure, outcome, and confounders) are measured simultaneously. The main outcome measure obtained from a cross-sectional study is prevalence, that is:

$$\text{Prevalence} = \frac{\text{Number of cases in a defined population at one point in time}}{\text{Number of persons in a defined population at the same point in time}}$$

Note that for continuous variables such as blood pressure or weight, prevalence may only be calculated when the variable is divided into those which fall below or above a particular pre-determined level. Alternatively, mean or median levels may be calculated. In analytical cross-sectional studies, the odds ratio can be used to assess the strength of an association between a risk factor and health outcome of interest, provided that the current exposure accurately reflects the past exposure.

1.4.4. Strengths and weaknesses of cross-sectional studies

Strengths

- Relatively quick and easy to conduct (no long periods of follow-up).
- Data on all variables is only collected once.
- Able to measure prevalence for all factors under investigation.
- Multiple outcomes and exposures can be studied.
- The prevalence of disease or other health related characteristics are important in public health for assessing the burden of disease in a specified population and in planning and allocating health resources.
- Good for descriptive analyses and for generating hypotheses.

Weaknesses

- Difficult to determine whether the outcome followed exposure in time or exposure resulted from the outcome.
- Not suitable for studying rare diseases or diseases with a short duration.
- As cross-sectional studies measure prevalent rather than incident cases, the data will always reflect determinants of survival as well as aetiology.
- Unable to measure incidence.
- Associations identified may be difficult to interpret.

- Susceptible to bias due to low response and misclassification due to recall bias.

1.5 Review of different cross sectional study on neurosurgery:

1.5.1 Acute care in neurosurgery: quantity, quality, and challenges

Schuhmann et al. performed a survey over a 1 year period, all acute care cases managed by two neurosurgical on call teams in a large northern German city, were recorded prospectively on a day by day basis. A large database of 1819 entries was created and analyzed using descriptive statistics under the following field headings:

Personal data

Date and time of first contact

Patient origin (emergency room, different hospital, within own hospital)

Suspected diagnosis

Duration of symptoms

Neurological status

Existing images and mode of image transfer

Neurosurgical action

They found that the minimum incidence of patients requiring neurosurgical acute care was estimated to be 75–115/100 000 inhabitants/year. This corresponds to a mean of about 6/day. Only 30% of patients came directly via the emergency room. The fate of 70% of patients depended initially on the “neurosurgical qualification” of primary care doctors and here deficits existed. Although most intracerebral and subarachnoid hemorrhages were managed with the participation of neurosurgeons, they were not involved in the management of most mild and moderate traumatic brain injuries. Within 1 year the additional workload from acute care amounted to 1000 unplanned admissions, 900 acute imaging procedures, and almost 400 emergency operations (Schuhmann et al., 2001).

TABLE 1.1: Incidence of diseases according to final diagnosis and accuracy of referring Diagnosis

Diagnosis group	Recorded patients (n)	Estimated total (n)	Total (%)	Incidence (number/100000 inhabitants/y)	Deviant referring diagnosis (%)
TBI	484	583	26.6	19–29	5.6
ICH	320	412	17.6	14–21	4.4
ND	222	303	12.2	10–15	7.7
SP	168	235	9.2	8–12	7.7
SAH	119	147	6.5	5–7	2.5
HAI	107	121	5.9	4–6	29
cSDH	81	101	4.5	3–5	6.2
INF	40	52	2.2	2–3	12.5
MSC	278	333	15.3	11–17	40.6
Total	1819	2287	100	76–114	

TBI=Traumatic brain injury; ICH=intracerebral haemorrhage; ND=neoplastic diseases; SP=spinal pathology; SAH=subarachnoid haemorrhage; HAI=hydrocephalus. cSDH=chronic subdural haematoma; INF=infection; MSC=miscellaneous.

1.5.2. Non-traumatic spinal cord lesions: epidemiology, complications, neurological and functional outcome of rehabilitation:

Gupta et all. Performed a prospective study consisted of 64 patients with NTSCL (Non-traumatic spinal cord lesions) admitted in neurological rehabilitation unit over a period of 32 months (June 2005–January 2008). During this period, overall 106 patients with spinal cord lesions (both traumatic and non-traumatic) were admitted for in-patient rehabilitation. Patients who were medically stable and able to participate actively for at least 2 hrs per day in the rehabilitation were included in the study. Patients with cardiorespiratory co-morbidities, requiring ventilator for assisted respiration, and with unstable vertebral injuries were excluded.they found that NTSCL constituted 60% (64 of 106) of the total SCL patients admitted for rehabilitation during the same period. Female patients outnumbered males (56.25%) in the study. Mean age, duration of illness and duration of stay in rehabilitation were 30.64±13.67 years (6–57), 7.09±9.15 months (1–48) and 55.75±40.91 days (14–193), respectively. The ratio of paraplegia and quadriplegia was 2:1. Forty-four patients (68.75%) had incomplete cord lesion according to the ASIA impairment scale. Spinal tumors (26.6%) were found to be the most common etiology, followed by Pott's spine (25%) and transverse myelitis (22%). Urinary tract infection was found to be the most common complication (50%), followed by spasticity (35.93%) and urinary incontinence (31.25%). The mean BI scores showed significant (P=0.000) functional recovery during rehabilitation using paired Student's t-test. The ASIA (American Spinal Injury Association) impairment scale showed significant neurological recovery (P=0.001) using the Wilcoxon non-parametric test (Gupta et al., 2008).

The etiology of NTSCL is given in table 1.2

Table 1.2: The etiology of NTSCL

Diagnosis	**No. of patients**	**%**	**Level of lesion**
Spinal tumors	17	26.6	C-7, HD-1, LD-8, L-1
Pott's spine	16	25	C-5, HD-2, LD-9
Transverse myelitis	14	22	C-3, HD-2, LD-9
OPLL	7	10.9	C-3, LD-4
Demyelination	4	6.3	C-1, HD-1, LD-2
Spinal arachnoiditis	2	3.1	LD-2
PIVD	2	3.1	C-1, CE-1
Ischemic myelopathy	1	1.6	C-1
Organo-phosphorus poisoning induced myelopathy	1	1.6	LD-1
Total	64	100	

Abbreviations: C, cervical lesion; CE, cauda equina syndrome; HD, high dorsal lesion (D1–D6); L, lumbar lesion; LD, low dorsal Lesion (D7–D12); OPLL, ossified posterior longitudinal ligament; PIVD, prolapsed inter-vertebral disc.

The frequency of common medical complications is shown in table 1.3

Table 1.3: Medical complications during in-patient rehabilitation

Complications	**No. of patients**	**%**
Urinary tract infection	32	50
Spasticity	23	35.93
Urinary incontinence	20	31.25
Pressure ulcers	16	25
Constipation	15	23.5
Pain	14	21.87
Depression	14	21.87
Deep vein thrombosis	4	6.3
Flexor spasms	4	6.3
Genital ulcer/trauma	2	3.1
No complications	6	9.4

This study gives further information about change in the demographic profile in NTSCL patients compared with TSCL patients in the form of less gender difference in the former. No trend toward any specific age group was noted in the study in contrast to some earlier studies. The study is suggestive of the fact that patients with NTSCL tend to have less-severe, incomplete injury and more paraplegics when compared with TSCL. Adequate provision of assistive devices/orthoses contributes favorably in making these patients independent/less dependent for transportation and locomotion. Further, rehabilitation has an indispensable role to play in favorable functional outcome and prevention/management of medical complication after NTSCL. The demographic characteristics of this study were in accordance with the earlier studies performed on NTSCL. In this study, patients with NTSCL had a more even gender distribution with women outnumbered men (36 of 64) as compared to the results with TSCL where almost all studies have found male preponderance with most common age group ranging between 16 and 30 years. Similar findings with male predominance among TSCL were also found in our earlier study. However, in contrast with these studies,no age-related trend was found in the present study, and the patients were distributed equally in all age groups. This could be attributed to the fact that in these studies most of the patients with spinal tumors, which was the most common etiology, had secondary tumors, which is a late decade phenomenon. In our study, all patients barring none had primary spinal tumors, which may occur at very early age.

More than two-third of the patients in the study (68.75%—44 of 64) had incomplete cord lesion, and this trend was noticed both in quadriplegia (62%—13 of 21) and in paraplegia (72%—31 of 43). The injuries were found to be less severe (incomplete). The ratio of paraplegia and quadriplegia was found to be 2:1. The severity and completeness of the injury, as well as the clinical pattern of cord lesions observed in the study, were similar to some earlier studies. This may be due to a combination of factors, such as the region of the spinal cord involved in NTSCL and the often insidious nature of the lesion. The specific pattern of the lesions seen at individual centers could influence the severity of the NTSCL seen. Considering the etiology of the spinal cord lesions, most of NTSCL have the propensity to develop in the dorsal or dorsolumbar region, except the ossification/fluorosis of the posterior longitudinal ligament which is reported to be more common in the cervical region (McKinley, 2000).

The most common etiology in this study was spinal tumors. Some earlier studies have also reported tumors as the most common etiology in their series. But as compared to these studies, the present study has all primary tumors. All spinal tumors were already operated and then taken over by the rehabilitation unit for further rehabilitation. These cases showed both neurological and functional recovery during their stay in rehabilitation. However, as this is a cross-sectional study, conclusions cannot be drawn on the long-term outcome in these cases. Some studies performed in the same region have reported Pott's spine as the most common etiology of NTSCL in their series. In our study also it was the second most common cause of NTSCL.

More than 76% of patients (16/21) with quadriplegia required assistive devices, orthoses or both as a means of mobility, transfers and locomotion. Among paraplegics, 53.48% of patients (23/43) needed them for mobility, transfers and locomotion. Fourteen patients (21.9%) required lower limb orthoses for locomotion, 6 patients (9.4%) required walkers and an additional 10 patients (15.6%) used both for locomotion. Nine patients (14.1%) used wheelchairs for transportation and mobility. In an earlier study, wheelchairs were rated significantly higher than long leg braces on value, potency and activity and transportation. It was also observed that wheelchair users had complete cord lesions and were older, whereas orthoses users had incomplete injury and were youngers the present study is not a follow-up study, it is impossible to comment on the future use of orthoses or wheelchairs after discharge from the rehabilitation unit.

Mortality and morbidity after TSCL are higher in people with higher age at incubate Nair in their study on NTSCL, did not observe significant correlation between age and frequency of medical complications during the rehabilitation phase. In the present study, 90.62% of patients (58/64) had at least one medical complication during in-patient rehabilitation. Similar frequency was noted by Nair *et al.* in their series with NTSCL patients. However, New et al. observed a lower incidence (63.2%) of medical complications in their series. UTI was found in 50% of patients (32/64) and was the most common medical complication in the present study. All NTSCL patients are taken on clean intermittent catheterization/self-catheterization soon after admission in the rehabilitation unit after getting a urine culture sample. Prophylactic antibiotic was not given routinely to the patients and only symptomatic UTIs (with fever) were treated with antibiotics. Abdominal ultrasound was urodynamic studies performed in all patients with spinal cord lesion admitted in the rehabilitation unit. Despite all these protocols, the reasons for this high UTI could be poor compliance in relation to timed voiding, poor hygiene with CIC, indwelling catheter for prolonged period (before coming to the rehabilitation ward) and neurogenic bladder with irrigative or obstructive urinary symptoms.

Spasticity was the second most common complication with 35.93% (23 of 64), urinary incontinence in 31.25% (20 of 64) and pressure ulcers in 25% of patients (16/64). Nair reported genitor-urinary complications in 70% of the participants in their series, with 60% of patients having at least one episode of UTI. Present study showed similar frequency of UTI (64–80%) among patients with SCL. Similar frequency of UTI has been noted in different rehabilitation settings within the National Health Service in United Kingdom. Some other studies on NTSCL have reported lower frequency of UTI. The reason behind this low frequency could be; because of different etiology of the cord lesion, bladder management technique, usage of antibiotics and infection control protocols. In NTSCL, the frequency of spasticity ranged from 14.9 to 56%. In the present study, spasticity was found to be present in 35.93% of patients. Maynard reported 32.2% of patients with TSCL developed spasticity before discharge from hospital. So our study showed a similar trend, although with NTSCL. In this study, the frequency of pressure ulcers was 25% (16 of 64), which is similar to earlier studies with NTSCL. As ulcers take long time to heal, strategies of prevention and treatment should be an integral part of the protocol for rehabilitation of subjects with NTSCL. Fifteen patients in the study had constipation during rehabilitation. It could be because of immobility, changes in colonic compliance, prolonged transit time, fecal impaction, poor fluid intake and low fiber content in the diet. A regular bowel program with adequate fluid and fiber intake may help in preventing constipation.

Neurological recovery is an important aspect of rehabilitation of patients with NTSCL. Significant neurological recovery was noted in this study during the period of rehabilitation

(*P*=0.001), as most of the patients improved by at least one grade according to the ASIA impairment scale at the time of discharge. Eight patients, who were ASIA-A at admission, showed recovery by at least one grade by the time of discharge. The reason could be that the patients were in spinal shock at admission or that their infection (in cases of Pott's spine and transverse myelitis) subsided with treatment during stay in rehabilitation and they showed neurological recovery. Catz in their study, observed complete or substantial neurological recovery (Frankel Grade D or E) in patients with NTSCL in rehabilitation with 51% of patients with Grade A, B or C on admission were improved to Grade D by the time of discharge. According to the authors, neurological recovery in NTSCL during rehabilitation was significantly affected by initial Frankel grade and etiology, and recovery is usually better in NTSCLs than in TSCLs. Ronen *et al*. in their study with spinal stenosis patients, reported significant neurological recovery in 58% of cases after inpatient rehabilitation. Providing an optimum environment for spontaneous recovery, preventing/managing secondary complications as well as medication or other treatment modality as per the etiology of the lesion and proper physiotherapy are some of the contributory factors in the neurological recovery of patients with NTSCL.

Functional recovery was assessed by comparing the mean BI score at-admission with at-discharge scores. Significant functional recovery was observed in the study (*P*=0.000) during the period of rehabilitation. Several studies have shown similar significant functional recovery among patients with NTSCL, underlying the important role of rehabilitation in making these patients independent for their activities of daily living, mobility and locomotion.

1.5.3 Cross-sectional magnetic resonance imaging study of lumbar disc degeneration in 200 healthy individuals:

Kanayama et all. performed the current cross-sectional observational MR imaging study aimed to investigate the prevalence and risk factors of lumbar disc degeneration in a healthy population and to establish the baseline data for a prospective longitudinal study. Two hundred healthy volunteers participated in this study after providing informed consent. The status of lumbar disc degeneration was assessed by 3 independent observers, who used sagittal T2-weighted MR imaging. Demographic data collected included age, sex, body mass index, episode(s) of low-back pain, smoking status, hours of standing and sitting, and Roland-Morris Disability Questionnaire scores. There were 68 men and 132 women whose mean age was 39.7 years (range 30–55 years). Eighty-two individuals (41%) were smokers, and the Roland-Morris Disability Questionnaire scores were averaged to 0.6/24 (Kanayama et al., 2009).

There were 68 men and 132 women whose mean age was 39.7 years (range 30–55 years). The BMI was averaged to 22.6 ± 3.6%. Eighty-two individuals (41%) were smokers. The Roland-Morris Disability Questionnaire and Oswestry Disability Index were 0.6 ± 1.6/24 and 5.7 ± 6.5/100, respectively. The demographic data are listed in table 1.4

TABLE 1.4: Demographic obtained in 200 healthy individuals in whom lumbar disc degeneration was assessed

Variable	No. of patients (%)
Sex	
Male	68 (34.0)
Female	132 (66.0)
age (yrs)	
30–40	103 (51.5)
40–50	80 (40.0)
50–55	17 (8.5)
BMI	
<18.5%	17 (8.5)
18.5–25.0%	143 (71.5)
25.0–30.0%	32 (16.0)
>30.0%	8 (4.0)
smoking status	
Smoker	82 (41.0)
Nonsmoker	118 (59.0)
Episode of low-back pain	
Yes	128 (64.0)
No	72 (36.0)
Physical daily activities	
(Hours of sitting)	
<4	111 (55.5)
4–8	66 (33.0)
>8	23 (11.5)
(Hours of standing)	
<4	60 (30.0)
4–8	97 (48.5)
>8	43 (21.5)

Multiple logistic regression analysis was done to investigate the relation between demographics and lumbar disc abnormalities. Regarding disc degeneration (Grade 2 to 3), age was a significant risk factor when examining any disc levels except L5–S1 (table 1.5);

TABLE 1.5: Risk factors for disc degeneration

Disc Level/Risk	OR (95% CI)	p Value
L2–3		
Male	1.87 (0.393–8.89)	0.432
age (yrs)		
40–50	2.60 (0.77–8.78)	0.124
>50	21.78 (4.74–100.06)	<0.001*
episode of LBP	2.98 (0.98–9.04)	0.054
Smoking	0.38 (0.12–1.23)	0.106
BMI >25%	2.11 (0.61–7.33)	0.240
standing >4hrs	0.78 (0.15–3.99)	0.767
sitting >4 hrs	0.48 (0.09–2.45)	0.374
L3–4		
Male	1.24 (0.36–4.25)	0.732
age (yrs)		
40–50	2.80 (1.03–7.59)	0.043*
>50	12.23 (3.20–46.83)	<0.001*
episode of LBP	2.15 (0.81–5.69)	0.123
Smoking	1.39 (0.56–3.49)	0.481
BMI >25%	0.53 (0.15–1.86)	0.322
standing >4hrs	1.89 (0.50–7.10)	0.345
sitting >4 hrs	1.51 (0.42–5.34)	0.527
L4–5		
Male	0.90 (0.35–2.32)	0.827
age (yrs)		
40–50	3.99 (2.00–7.96)	<0.001*
>50	18.12 (3.50–93.76)	<0.001*
episode of LBP	0.74 (0.35–1.53)	0.413
Smoking	0.94 (0.48–1.84)	0.861
BMI >25%	2.33 (0.93–5.85)	0.071
standing >4hrs	1.91 (0.67–5.45)	0.227
sitting >4 hrs	1.99 (0.77–5.19)	0.158
L5–S1		
Male	0.68 (0.28–1.64)	0.386
age (yrs)		
40–50	1.59 (0.84–3.00)	0.151
>50	3.28 (0.92–11.69)	0.067
episode of LBP	1.28 (0.65–2.52)	0.475

Smoking	1.05 (0.56–1.95)	0.889
BMI >25%	1.26 (0.55–2.89)	0.589
standing >4hrs	1.85 (0.71–4.84)	0.208
sitting >4 hrs	0.79 (0.31–1.97)	0.605

* Disc degeneration was defined as Grade 2 ("marked") or Grade 3 ("absent") according to the Schneiderman grading system. Abbreviation: LBP = low-back pain

Other parameters (episode of low-back pain, smoking status, BMI, and hours of standing/sitting) were not found to be significantly related to disc degeneration. As listed in table 1.6, a Modic change in the L4–5 endplate was related to low-back pain (OR 3.46, p = 0.035) and hours of sitting (OR 5.06, p = 0.039). An HIZ in the L4–5 disc was only related to the age group of 40–50 years (OR 2.55, p = 0.014). Smoking and BMI were not significantly related to Modic change and HIZ.

TABLE 1.6: Risk factors for Modic change and HIZ

Variable	OR (95% CI)	p Value
Modic change		
L4–5		
Male	1.03 (0.26–4.08)	0.971
Age (yrs)		
40–50	2.56 (0.84–7.79)	0.097
>50	1.37 (0.24–7.78)	0.724
episode of LBP	3.46(1.09–10.94)	0.035*
Smoking	0.65 (0.21–1.96)	0.441
BMI >25%	0.70 (0.17–2.83)	0.618
standing >4hrs	3.65(0.80–16.71)	0.096
sitting >4 hrs	5.06(1.09–23.53)	0.039*
L5–S1		
Male	1.33 (0.33–5.35)	0.692
age (yrs)		
40–50	1.40 (0.47–4.18)	0.551
>50	0.88 (0.14–5.41)	0.891
episode of LBP	0.60 (0.17–2.12)	0.429
Smoking	0.64 (0.21–1.94)	0.433
BMI >25%	1.31 (0.36–4.71)	0.680
standing >4hrs	2.46 (0.52–11.71)	0.258
sitting >4hrs	0.96 (0.24–3.96)	0.958
HIZ		
L4–5		
Male	0.50 (0.18–1.37)	0.178
age (yrs)		
40–50	2.55 (1.21–5.38)	0.014*
>50	1.45 (0.37–5.67)	0.592
episode of LBP	0.82 (0.36–1.86)	0.638
Smoking	0.99 (0.47–2.09)	0.981
BMI >25%	1.63 (0.63–4.23)	0.317
standing >4hrs	1.90 (0.65–5.58)	0.240
sitting > 4hrs	1.72 (0.63–4.65)	0.287
L5–S1		
Male	1.13 (0.41–3.11)	0.809
Age		
40–50	1.43 (0.67–3.03)	0.352
episode of LBP	1.81 (0.84–3.93)	0.132
Smoking	1.46 (0.71–3.00)	0.303
BMI >25%	0.77 (0.29–2.05)	0.603
standing >4hrs	1.55 (0.52–4.67)	0.434
sitting >4 hrs	0.43 (0.16–1.21)	0.110

TABLE 1.7: Risk factors for disc herniation

Disc Level/Risk	OR (95% CI)	p Value
L3–4		
Male	0.74 (0.13–4.11)	0.728
age (yrs)		
40–50	1.94 (0.42–8.95)	0.397
>50	11.70 (1.68–81.76)	0.013*
episode of LBP	0.64 (0.13–3.20)	0.588
Smoking	1.29 (0.32–5.12)	0.723
BMI >25%	0.91 (0.16–5.29)	0.912
standing >4hrs	0.90 (0.16–5.02)	0.908
sitting >4 hrs	1.93 (0.32–11.60)	0.475
L4–5		
Male	1.02 (0.37–2.86)	0.966
age (yrs)		
40–50	2.18 (1.03–4.63)	0.042*
>50	4.51 (1.35–15.09)	0.015*
episode of LBP	0.82 (0.37–1.84)	0.634
smoking	1.36 (0.65–2.84)	0.412
BMI >25%	1.67 (0.65–4.26)	0.286
standing >4hrs	2.20 (0.75–6.44)	0.149
sitting >4hrs	3.52 (1.26–9.84)	0.016*
L5–S1		
Male	0.48 (0.19–1.19)	0.113
age (yrs)		
40–50	0.95 (0.49–1.83)	0.870
>50	1.12 (0.35–3.56)	0.847
episode of LBP	0.92 (0.45–1.88)	0.822
smoking	1.39 (0.73–2.66)	0.319
BMI >25%	1.20 (0.51–2.84)	0.675
standing >4hrs	1.33 (0.50–3.52)	0.570
sitting >4hrs	0.86 (0.34–2.14)	0.739

Hours of sitting was a significant risk factor related to L4–5 disc herniation (OR 3.52, p = 0.016). Smoking, BMI, and hours of standing were not significantly related to lumbar disc herniation.

An MR imaging analysis of 200 healthy individuals showed that half of the population had disc degeneration at lower lumbar levels. A herniated disc was observed in 25% of the population at L4–5 and 35% at L5–S1. Age and hours sitting were significant risk factors for L4–5 disc herniation. Episode of low-back pain, smoking status, obesity, and hours standing did not significantly affect the prevalence of disc degeneration and herniated disc (Nagy, 2014).

1.5.4 Association between low-back pain and lumbar spine bone density: a population-based cross-sectional study:

Lee et all. Performed this study to investigate the relationships between low-back pain (LBP) and spinal bone density. However, there have been limited studies addressing the relationships between LBP and spinal bone density. Data were obtained from the population-based Fourth Korea National Health and Nutrition Examination Survey K-NHANES IV, 2009. From 10,533 K-NHANES participants, the authors identified 7144 (3099 men and 4045 women) 21 years of age or older who underwent dual-energy x-ray absorptiometry and anthropometric measurements for inclusion in this study. Low-back pain patients were defined as those who had been diagnosed with LBP by a medical doctor. Chi-square tests, t-tests, and multivariable logistic regression analyses were used to examine the relationships between LBP and spinal bone density. This study was based on data obtained from the cross-sectional K-NHANES IV, which was conducted by the Korean Ministry of Health and Welfare from January to December 2009.

The relationships between LBP and the participants' socio-demographic, personal, and medical characteristics are shown in table. A total of 1221 (17.1%) of 7144 participants reported LBP. The proportion of patients with LBP was significantly higher among females than among males (21.0% vs 12.1%, $p < 0.001$). LBP was more prevalent in the older population than in the younger population ($p < 0.001$). Of participants 21–30 years old, 6.5% had LBP; in contrast, 34.1% of participants 71 years or older had LBP. The proportion of patients with LBP was higher among those living in rural areas (23.9%) than among those living in urban areas (14.7%)

(p < 0.001). One-third of agricultural and fishery workers suffered from LBP (31.7%), while only a small percentage of clerks (7.7%) suffered LBP (p < 0.001). As education level increased, the proportion of LBP patients decreased (p < 0.001). The proportion of LBP was the greatest in subjects with less than 6 years of education (31%) and the lowest in those with more than 13 years of education (8.0%). However, the relationship between income and LBP was not significant (p = 0.604) (Lee et al., 2013).

TABLE 1.8: The relationships between LBP and the participants' socio-demographic, personal, and medical characteristics

Variable & Category	No LBP (%)	LBP (%)	p Value
Sex			<0.001
Male	2720 (87.9)	374 (12.1)	
Female	3188 (79.0)	847 (21.0)	
age (yrs)*			<0.001
21–30	906 (93.5)	63 (6.5)	
31–40	1303 (91.3)	124 (8.7)	
41–50	1253 (87.7)	176 (12.3)	
51–60	980 (80.2)	242 (19.8)	
61–70	848 (74.1)	296 (25.9)	
≥71	618 (65.9)	320 (34.1)	
place of residence			<0.001
City	4489 (85.3)	775 (14.7)	
rural area	1419 (76.1)	446 (23.9)	
Occupation			<0.001
professional, manager, or administrator	730 (92.3)	61 (7.7)	
Clerk	525 (92.8)	41 (7.2)	
sales or service worker	826 (88.2)	110 (11.8)	
agricultural or fishery worker	435 (68.3)	202 (31.7)	
plant or machine operator	596 (87.5)	85 (12.5)	
manual worker	512 (83.8)	99 (16.2)	
unemployed (unemployed men, housewives, students)	2233 (78.3)	619 (21.7)	
education (yrs)			<0.001
≤6	1396 (69.0)	626 (31.0)	
7–9	671 (81.8)	149 (18.2)	
Variable & Category	No LBP (%)	LBP (%)	p Value
≥13	1713 (92.0)	149 (8.0)	
Income			0.598
Low	1448 (82.2)	314 (17.8)	
lower middle	1454 (82.1)	317 (17.9)	
upper middle	1461 (83.5)	288 (16.5)	
High	1471 (83.2)	298 (16.8)	

cigarette use			<0.001
Nonsmoker	3289 (79.6)	844 (20.4)	
<5 lifetime packs	134 (88.2)	18 (11.8)	
≥5 lifetime packs	2456 (87.3)	356 (12.7)	
alcohol use			<0.001
>2 times per mo	3231 (78.9)	864 (21.1)	
1–4 times per mo	1336 (88.1)	181 (11.9)	
>2 times per wk	1341 (88.4)	176 (11.6)	
Exercise			0.055
No	5068 (83.2)	1027 (16.8)	
Yes	816 (81.0)	191 (19.0)	
Hypertension			<0.001
No	4758 (85.0)	838 (15.0)	
Yes	1150 (75.0)	383 (25.0)	
diabetes mellitus			<0.001
No	5477 (83.5)	1083 (16.5)	
Yes	431 (75.7)	138 (24.3)	
Depression			<0.001
No	5214 (84.6)	952 (15.4)	
Yes	694 (72.1)	269 (27.9)	

More LBP patients were observed among nonsmokers (20.4%) than smokers who had smoked less than 5 lifetime packs of cigarettes (11.8%) or smokers who had smoked more than 5 lifetime packs (12.7%) ($p < 0.001$). Drinking behavior was also associated with LBP ($p < 0.001$). People who never drink alcohol or drink less than one time per month have more chance of reporting LBP than those who drink alcohol more frequently. However, there was no association between exercise and LBP ($p = 0.055$). All 3 medical factors, hypertension ($p < 0.001$), diabetes ($p < 0.001$), and depression ($p < 0.001$), were associated with LBP.

The results of analyses of the relationships between LBP and waist circumference, BMI, and lumbar spine T-score are shown in table 1.9 Among males, the average waist circumference of individuals with LBP (8.09) was not significantly different from that of those who did not have LBP (8.02) ($p = 0.169$). Among females, however, the average waist circumference of LBP patients was higher (7.71) than that of those who did not have LBP (7.45) ($p < 0.001$). Likewise, the BMI differed significantly between individuals with and without LBP only in females; females with LBP had a higher mean BMI (6.83 kg/m^2) than those without LBP (6.64 kg/m^2) ($p < 0.001$). Lumbar spine T-scores were significantly higher in females without LBP than with LBP ($p < 0.001$). However, no significant difference with respect to lumbar spine T-scores was observed in males ($p = 0.950$).

TABLE 1.9: **Analysis of the relationships between LBP and mean waist circumference, BMI, and lumbar spine T-score.**

Analysis of the relationships between LBP and mean waist circumference, BMI, and lumbar spine T-scores*

Variable	**Male**			**Female**		
	No LBP	**LBP**	**p Value**	**No LBP**	**LBP**	**p Value**
waist circumference	8.02 ± 0.85	8.09 ± 0.85	0.169	7.45 ± 0.95	7.71 ± 0.94	<0.001
BMI	6.84 ± 0.90	6.78 ± 0.90	0.284	6.64 ± 1.0	6.83 ± 0.96	<0.001
lumbar spine T-score	−0.37 ± 0.88	−0.37 ± 1.04	0.950	−0.62 ± 1.02	−1.04 ± 1.12	<0.001

* Mean values are given with SDs. Standardized values were calculated for waist circumference and BMI by dividing by the variance

Table 1.10 shows the results of logistic regression analyses examining the relationships between LBP and lumbar spinal bone density after adjusting for demographic (age and sex), socioeconomic (education, occupation, and income), lifestyle (smoking, drinking, and exercise), and medical (hypertension, diabetes mellitus, and depression) factors. Among the confounding variables, sex, age, education, and depression were associated with LBP. Lumbar spine bone density (as assessed by T-score) (OR 1.11; 95% CI 1.02–1.20) was associated with LBP.

TABLE 1.10: Logistic regression analysis of the relationships between LBP and lumbar spine bone density after adjusting for socio-demographic, individual, medical, and psychological factors.

Variable & Category	OR	p Value	95% CI
Sex			
Male	ref		
Female	1.45	0.001	1.15–1.83
age (yrs)			
21–30	ref		
31–40	1.28	0.128	0.92–1.77
41–50	1.68	0.001	1.22–2.30
51–60	2.55	0.000	1.83–3.56
61–70	3.11	0.000	2.18–4.46
≥71	4.65	0.000	3.20–6.76
place of residence			
Urban	ref		
Rural	1.18	0.055	0.99–1.39
Occupation			
professional, manager, or administrator	ref		
Clerk	0.91	0.667	0.59–1.38
sales or service worker	0.89	0.564	0.62–1.29
agricultural or fishery worker	1.54	0.026	1.05–2.26
manual worker	0.86	0.476	0.59–1.27
education (yrs)			
≤6	ref		
7–9	0.73	0.008	0.59–0.92
10–12	0.71	0.003	0.58–0.89
≥13	0.50	0.000	0.38–0.67
income class			
Low	ref		
lower middle	1.03	0.754	0.85–1.24
upper middle	0.99	0.995	0.82–1.21
Smoking			
Nonsmoker	ref		
<5 lifetime packs	1.22	0.060	0.99–1.50
≥5 lifetime packs	1.17	0.556	0.69–2.01
alcohol use per mo			
<1 time per mo	ref		
1–4 times per mo	0.89	0.249	0.74–1.08

>2 times per wk	0.72	0.002	0.58–0.88
Exercise			
No	ref		
Yes	1.15	0.132	0.95–1.39
Hypertension			
No	ref		
Yes	0.96	0.700	0.81–1.14
Depression			
No	ref		
Yes	1.67	0.000	1.40–1.98
diabetes mellitus			
No	ref		
Yes	0.97	0.824	0.77–1.22
Waist	1.01	0.931	0.86–1.17
BMI	1.01	0.868	0.87–1.17
lumbar spine T-score	1.11	0.011	1.02–1.20

Higher bone density in the lumbar spine is associated with LBP independent of confounding factors such as socio-demographic status, education, and medical-psychiatric disorders. Investigations identifying the relationship between bone quality and LBP are needed.

1.5.5 Disc degeneration of the lumbar spine in relation to overweight:

Like et all. this study were employed middle-aged men, a subgroup from a cohort of 1832 men representing three occupations (machine drivers, construction carpenters, and office workers) who had participated in two previous questionnaire surveys. In 1991, 210 men were selected to the baseline MRI study using age (40–45 y) and place of residence (Helsinki metropolitan area) as inclusion criteria. A total of 164 (71%) persons took part in MRI examination. All of them were invited in 1995 to the follow-up study and 129 (79%) participated (Like et al., 2005).

Mean age of the subjects at baseline was 44 y (s.d. 2, range 41–46 y). The prevalence of discs with a decreased signal intensity of the nucleus pulposus was 63% at baseline and 73% at follow-up. In 1991, 38 subjects (29%) had degenerative changes at two or three disc levels, in 1995 a multilevel decrease of signal intensity was present in 53 (41%) subjects. There were no statistically significant differences in the number of discs with decreased signal intensity at baseline and follow-up between the occupations (table 1.11).

Table 1.11: Association between occupation, overweight and decreased signal intensity of the nucleus pulposus.

	Machine drivers		Carpenters		Office workers	
	N	**%**	**N**	**%**	**N**	**%**
Number of discs with decreased signal intensity of nucleus pulposus at baseline						
None of the discs	9	24.3	16	37.2	24	48.0
One disc	13	35.1	15	34.9	15	30.0
≥2 discs	15	40.6	12	27.9	11	22.0
Number of discs with decreased signal intensity of nucleus pulposus at follow-up						
None of the discs	8	21.6	12	27.3	15	30.6
One disc	10	27.0	14	31.8	18	36.7
≥2 discs	19	51.4	18	40.9	16	32.7
BMI at the age of 25 y						
<25 kg/m^2	30	81.1	35	79.5	44	88.0
≥25 kg/m^2	7	18.9	9	20.5	6	12.0
BMI at the age 40−45 y *						
<25 kg/m^2	13	35.1	14	31.8	34	68.0
≥25 kg/m^2	24	64.9	30	68.2	16	32.0

The means of subjects' height, weight at the age of 25 y and at the age of 40–45 y were 178.1 cm (s.d. 5.8, range 167–192 cm), 73.2 kg (s.d. 9.1, range 54–103 kg) and 81.9 kg (s.d. 13.3, range 57–130 kg), respectively. The prevalence of overweight at the age of 25 y varied from 12 to 20.5% depending on occupational group, being highest for carpenters and lowest for office workers table 1.11. Overweight at the age of 40–45 y was significantly more often observed among carpenters and machine drivers as compared with office workers (68.2 and

64.9 *vs* 32.0%).Persistent overweight (BMI ≥25 kg/m^2 at the age of 25 and 40–45 y) was strongly associated with disc degeneration at follow-up (adjusted OR 4.3; 95% CI 1.3–14.3). The effects of other explanatory variables were not statistically significant table 1.12.

TABLE 1.12. Effect of overweight and other risk factors on the number of lumbar discs L2/L3−L4/L5 with decreased signal intensity of nucleus pulposus at baseline and follow-up

Determinant	**OR**	**95% CI**	**OR**	**95% CI**
	Baseline		Follow-up	
Occupation				
Construction carpenter	2.2	0.8−5.5	1.8	0.7−4.9
Machine operator	1.3	0.5−3.1	1.3	0.5−3.2
Office worker	1.0		1.0	
History of accidental back injuries before baseline				
One or more injuries	1.2	0.5−2.8	1.2	0.5−2.8
No injury	1.0		1.0	
Overweight				
BMI ≥25 kg/m^2 at the age of 25 and 40−45 y	1.6	0.6−4.4	4.3	1.3−14.3
Other	1.1	0.5−2.4	0.9	0.4−2.0
BMI <25 kg/m^2 at the age of 25 and 40−45 y	1.0		1.0	
Smoking status at baseline				
Smoker	1.2	0.5−2.6	0.6	0.8−1.4
Ex-smoker	0.9	0.4−2.0	0.6	0.7−1.4
Non-smoker	1.0		1.0	
Car driving before baseline				
>15 000 km/y	0.8	0.4−1.5	1.2	0.6−2.2
Less driving	1.0	1.0	1.0	

The risk of progression of degenerative changes (4-y changes in the number of discs with decreased signal intensity of the nucleus pulposus) was statistically significantly increased by overweight at young age (adjusted RR 3.8; 95% CI 1.4–10.4;table 1.13) but not by high BMI at the age of 40–45 y (adjusted RR 1.3; 95% CI 0.7–2.7).

Table 1.13. Effect of body mass index (BMI) at the age of 25 and 40−45 y on the 4-y changes in the number of lumbar discs with decreased signal intensity of nucleus pulposus

Determinant	**N**	**RR**	**95% CI**
Model I			
BMI at the age of 25 y			
<25 kg/m^2	109	1.0	
≥25 kg/m^2	20	3.8	1.4−10.4
BMI at the age of 40−45 y			
<25 kg/m^2	61	1.0	
≥ 25 kg/m^2	68	1.3	0.7−2.7
Model II			
BMI at the age 25 y			
<24 kg/m^2	91	1.0	
$24\leq$ BMI <25 kg/m^2	18	3.5	1.0−12.9
≥25 kg/m^2	20	4.5	1.2−16.7
BMI at the age of 40−45 y			
<24 kg/m^2	43	1.0	
$24\leq$ BMI <25 kg/m^2	18	0.9	0.3−2.6
≥25 kg/m^2	68	1.5	0.3−6.2

We also tested the effect of BMI between 24 and 25 kg/m^2 on developing decreased signal intensity (Model II). The risk ratio was 3.7 for men with BMI between 24 and 24.9 kg/m^2 and 4.3 for subjects with BMI of 25 kg/m^2 or more as compared with the reference group with BMI less than 24 kg/m^2 table 1.13.

Overweight was found to be a significant risk factor of lumbar disc degeneration as indicated by a marked reduction of the signal intensity of the nucleus pulposus (darker than adjacent CFS). The effect was stronger for overweight at young age than for overweight at the age of 40–45 y.

Decreased signal intensity of the intervertebral discs is the most common sign of disc degeneration on MRI. A recent study by Luoma *et al* showed that the signal intensity of the nucleus pulposus seems to be a more feasible measure of early degeneration than absolute disc height. Height and weight of the subject and distance from the surface coil affect the signal intensity. Since height and weight of the subjects did not change much during follow-up and the positioning was the same, their effect on the change of signal intensity between studies was minimal. The technical quality of the images at follow-up was on the average lower than that at baseline. However, only images with good or satisfactory image quality were included in the study, and only discs L2/L3–L4/L5, located in the middle of the field of view were evaluated. CSF was used as an intensity reference in both studies. Therefore, small differences in the signal-to-noise ratio between baseline and follow-up should not cause substantial differences in classifying the signal intensity.

The World Health Organization defines overweight as a BMI of 25 kg/m^2 or higher. In an extensive population study, Heliövaara found that among men, the risk of herniated lumbar disc requiring hospitalization increased even when BMI was more than 22 kg/m^2, and the risk increased up to BMI 29.9 kg/m^2 when the RR was 3.7 (95% CI 1.7–8.0). In our study, an increased risk of lumbar disc degeneration was found already when BMI at the age of 25 y was between 24 and 24.9 kg/m^2.

The mechanism by which overweight causes lumbar disc degeneration is poorly understood. The contribution of both mechanical and systemic factors is likely. Overweight may increase the mechanical load of the spine, thereby increasing the risk of degeneration and back disorders. Epidemiological studies produce evidence that obesity increases the risk of atherosclerosis and cardiovascular disease. Poirier and Eckel proposed that obesity may affect atherosclerosis through dyslipidemia, hypertension, glucose intolerance, inflammatory markers, and the prothrombotic state. Spinal blood circulation has been shown to affect disc degeneration in a cadaver study by Kauppila, in which subjects with atherosclerosis of the spinal vessels had an increased risk for disc degeneration.

It is believed that intervertebral disc degeneration is the result of enzymatic breakdown of the extracellular matrix, and possibly local inflammation. Recently, Das proposed that obesity could be an inflammatory disorder. Overweight and obese children and adults have elevated serum levels of C-reactive protein, interleukin-6, tumor necrosis factor-α, and leptin, all known markers of inflammation and closely associated with cardiovascular risk factors. This may explain the increased risk of diabetes, ischemic heart disease, and many other chronic diseases in the obese. It can be speculated that inflammation could be the common link between obesity and disc degeneration. This hypothesis warrants further studies.

The current study is the part of the project which aimed to examine the relationship of occupation with disc degeneration and low back pain. A marginally elevated risk of decreased signal intensity of the nucleus pulposus was found among carpenters compared with office workers. In the present analyses, occupation was a potential confounder. Overweight was more prevalent among machine drivers and construction carpenters as compared with office workers. The educational level of the men was not uniform. The office workers were more highly educated than the machine drivers and carpenters. Lifestyle factors depend on education and social class and may affect the occurrence of disc degeneration. Therefore, it was necessary to control for occupation in the analyses. It is not likely that the association of overweight with decreased signal intensity observed was due to other risk factors. The subjects' possible recall error in reporting their weight and height tends to underestimate BMI and thence also the effect on degeneration.

In summary, this prospective MRI study provides evidence that BMI above 25 kg/m^2 increases the risk of lumbar disc degeneration, with a stronger effect of high BMI at young age than in middle age. Owing to the small size of the study sample, the effect estimates had low precision and could have occurred by chance or could have been biased. The results need to be confirmed in larger studies in different settings.

1.5.6 Magnetic resonance imaging for quantitative flow measurement in infants with hydrocephalus: a prospective study

Paul et all. Performed this study the authors investigated whether cerebral blood flow (CBF) can be measured by using quantitative MR angiography in infants with progressive hydrocephalus. In addition, the authors investigated the relationship between CBF and ICP, before and after cerebrospinal fluid (CSF) diversion.

Fifteen infants with progressive hydrocephalus (age range 1 day–7 months) were examined. All patients underwent anterior fontanel pressure measurement, MR angiography, and mean arterial blood pressure measurements before and after CSF diversion. Brain volume was measured to compensate for the physiological increase in CBF during brain maturation in infants. The mean preoperative ICP was 19.1 ± 8.4 cm H_2O (± standard deviation). The mean postoperative ICP was 6.7 ± 4.0 cm H_2O ($p < 0.005$). The mean preoperative CBF was 25.7 ± 11.3 ml/100 cm^3 brain/min. After CSF diversion, CBF increased to 50.1 ± 12.1 ml/100 cm^3 brain/min ($p < 0.005$). The mean arterial blood pressure did not change after surgical intervention (Paul et al., 2008). Descriptive data of the patients are listed in table 1.14

TABLE 1.14: Descriptive data of the patients

Case No.	Age (wks), Sex*	Cause of Hydrocephalus	Clinical Signs†
1	1, M	spina bifida	1, 2
2	1, F	aqueductal stenosis	1, 2, 3, 4
3	1, F	aqueductal stenosis	1, 2
4	2, M	spina bifida	2, 4
5	2, F	spina bifida	1, 2
6	4, F	arachnoidal cyst	1, 2, 3
7	5, M	posthemorrhagic Grade III	1, 2, 3, 4
8	5, F	aqueductal stenosis	1, 2, 3
9	6, M	arachnoidal cyst	1, 2, 3, 4
10	13, F	posthemorrhagic Grade III	1, 2, 3, 4
11	17, M	spina bifida	1, 2, 4
12	21, M	aqueductal stenosis	1, 2
13	27, F	mucopolysaccharidosis	1, 2, 3
14	31, M	arachnoidal cyst	1, 2, 4, 5
15	33, F	spina bifida	1, 4, 5

* Patient age is noted for the time of inclusion in the study.

† Clinical signs are as follows: 1, progressive increase in skull circumference; 2, bulging of the fontanel; 3, engorgement of scalp veins; 4, setting sun sign; and 5, decreased level of consciousness.

Mean values are expressed as the means ± standard deviations. In all patients preoperative ICP was increased (mean 19.1 ± 8.4 cm H_2O). After the operation, ICP significantly ($p < 0.005$) decreased to values within the normal range (mean 6.7 ± 4.0 cm H_2O) (Fig.1.1 and Table 2). Postoperative intraventricular ICP measurements obtained in 4 patients who had been sedated did not differ significantly from those in the 11 patients in whom ICP was measured using the RTT while patients were asleep (7.0 cm vs 6.5 cm H_2O, respectively). Moreover, the MABP did not differ significantly (69 vs 60 mm Hg, respectively).

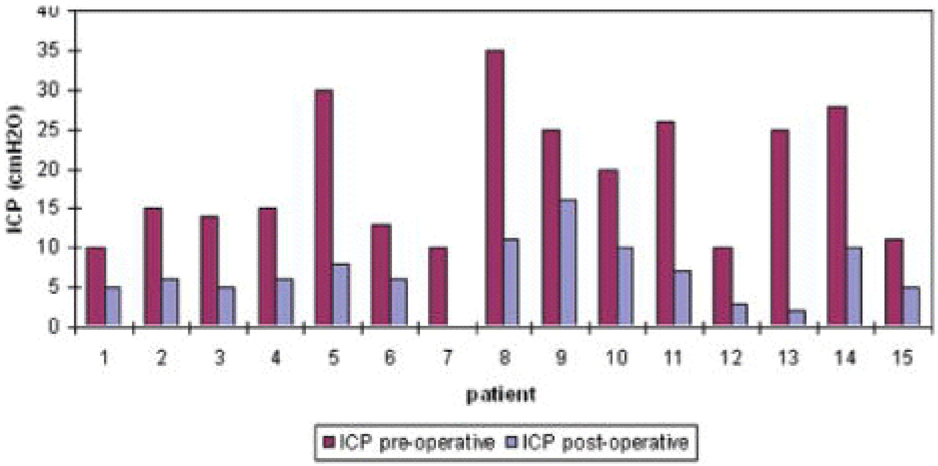

Fig. 1.1. Bar graph showing pre- and postoperative ICP values.

TABLE 1.15: Measurement data obtained pre- and postoperatively in 15 patients with hydrocephalus

Measurement			
Case No.	**CBF (ml/min)**	**ICP (cm H_2O)**	**MABP (mm Hg)**
1			
Preop	154	10	58
Postop	390	5	63
2			
Preop	101	15	58
Postop	226	6	57
3			
Preop	62	14	54
Postop	317	5	64
4			
Preop	59	15	56
Postop	262	6	63
5			
Preop	74	30	58
Postop	253	8	63
6			
Preop	49	13	57
Postop	323	6	60
7			
Preop	276	10	64
Postop	541	0	62

8			
Preop	111	35	68
Postop	701	11	78
9			
Preop	84	25	62
Postop	255	16	63
10			
Preop	129	20	75
Postop	419	10	67
11			
Preop	264	26	52
Postop	503	7	50
12			
Preop	377	10	77
Postop	519	3	73
13			
Preop	398	25	60
Postop	599	2	67
14			
Preop	408	28	67
Postop	533	10	53
15			
Preop	271	11	63
Postop	649	5	48

The mean preoperative CBF was 25.7 ±11.3 ml/100 cm^3 brain/min. After CSF diversion, the mean CBF increased significantly ($p < .005$) to 50.1 ± 12.1 ml/100 cm^3 brain/ min (Fig 1.2 and table 1.16)The postoperative mean CBF values were within the normal range.

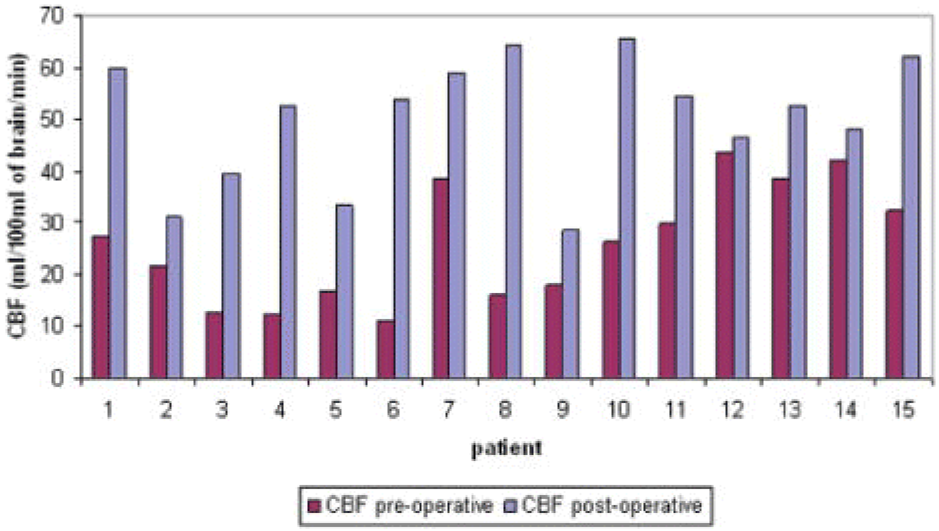

Fig. 1.2 Bar graph showing pre- and postoperative CBF values.

TABLE 1.16 Volumetric measurement leading to CBF

Case No.	Ventricle Vol (cm^3)	Brain Vol (cm^3)	CBF (ml/min)	CBF (ml/100 cm^3 brain/min)
1				
Preop	180.20	566.16	154	27.20
Postop	22.13	652.01	390	59.83
2				
Preop	480.02	467.63	101	21.60
Postop	79.81	729.67	226	30.97
3				
Preop	155.22	486.31	62	12.76
Postop	256.63	803.45	317	39.45
4				
Preop	583.66	472.37	59	12.49
Postop	535.52	498.61	262	52.55
5				
Preop	90.13	439.18	74	16.85
Postop	17.32	762.75	253	33.17
6				
Preop	553.57	432.09	235	32.78
Postop	713.90	601.15	323	53.73
7				
Preop	88.12	716.71	276	38.51
Postop	81.34	1004.17	541	58.88
8				
Preop	890.01	681.49	111	16.29
Postop	1144.53	1090.25	701	64.30

9				
Preop	819.66	467.39	84	17.97
Postop	953.34	891.34	255	28.61
10				
Preop	685.56	489.47	129	26.36
Postop	1056.12	639.13	419	65.56
11				
Preop	976.12	886.73	264	29.77
Postop	990.82	924.82	503	54.39
12				
Preop	149.44	865.42	377	43.56
Postop	88.42	1112.60	519	46.65
13				
Preop	504.68	1028.09	398	38.71
Postop	291.41	1137.16	599	52.68
14				
Preop	1222.13	971.25	408	42.01
Postop	1255.69	1105.55	533	48.21
15				
Preop	275.54	839.60	271	32.27
Postop	104.15	1045.29	649	62.09

As a group, the infants with raised ICP had a significantly lower CBF than the infants with postoperatively lower ICP. The relationship between CBF and ICP is more or less linear, showing an ~ 10 ml/100 cm^3 brain/min decrease in CBF with every 10 cm H_2O ICP increase (Fig. 1.3). The correlation coefficient between CBF and ICP was −0.55 ($p < 0.01$).

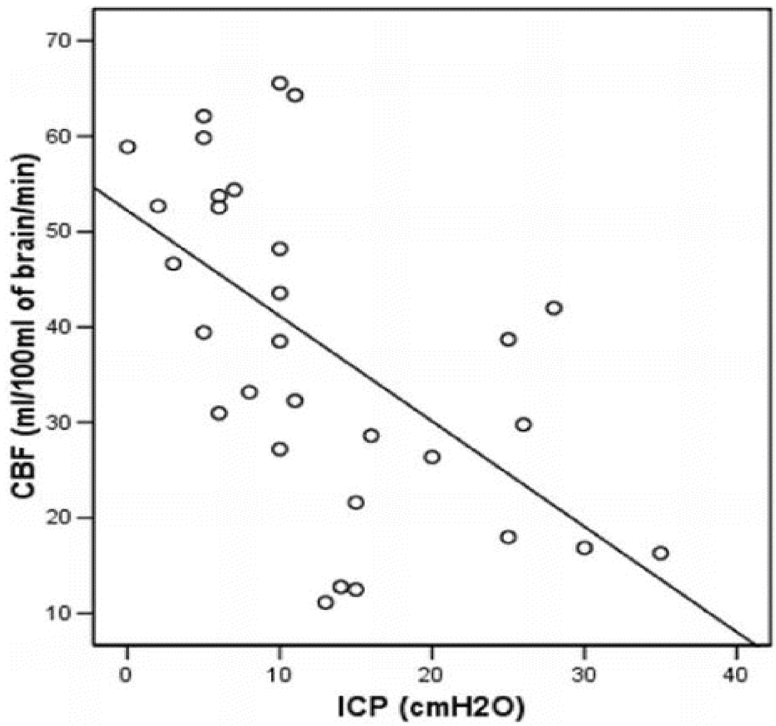

Fig. 1.3 Scatterplot showing the linear relation between ICP and CBF.

The CPP was derived from the ICP and MABP and then compared with the CBF. The Pearson correlation coefficient was 0.548 and was significant at the 0.01 level. Their relationship is shown in Fig. 1.4

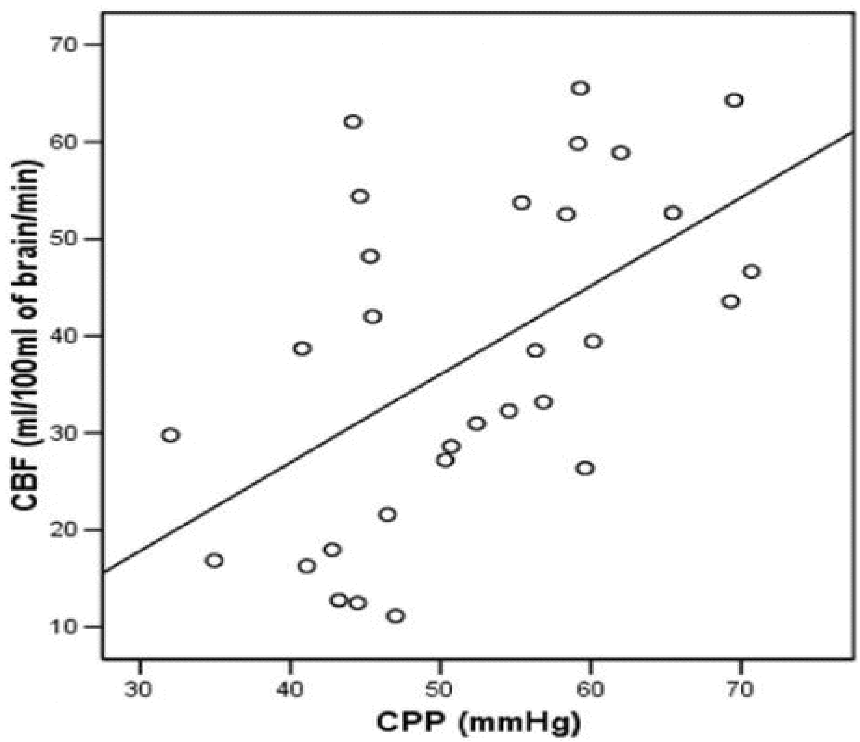

Fig. 1.4 Scatterplot showing the linear correlation between CBF and CPP.

The contribution of the blood flow through the right and left ICAs to the CBF was 34 and 38% preoperatively and 31 and 41% postoperatively, respectively. For the BA the contribution of blood flow was 27% preoperatively and 29% postoperatively. The mean differences were not significant, meaning that raised ICP in hydrocephalic infants affects both left and right as well as anterior and posterior circulation equally.

In all patients the MABP was within physiological limits pre- and postoperatively (mean 61.9 ± 7.3 and 62.1 ± 7.9 mm Hg, respectively. (Table 1.17)

TABLE 1.17: Mean CBF, ICP, and MABP values in 15 infants with hydrocephalus

Mean CBF, ICP, and MABP values in 15 infants with hydrocephalus*

Value	**Preop**	**Postop**
mean CBF (ml/100 cm^3 brain/min)	25.7 ± 11.3	50.1 ± 12.1
mean ICP (cm H_2O)	19.1 ± 8.4	6.7 ± 4.0
MABP (mm Hg)	61.9 ± 7.3	62.1 ± 7.9

* Values are recorded as the mean ± standard deviation.

Quantitative measurement of CBF with MR angiography is a useful noninvasive method in infants with progressive hydrocephalus and can detect a decrease in CBF that ultimately can cause ischemia of the brain resulting in cerebral damage. Diversion of CSF leads to a significant increase in CBF, restoring the pathophysiological situation. This increase is probably not only caused by a decrease in ICP, but also by reduction of CVR. The CVR reduction can be explained by vasogenic, interstitial, or cytotoxic edema. Further investigation will be necessary to distinguish between the different types of brain edema, thus classifying the risk or degree of brain ischemia.

1.6 Diagnosis process in neurosurgery

1.6.1 MRI

Magnetic resonance imaging (MRI) is a noninvasive medical test that helps physicians diagnose and treat medical conditions.

MRI uses a powerful magnetic field, radio frequency pulses and a computer to produce detailed pictures of organs, soft tissues, bone and virtually all other internal body structures. MRI does not use ionizing radiation (x-rays).

Detailed MR images allow physicians to evaluate various parts of the body and determine the presence of certain diseases. The images can then be examined on a computer monitor, transmitted electronically, printed or copied to a CD.

MRI has a wide range of applications in medical diagnosis and over 25,000 scanners are estimated to be in use worldwide. MRI has an impact on diagnosis and treatment in many specialties although the effect on improved health outcomes is uncertain. Since MRI does not use any ionizing radiation, its use is generally favored in preference to CT when either modality could yield the same information. (In certain cases MRI is not preferred as it can be more expensive, time-consuming, and claustrophobia-exacerbating) (Ray et al., 2003).

MRI is in general a safe technique but the number of incidents causing patient harm has risen. Contraindications to MRI include most cochlear implants and cardiac pacemakers, shrapnel and metallic foreign bodies in the orbits. The safety of MRI during the first trimester of pregnancy is uncertain, but it may be preferable to alternative options. The sustained increase in demand for

MRI within the healthcare industry has led to concerns about cost effectiveness and over diagnosis.

1.6.2 CT Scan

A CT scan, also called X-ray computed tomography (X-ray CT) or computerized axial tomography scan (CAT scan), makes use of computer-processed combinations of many X-ray images taken from different angles to produce cross-sectional (tomographic) images of specific areas of a scanned object, allowing the user to see inside the object without cutting.

X-ray computed tomography (X-ray CT) is a technology that uses computer-processed X-rays to produce tomographic images (virtual 'slices') of specific areas of a scanned object, allowing the user to see inside the object without cutting (Bindman et al., 2009).

Digital geometry processing is used to generate a three-dimensional image of the inside of the object from a large series of two-dimensional radiographic images taken around a single axis of rotation. Medical imaging is the most common application of X-ray CT. Its cross-sectional images are used for diagnostic and therapeutic purposes in various medical disciplines. The rest of this article discusses medical-imaging X-ray CT; industrial applications of X-ray CT are discussed at industrial computed tomography scanning.

As X-ray CT is the most common form of CT in medicine and various other contexts, the term computed tomography alone (or CT) is often used to refer to X-ray CT, although other types exist (such as positron emission tomography [PET] and single-photon emission computed tomography [SPECT]). Older and less preferred terms that also refer to X-ray CT are computed axial tomography (CAT scan) and computer-aided/assisted tomography. X-ray CT is a form of radiography, although the word "radiography" used alone usually refers, by wide convention, to non-tomographic radiography.

CT produces a volume of data that can be manipulated in order to demonstrate various bodily structures based on their ability to block the X-ray beam. Although, historically, the images generated were in the axial or transverse plane, perpendicular to the long axis of the body, modern scanners allow this volume of data to be reformatted in various planes or even as volumetric (3D) representations of structures. Although most common in medicine, CT is also used in other fields, such as nondestructive materials testing. Another example is archaeological uses such as imaging the contents of sarcophagi. Individuals responsible for performing CT exams are called radiographers or radiologic technologists and are required to be licensed in most states of the USA.

Usage of CT has increased dramatically over the last two decades in many countries. An estimated 72 million scans were performed in the United States in 2007.One study estimated that as many as 0.4% of current cancers in the United States are due to CTs performed in the past and that this may increase to as high as 1.5 to 2% with 2007 rates of CT usage; however, this estimate is disputed,as there is not a scientific consensus about the existence of damage from low levels of radiation. Kidney problems following intravenous contrast agents may also be a concern in some types of studies.

1.6.3 MRI versus CT

MRI and computed tomography (CT) are complementary imaging technologies and each has advantages and limitations for particular applications. CT is more widely used than MRI in OECD countries with a mean of 132 vs 46 exams per 1000 population performed respectively. A concern is the potential for CT to contribute to radiation-induced cancer and in 2007 it was estimated that 0.4% of current cancers in the United States were due to CTs performed in the past, and that in the future this figure may rise to 1.5–2% based on historical rates of CT usage. An Australian study found that one in every 1800 CT scans was associated with an excess cancer. An advantage of MRI is that no ionizing radiation is used and so it is recommended over CT when either approach could yield the same diagnostic information. However, although the cost of MRI has fallen, making it more competitive with CT, there are not many common imaging scenarios in which MRI can simply replace CT, although this substitution has been suggested for the imaging of liver disease.The effect of low doses of radiation on carcinogenesis are also disputed. Although MRI is associated with biological effects, these have not been proven to cause measurable harm. In a comparison of possible genotoxic effects of MRI compared with those of CT scans, Knuuti et al. noted that although previous studies have demonstrated DNA damage associated with MRI, "the long-term biological and clinical significance of DNA double-strand breaks induced by MRI remains unknown".

Iodinated contrast medium is routinely used in CT and the main adverse events are anaphylactic reactions and nephrotoxicity. Commonly used MRI contrast agents have a good safety profile but linear non-ionic agents in particular have been implicated in nephrogenic systemic fibrosis in patients with severely impaired renal function.

MRI is contraindicated in the presence of MR-unsafe implants, and although these patients may be imaged with CT, beam hardening artefact from metallic devices, such as pacemakers and implantable cardioverter-defibrillators, may also affect image quality. MRI is a longer investigation than CT and an exam may take between 20 - 40 mins depending on complexity.

Objectives of the study:

The objective of this study were to-

- To find out relationship between neurosurgery patients with their gender, age, blood group, height, weight, blood pressure, blood glucose, hair color, duration of treatment, smoking habit, surgery history, target of organ.
- Observe the diagnosis process, diagnosis impression and treatment intervention.

Chapter Two

Materials and Methods

2. Method:

To investigate the relationship between neurosurgery patients and other variables of interest as they exist, the personal and clinical data was retrieved from the patient's profile at neurosurgery department under Bangabandhu Sheikh Mujib Medical University (BSMMU) during 30th December to 25th May. Firstly researcher collected information from patients profile which was kept in nurse room. For, further information, after explaining the purpose of the study to the respondents and obtaining their verbal consent, the researcher interviewed all the respondents by asking questions in Bengali and using a thoroughly pre-tested questionnaire.

The questionnaire contains patient's age, sex, diagnosis period of disease, hair color, height, weight, blood group, blood pressure, blood glucose level, smoking habit, surgery history, target organ of injury, diagnosis of patients, diagnosis impression, disease state, complications/associated disease, medications.

The sample size was 90.

Data was entered into a computer database and doubled checked before analysis. Means and proportions for the patients socio-demographic characteristics and treatment intervention were compared between the groups of the study (cases and controls).

Chapter Three

Results

Table 3.1: Distributions of patients according to gender:

Gender	No. of patients	Percentage (%)
Male	**48**	**53**
Female	**42**	**47**
Total	**90**	**100**

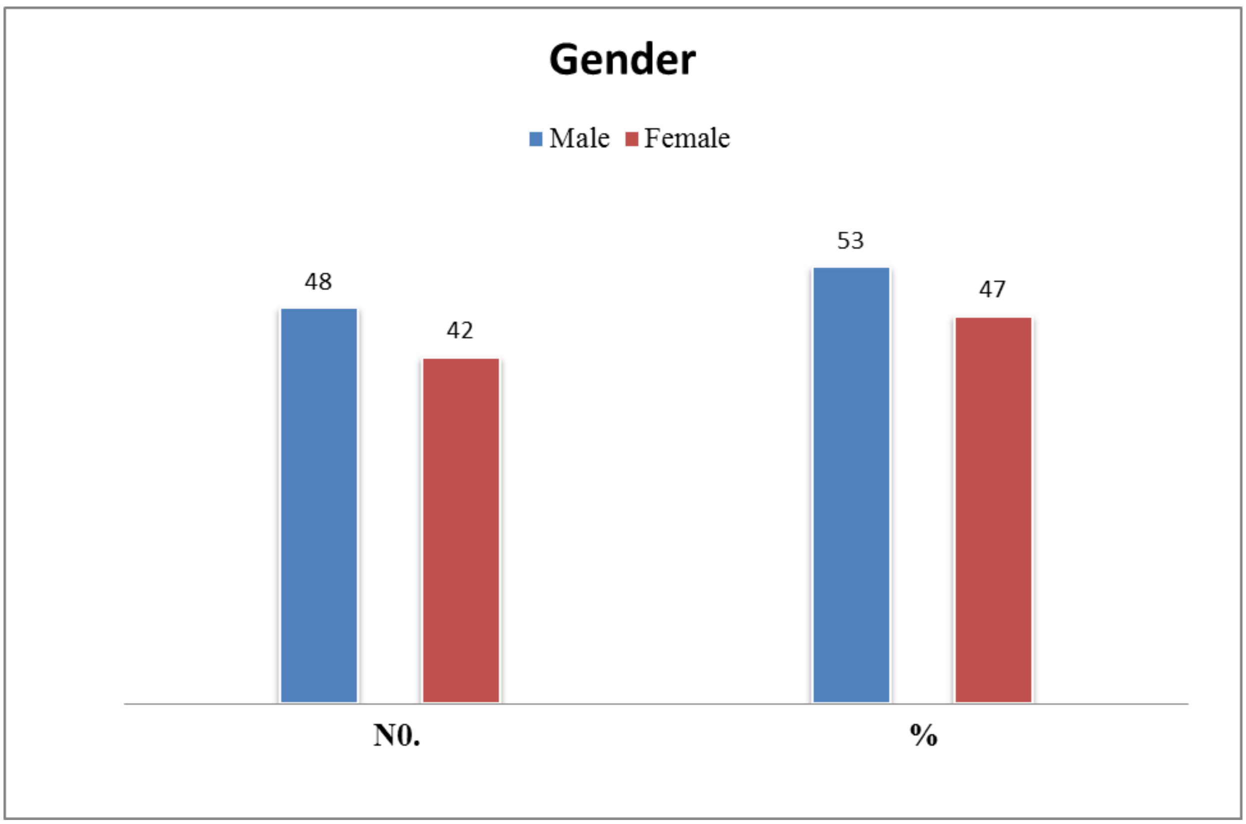

Figure 3.1: Distribution of patient's gender

Table 3.2: Distribution of patient's age:

Age (years)	No. of patients	Percentage (%)
0-10	12	13.33
11-20	2	2.22
21-30	14	15.56
31-40	22	24.44
41-50	30	33.33
51-60	5	5.56
61 & above	5	5.56

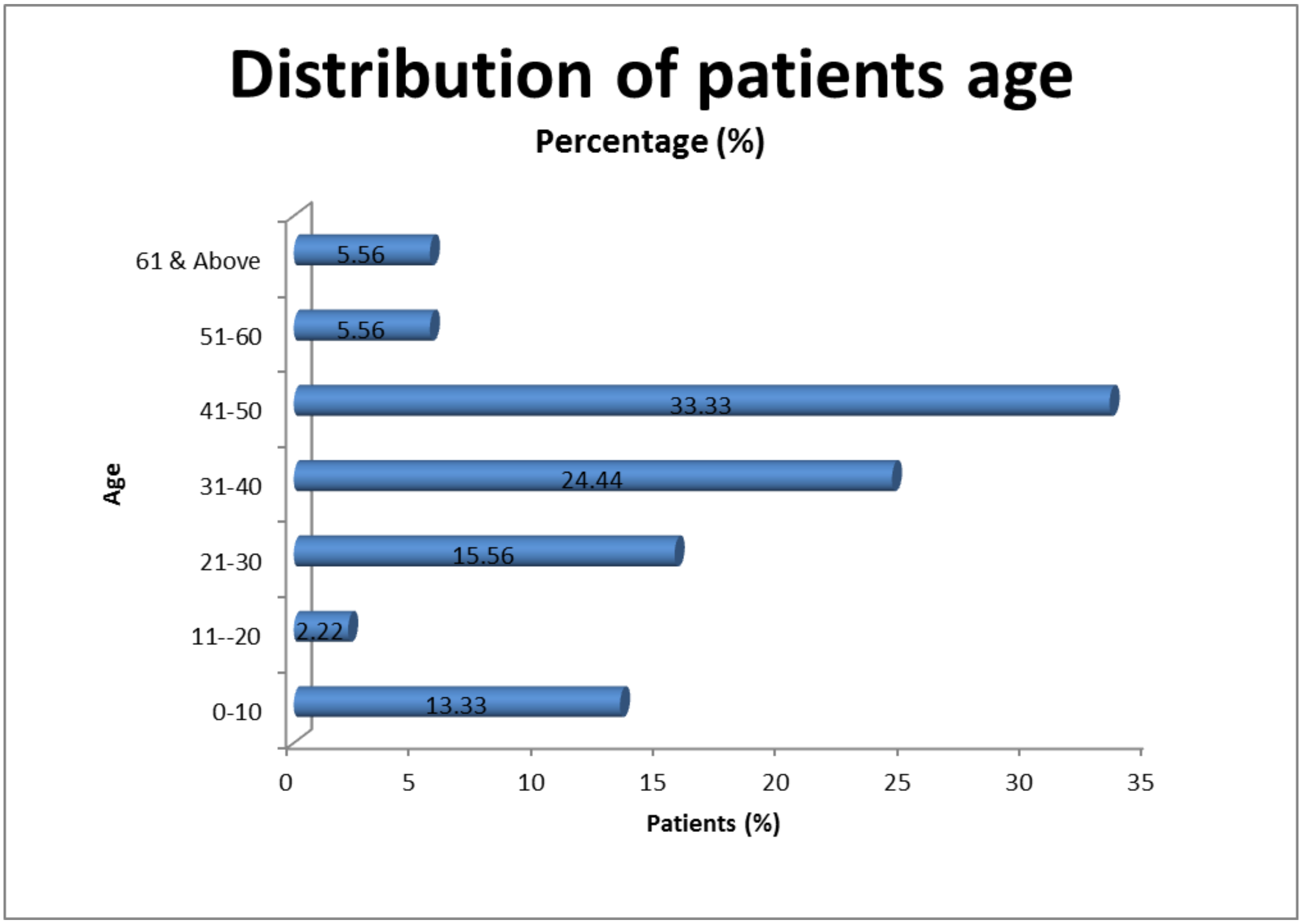

Figure 3.2: Distribution of patient's age

Table 3.3: Distribution of patient's blood group:

Blood group	No. of patients	Percentage (%)
B(+ve)	52	57.78
B(-ve)	0	0.00
A(+ve)	8	8.89
A(-ve)	2	2.22
O(+ve)	20	22.22
O(-ve)	0	0.00
AB(+ve)	8	8.89
AB(-ve)	0	0.00

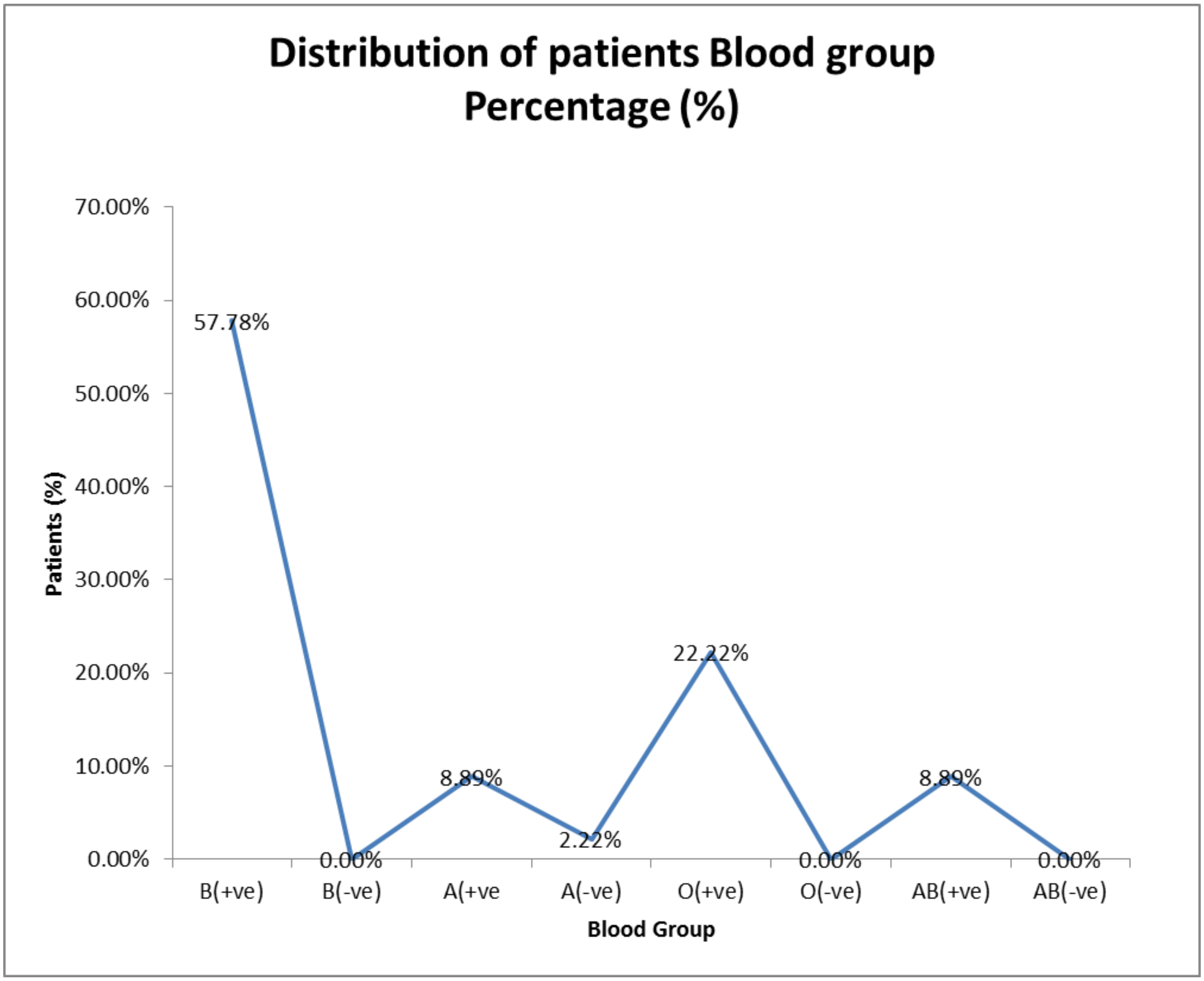

Figure 3.3: Distribution of patients blood group

Table 3.4: Distribution of patient's treatment duration:

Diagnosis period	No. of patients	Percentage (%)
0-60 days	62	68.89
61-120 days	17	18.89
121-180 days	6	6.67
181 days and above	5	5.56

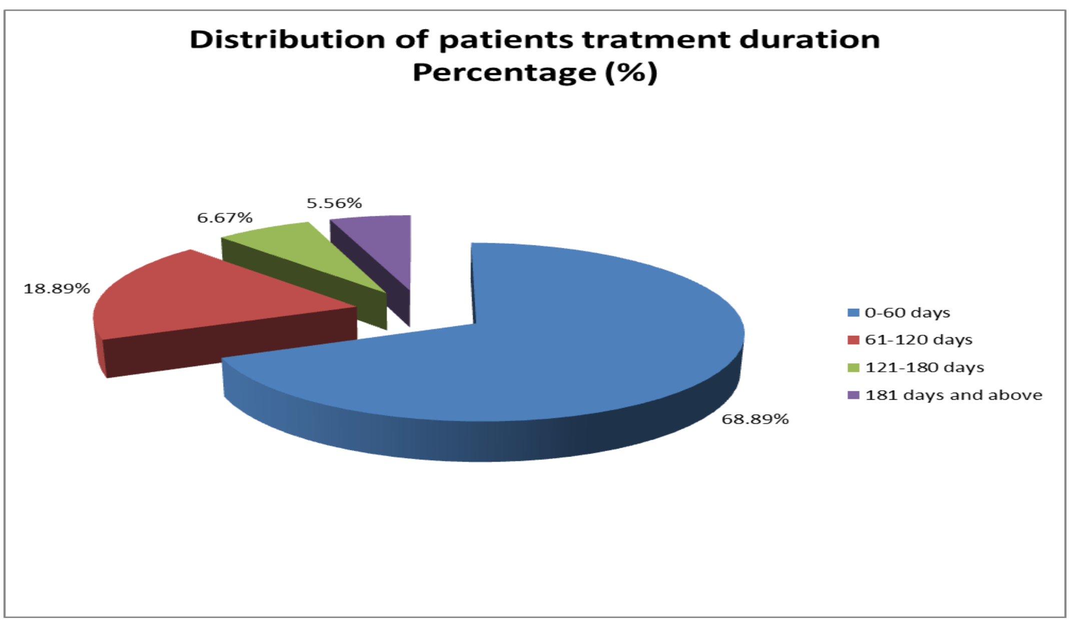

Figure 3.4: Distribution of patient's treatment duration

Table 3. 5: Distribution of patient's height:

Height	No. of patients	Percentage (%)
Below 5'0''	16	17.78
5'1''-5'3''	30	33.33
5'4''-5'6''	37	41.11
5'7''-5'9''	7	7.78

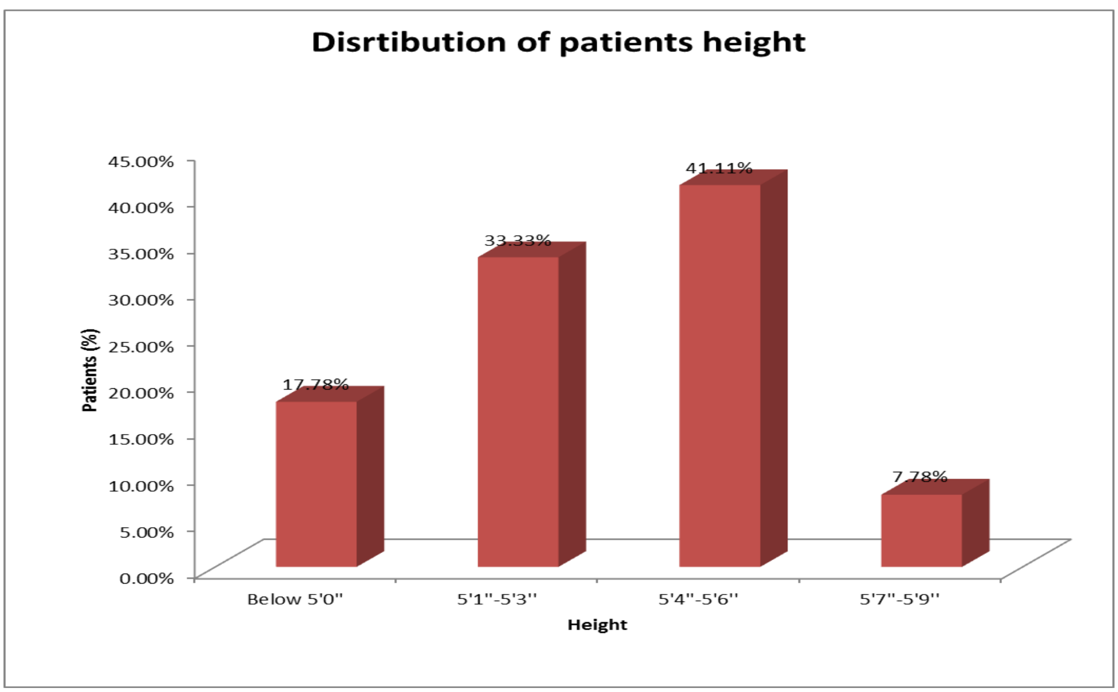

Figure 3. 5: Distribution of patient's height

Table 3. 6: Distribution of patient's weight:

Weight (kg)	No. of patients	Percentage (%)
0-20	6	6.67
21-40	7	7.78
41-60	51	56.67
61-80	26	28.89

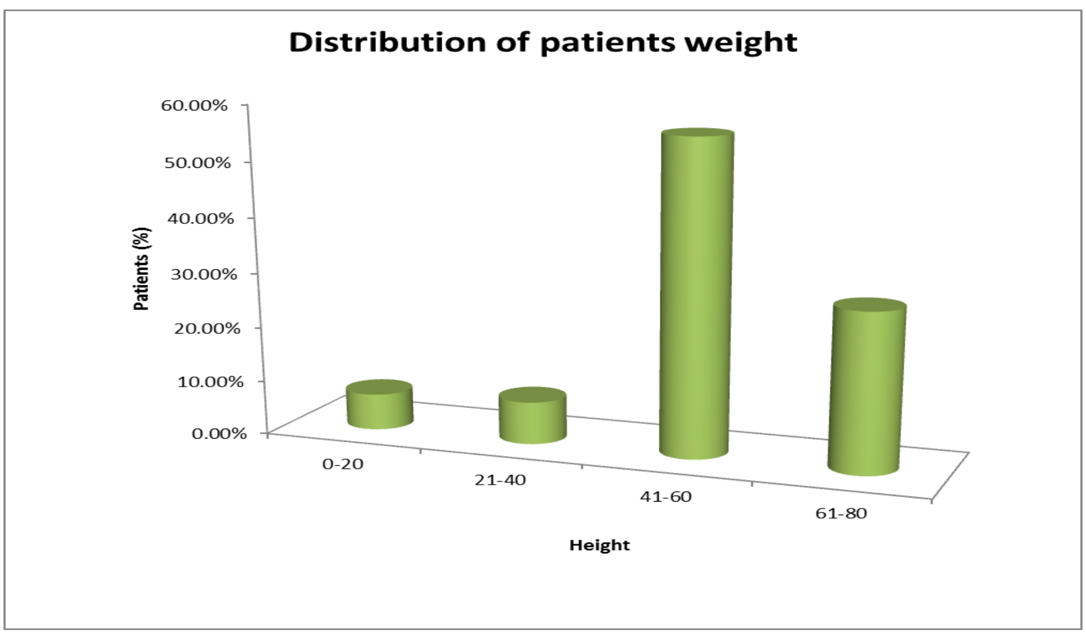

Figure 3.6: Distribution of patient's weight

Table 3.7: Distribution of patient's blood pressure (mm Hg):

Category	Systolic, mmHg	Diastolic, mmHg	No. of patients	Percentage (%)
Hypotension	<90	<60	0	0
Desired	90-119	60-79	18	20.00
Prehypertension	120-139	80-89	60	66.67
Stage1 hypertension	140-159	90-99	12	13.33
Stage2 hypertension	160-179	100-109	0	0

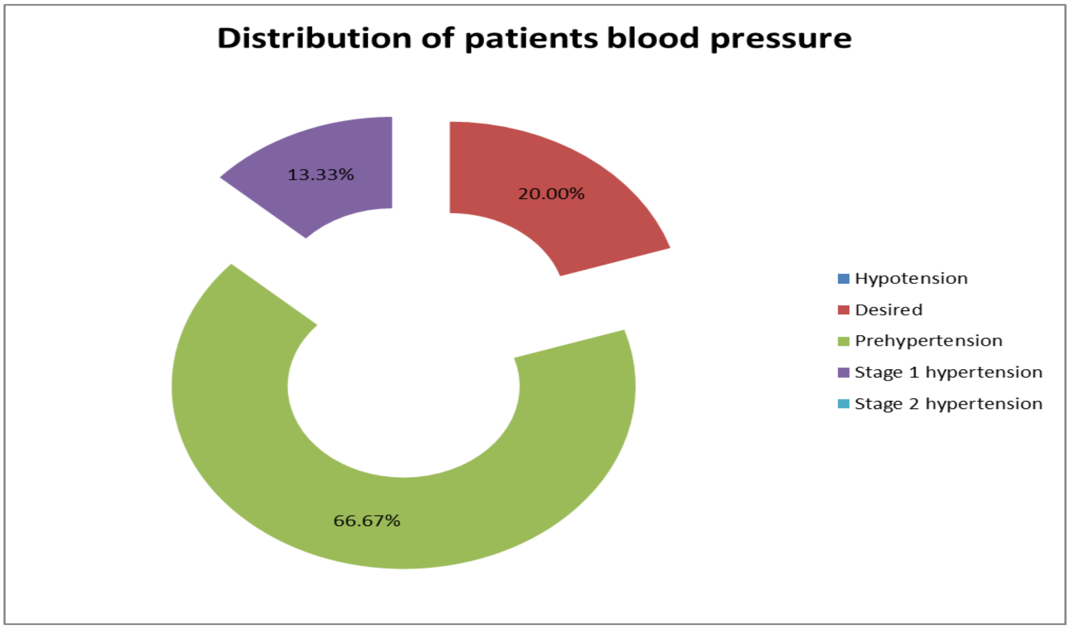

Figure 3.7: Distribution of patient's blood pressure

Table 3.8: Distribution of patient's hair color:

Hair color	No. of patients	Percentage
Black	64	71.11%
White	16	17.78%
Mixed	10	11.11%

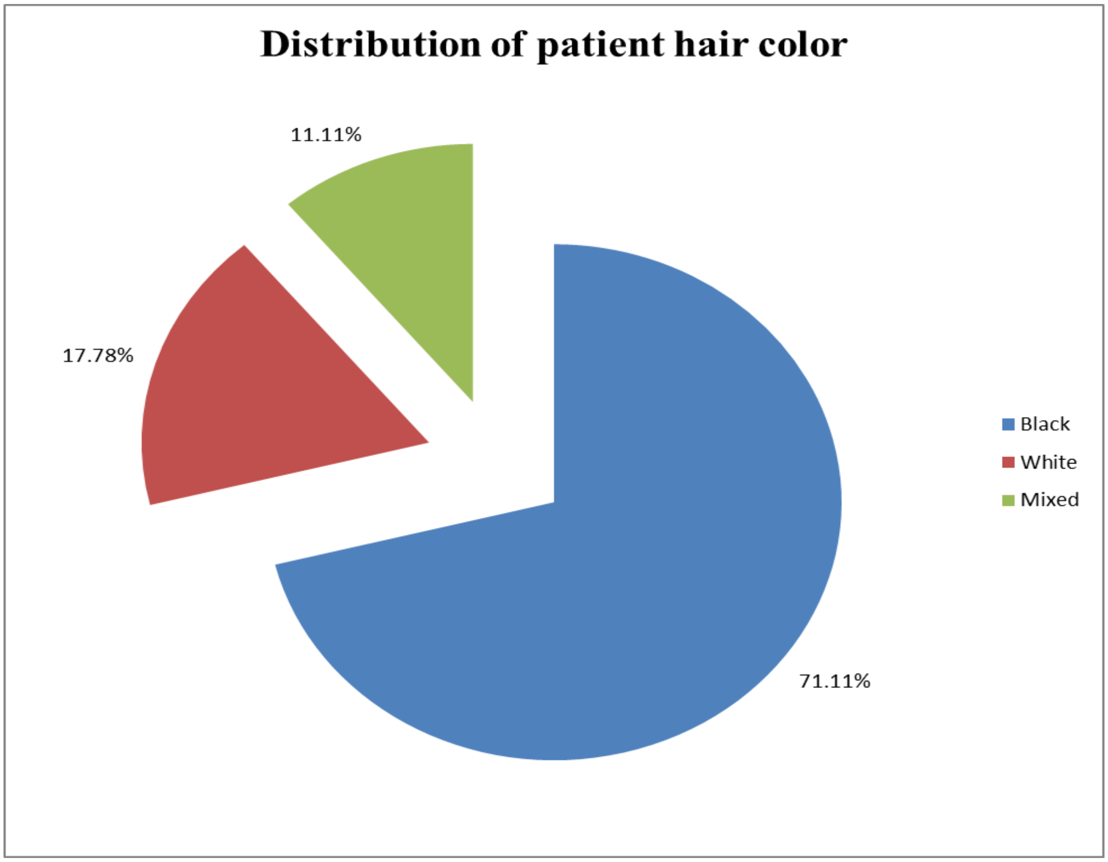

Figure 3. 8: Distribution of patient's hair color

Table 3.9: Distribution of patient's blood glucose level:

Blood glucose level	No. of patients	Percentage (%)
Normal	60	66.67%
Hyperglycemia	30	33.33%
Hypoglycemia	0	0%

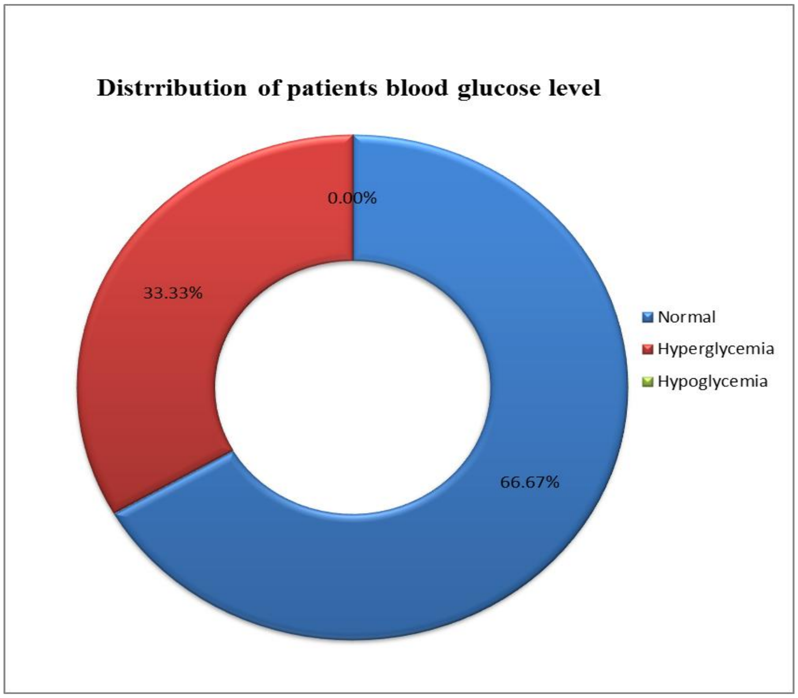

Figure 3. 9: Distribution of patient’s blood glucose level

Table 3.10: Distribution of patients smoking habit:

Smoking Habit	No. of patients	Percentage
Smoker	27	30%
Non- smoker	63	70%

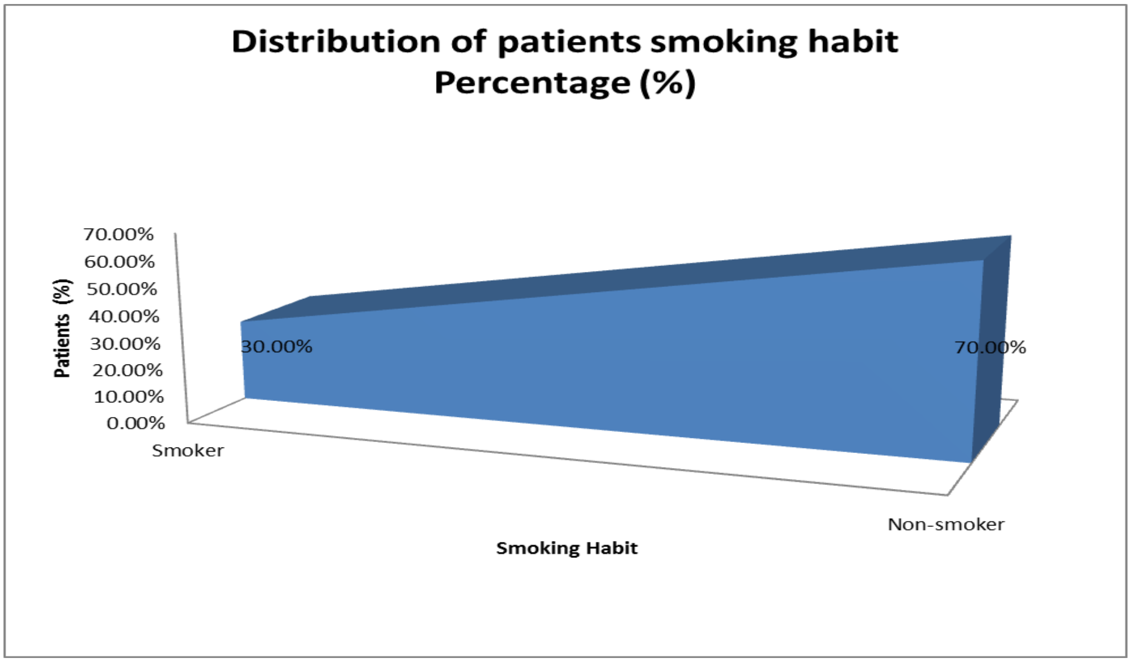

Figure 3.10: Distribution of patients smoking habit

Table 3.11: Distribution of patient's surgery history:

Surgery History	No. of patients	Percentage (%)
Previous surgery history	19	19.39%
Prepared for surgery	47	47.96%
No need	32	32.65%

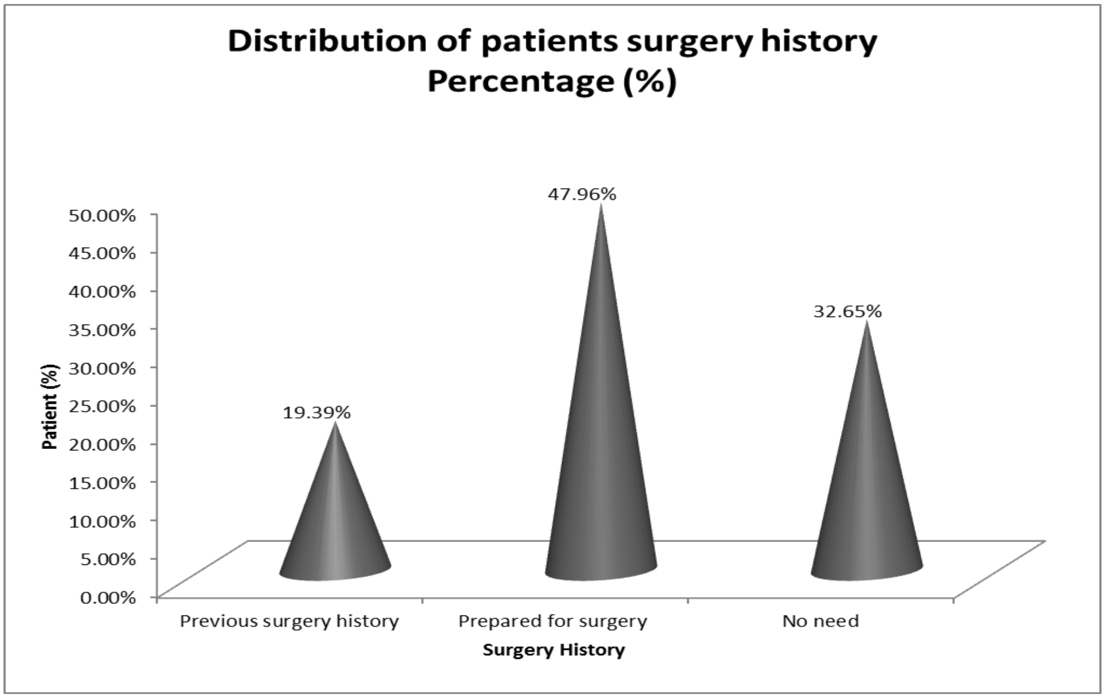

Figure 3. 11: Distribution of patient's surgery history

Table 3.12: Distribution of patients target organ of injury

Target organ	**No. of patients**	**Percentage (%)**
Brain	**61**	**66.30%**
Neck	**3**	**3.26%**
Back	**21**	**22.83%**
Spinal cord	**7**	**7.61%**

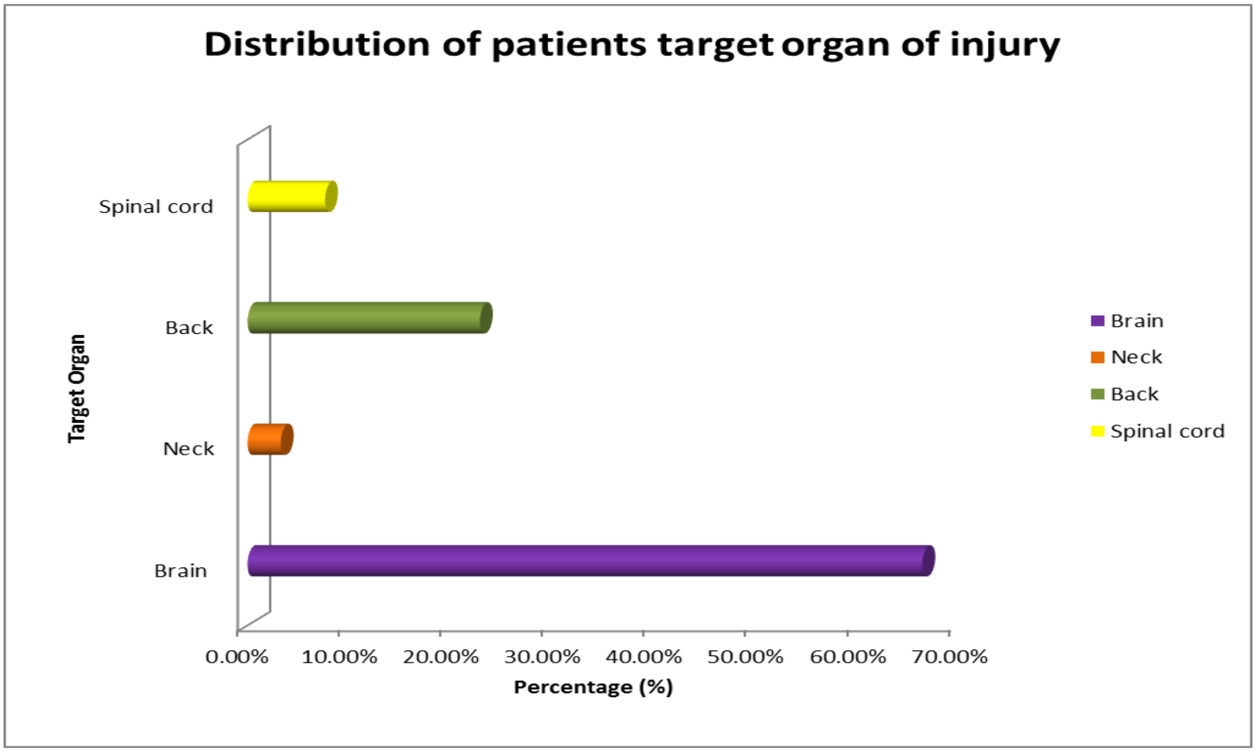

Figure 3.12: Distribution of patients target organ of injury

Table 3.13: Distribution of patient's diagnosis process

Diagnosis process	No. of patients	Percentage (%)
MRI of brain	46	51.11
MRI of lumbo-sacral spine	26	28.89
CT scan	18	20.00

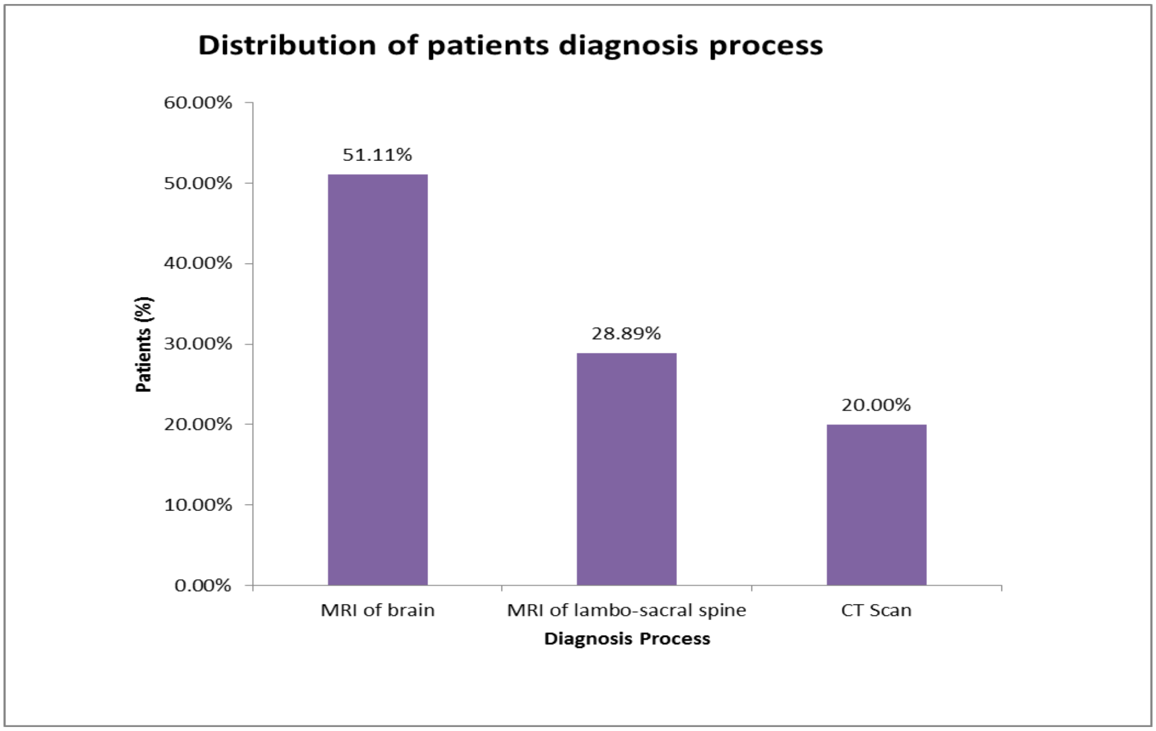

Figure 3.13: Distribution of patient's diagnosis process

Table 3.14: Distribution of patient's diagnosis impression

Diagnosis impression	No. of patients	Percentage (%)
Hydrocephalus	8	8.51
Meningioma	12	12.77
Glioma	6	6.38
CP angle tumor	6	6.38
Ependymoma	4	4.26
Cerebellar tumor	7	7.45
Degenerative disc disorder	8	8.51
Neck pain	3	3.19
Brain abscess	2	2.13
Head injury	9	9.57
Encephalocela	3	3.19
Spinal cord Injury	5	5.32
Low back pain	13	13.83
Pituitary tumor	8	8.51

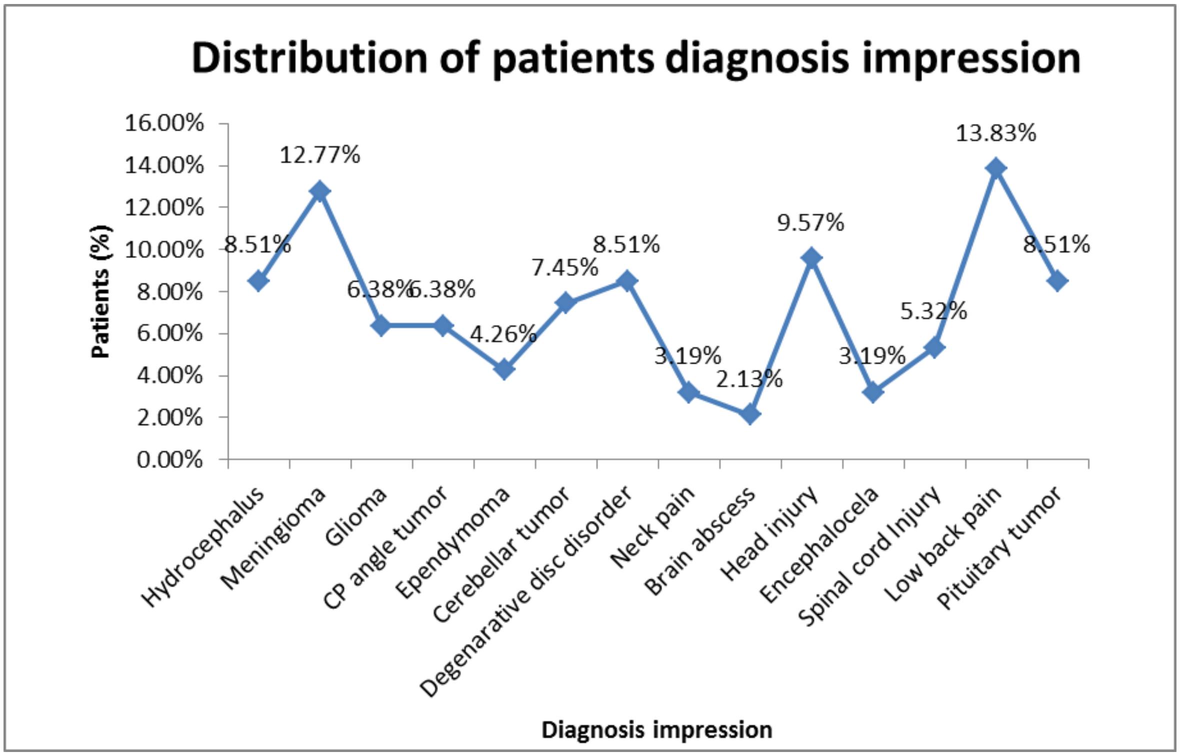

Figure 3.14: Distribution of patient's diagnosis impression

Table 3.15: Distribution of patient's complications/ associated diseases:

Complications	**No. of patients**	**Percentage (%)**
Fever	**20**	**22.22%**
Loss of consciousness	**7**	**7.78%**
Vomiting	**40**	**44.44%**
Convulsion	**7**	**7.78%**
Headache	**52**	**57.78%**

Vertigo	**9**	**10.00%**
Neck pain	**14**	**15.56%**
Weakness	**32**	**35.56%**
Vision Problem	**31**	**34.44%**

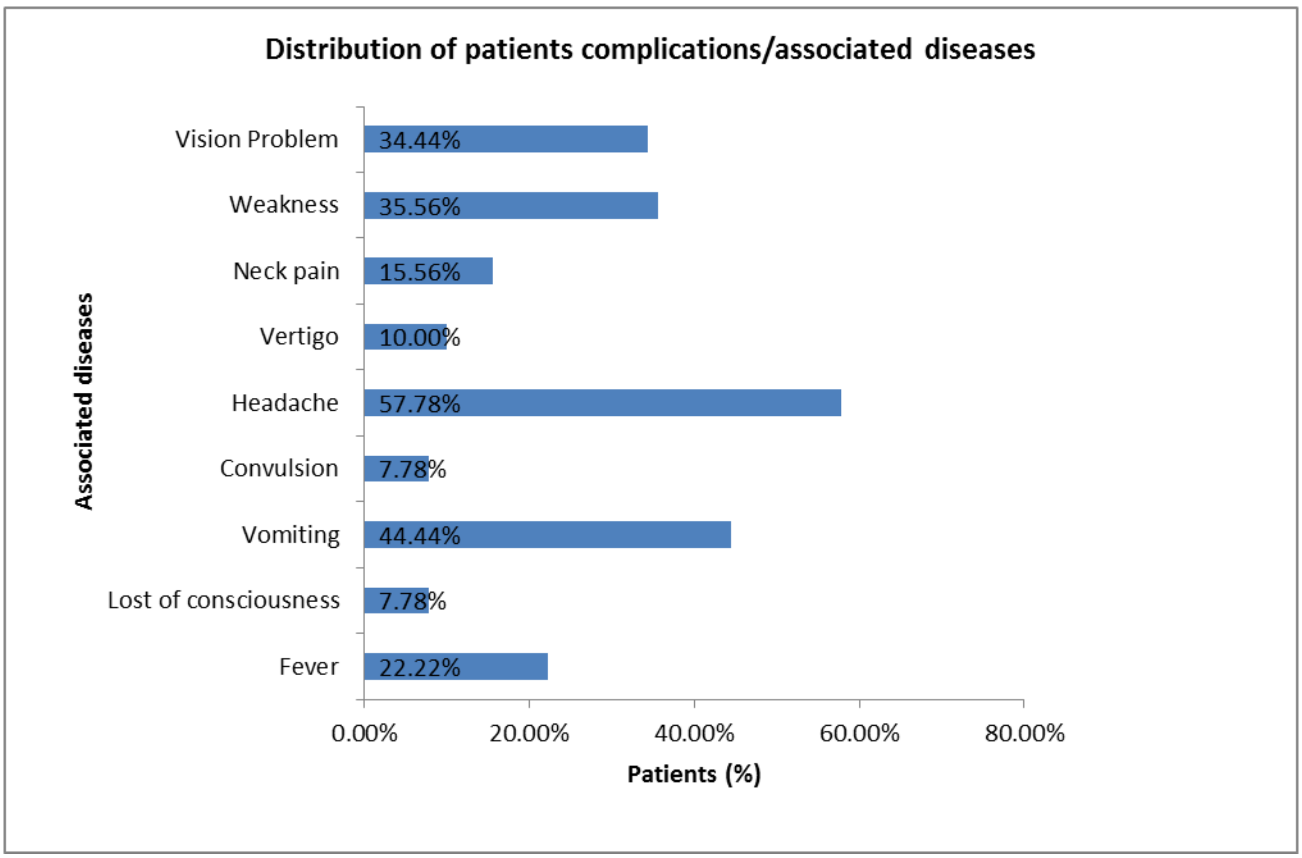

Figure 3.15: Distribution of patient's complications/ associated diseases

Table 3.16: Distribution of patients drug use:

Drugs	No. of patients	Percentage
Dexamethason	15	16.67%
Flucloxacillin	18	20.00%
Ceftazidime	17	18.89%
Phenobarbital	22	24.44%
PPIs	74	82.22%
Paracetamol	34	37.78%
Clonazepam	26	28.89%
Diazepam	9	10.00%
Diclofenac Sodium	19	21.11%
Phenytoin	18	20.00%
Beklofen	19	21.11%
Naproxen	10	11.11%
Ketorolac	13	14.44%
Anti-hypertensive	11	12.22%
Ciprofluxacin	9	10.00%
Normal Saline	7	7.78%
Vit-B Complex	33	36.67%

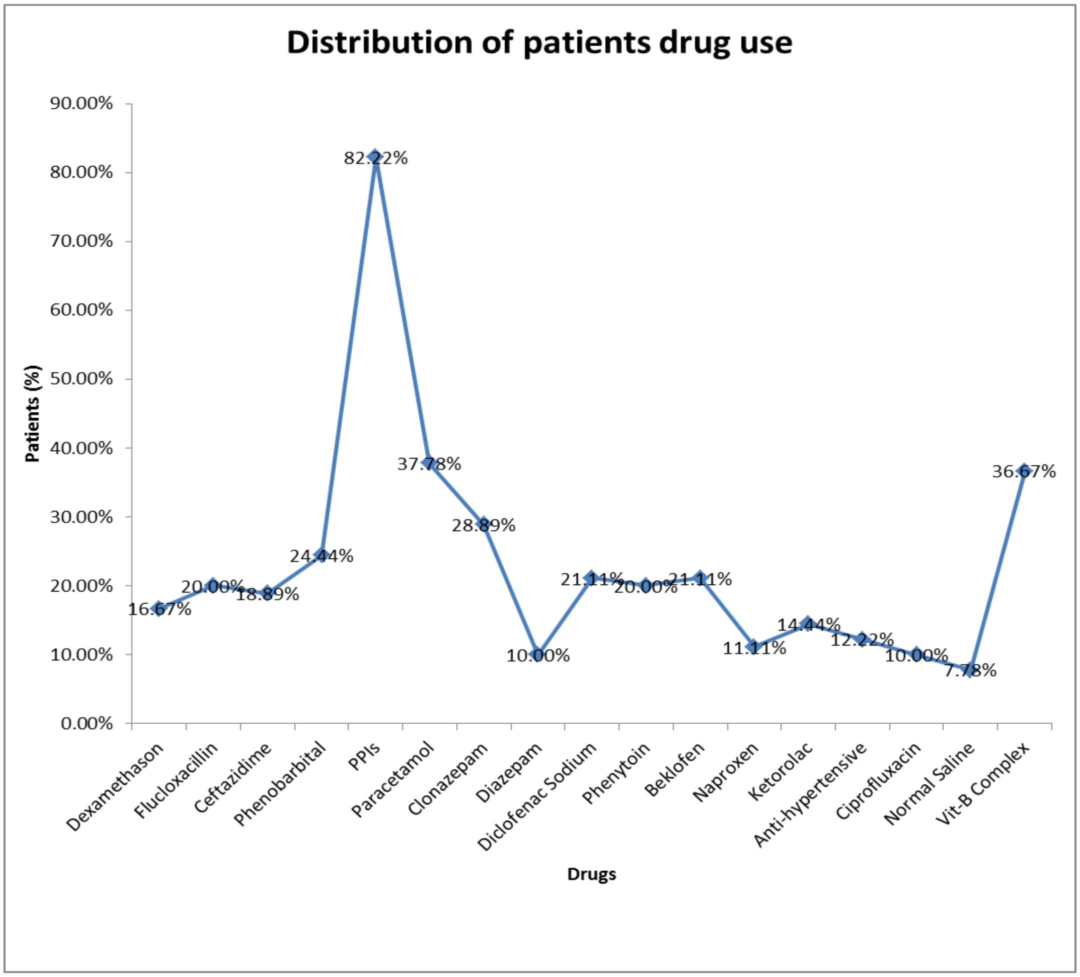

Figure 3.16: Distribution of patients drug use

Chapter Four

Discussion

Discussion:

This prospective study was conducted with 90 patients at Bangabandhu Sheikh Mujib Medical University (BSMMU**).**

This study revealed the gender distribution where male patients dominated (53 %) in number. Male are more commonly admitted at neurosurgery department.

The survey results revealed that the age group between 41-50 and 31-40 dominated in number. Among them most are male, but female patients are found mostly above 50 years.

In this study, majority of the patient's blood group belong B(+ve) and O(+ve). There were no patients of B(-ve), O(-ve) and AB(-ve).

Most of the patients were under treatment between 0-60 days, but the patients who are suffered from brain tumor and brain abscess their treatment duration become long.

37 patients among 90 patients height between 5'4''-5'6'', 30 patients height between 5'1''-5'3''.

56.67% patients weight between 41-60kg and among them most are female. Most of the male patients weight between 55-65 kg.

The below table shows the classification of blood pressure adopted by the American Heart Association for adults who are 18 years and older:

Category	**Systolic, mmHg**	**Diastolic, mmHg**
Hypotension	<90	<60
Desired	90-119	60-79
Prehypertension	120-139	80-89
Stage1 hypertension	140-159	90-99
Stage2 hypertension	160-179	100-109

This study shows that most of the patients (66.67%) belong in prehypertension stage and 13.33% patients in stage1 hypertension stage. 12.22% patients use antihypertensive drug.

The blood glucose target range for diabetics, according to the American Diabetes Association, should be 5–7.2 mmol/l (90–130 mg/dL) before meals, and less than 10 mmol/L (180 mg/dL) after meal.66.67% patient's blood glucose level in normal range. 33.33% patient's blood glucose level higher than normal range. But there was no patients who need to take insulin.

30% patients were smoker and there was no alcoholic patient.

There was 8 patients who have a previous surgery history and also prepared for another surgery. Most of them were prepared for a surgery and 32.65 % patients no need of surgery.

Most of the patients target organ is brain (66.30%) and back (22.83%). A few patients are affected in spinal cord and neck.

MRI has a wide range of applications in medical diagnosis and over 25,000 scanners are estimated to be in use worldwide. MRI has an impact on diagnosis and treatment in many specialties although the effect on improved health outcomes is uncertain. Since MRI does not use any ionizing radiation, its use is generally favored in preference to CT when either modality could yield the same information.

This study revealed most of the patient's about 80%, disease condition were diagnosed by MRI and 20% by CT scan.

Most of the patients who admitted in neurosurgery department for the treatment of different type of tumor e.g. glioma, ependymoma, astrocytoma, meningioma, neuroblastoma, cp angle tumor, cerebellar tumor, pituitary tumor. This study shows that patients of meningioma, low back pain, hydrocephalus, degenerative disc disorder dominated in number.

This study shows that there were common complications were found between the patients like fever, loss of consciousness, vomiting, convulsion, headache, vertigo, weakness, vision problem. Headache, vomiting and weakness are predominant.

Few drugs are common for the patients who were prepared for surgery. Diclofenac sodium, Naproxen, Beklofen, Paracetamol are used as pain reliever. PPIs are prescribed for more than 80% patients. For supplementary nutrient Vit-B complex also recommended.

Conclusion:

A cross sectional study is good for descriptive analyses and for generating hypotheses. During the 20th century, distinct educational institutions, accrediting organizations, reviewed publications, and professional societies defined each medical specialty. In the 21st century, the collection and analysis of practice data using shared mechanisms and platforms will add to these important shared and defining professional activities. Today, there is little question that we need to collect patient reported outcomes and economic data to monitor the cost effectiveness of neurosurgical interventions.

This study creates a defined relationship between the neurosurgery patients with their demographic data, diagnosis process, diagnosis impression, duration of treatment, complications /associated disease and also treatment intervention. This study will create huge energy for further analysis of acute or chronic conditions, or to answer questions about the causes of disease or the results of intervention or post-operative follow up.

Chapter Five

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Questionnaire

Name of the experiment: A Cross sectional study on the type of patients and treatment intervention in a neurosurgery department of a tertiary hospital in Bangladesh.

Patient name: Age: Sex:

Diagnosis period: Hair color: Height: Weight:

Blood group: Blood pressure: Diabetes:

Smoking habit: Alcoholic:

Previous Stroke History: Number of surgery/Types of injury/disease:

Target organ of injury: Use of tradition/folk medicines:

Cause of injury/disease:

Genetic background of injury/Family history of particular injury:

Probable reasons/diagnosis/pathology/pathophysiology:

1.

2.

3.

4.

5.

6.

Complications/associated disease:

1.

2.

3.

4.

5.

6.

7.

8.

9.

Drugs/Prescription patterns:

Brand name	Generic name