PRESSURE ULCERS PRESENTATION AND MANAGEMENT AT KENYATTA NATIONAL HOSPITAL AND NATIONAL SPINAL INJURY HOSPITAL

BY

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A DISSERTATION SUBMITTED IN PART FULFILLMENT FOR THE DEGREE OF MASTER OF MEDICINE IN SURGERY

UNIVERSITY OF NAIROBI

2003
DECLARATION

This dissertation is my original work and has never been presented by any other person for a degree in any other University.

SIGNED ___________________________ DATE ______________

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This dissertation has been submitted for examination with my approval as a university supervisor.

SIGNED ___________________________ DATE ______________

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DEDICATION

This work is dedicated to the following.

1. My beloved late mother, Anna Winjila Wamalwa, who took the initiative of taking me to school, was always an inspiration to me throughout my academic life.

2. My wife Lilliane Nyatich Nang’ole and my son Cedric Nicasio Nang’ole for their patience and support during the preparation of this dissertation.
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2. To all the other members of the Plastic Surgery Department for their concern, encouragement and support during the study.

3. The Medical Superintendent, Dr. Siminyu and his entire staff of National Spinal Injury Hospital for having allowed me to carry out the study in their hospital.

4. Mr. Lambert Nyabola of Department of Community Health, for his assistance in the construction of the manuscript.

5. Kenyatta National Hospital Ethical and Research Committee for having allowed me to do the study.
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<table>
<thead>
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<th>Abbreviation</th>
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<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency syndrome</td>
</tr>
<tr>
<td>CT Scan</td>
<td>Computerised Tomography</td>
</tr>
<tr>
<td>C.V.A</td>
<td>Cerebrovascular accidents</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<tr>
<td>KNH</td>
<td>Kenyatta National Hospital</td>
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<tr>
<td>NSIH</td>
<td>National Spinal Injury Hospital</td>
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<tr>
<td>P.S.I.S</td>
<td>Posterior Superior Iliac Spine</td>
</tr>
<tr>
<td>RTA</td>
<td>Road Traffic Accident</td>
</tr>
<tr>
<td>S.P.S.S</td>
<td>Stastitical Package for Social Sciences</td>
</tr>
<tr>
<td>U.K</td>
<td>United Kingdom</td>
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<tr>
<td>U.S.A</td>
<td>United States of America</td>
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SUMMARY
This study was carried out to determine the presentation and management of patients with pressure sores at the KNH and the National Spinal Injury Hospital. These included all patients with pressure sores that were either already admitted in the hospital or admitted during the study period. The period of study was between 1\textsuperscript{st} of March and 31\textsuperscript{st} December 2002.

A total of 113 patients were evaluated during the study period with 96 patients from KNH and 17 patients from the National Spinal Injury Hospital. Of the 113 patients, 77 (68.1\%) were males, while the remaining 36 (31.9\%) were females. The mean age of the patients evaluated was 38.1 years while the range was between 12 and 74 years.

Paraplegia was the main associated medical condition accounting for 35.4\% of the patients. This was followed up by AIDS, which accounted for 27.4\%.
The commonest anatomical site of pressure sores was the tronchanter, accounting for 43\% of the sores. Of the pressure sores studied, 97.2\% were below the umbilicus.

Grade III and IV accounted for 66.4\% of the ulcers. Two hourly turning was the most commonly used pressure dispersion method. Gauze dressing was the most commonly used dressing method while 67.3\% of patients had their wounds cleaned with povidone-iodine.

Fasciocutaneous flaps were the most common surgical procedures, accounting for 81.7\% percent. Others were myofasciocutaneous flaps, V-Y plasty and skin grafts. Overall 59.3\% percent of the surgical procedures had taken fully at one month after surgery. This was however reduced to 48.1\% percent at 3 months.

There is a need to enstrengthen the management of pressure sores at both institutions with special emphasis on prevention.
INTRODUCTION
Pressure ulcer is a serious and common condition that spreads across all the medical disciplines. It is more common among the debilitated patients. While the above is so, the management of this condition has proved to be a nightmare to medical doctors, be it in developed or the underdeveloped countries. Despite the fact that there have been new developments in the management of wounds, and patients as a whole, the outcome of pressure ulcers is by and large disappointing.

Despite recent advances in the management of pressure ulcers, the old saying that the best way to treat pressure ulcers is to anticipate its development and thus prevent its formation; still holds as it did before.

Little research, if any, of this condition seems to have been done locally. Statistics from elsewhere put the prevalence at 3-5% of all hospitalised patients (1). One may however, anticipate an increase in the prevalence of this condition due to a generally older population and an increase in terminal illnesses. Other factors such as R.T.A., HIV/AIDS may contribute to a high prevalence.

Management of this condition is expensive and time consuming and results more often than not a discouragement to the caregivers. The National Health Service (UK) spends an estimated 45 million sterling pounds each year on products and services directly relating to prevention and management of pressure sores(2). This is a colossal amount of money by any standards. The mortality rate in developed world is approximately 7-8%(3).

This study looked into the presentation and management of this condition at K.N.H and National Spinal Injury Hospital. Recommendations on how the management can be improved have been highlighted at the end of the study.
1.0 LITERATURE REVIEW

1.1 Definition

Pressure sores may be defined as localized areas of tissues necrosis that tend to occur when soft tissue is compressed between a bony prominence and external surface for a prolonged period. Shearing accompanying pressure are the most important in the causation of this ulcers.

Pressure sore, decubitus ulcer and bedsore have been used to refer to this condition commonly seen in debilitated patients. “Decubitus” is a Latin word which means to lie down. Since the common physiological process is unrelieved pressure, pressure sore is the best descriptive term. Factors contributing to the formation of pressure sores in addition to the unrelieved pressure include the following:

- Altered sensory perception
- Incontinence
- Exposure to moisture
- Altered activity and immobility
- Friction and shear forces
- Poor nutrition

Individually, any of these factors does not lead to ulcer formation, but the combination with unrelieved pressure may result in irreversible tissue injury.
1.2 Epidemiology
The incidence of the pressure ulcers is largely variable and depends on the patients’ population being evaluated. There is apparently no local study to determine the prevalence/incidence of pressure ulcers in our set-up. In general studies done elsewhere seem to suggest a prevalence of 3-5% of all hospitalised patients (1). Incidences are much higher in the chronic caregiver facilities with reports varying to as low as 3-5% to as high as 50% in some series (4). Pressure sores are obviously more common in the geriatric age groups, as opposed to the younger age groups. In the West, the incidence in patients with spinal cord injuries has decreased greatly with the advent of the rehabilitation centres and overall awareness of the problem.

During World War II, pressure sores were found in up to 85% of the war veterans with spinal injuries. In 1983 Stale et al cited a 20% incidence in the paraplegic patients and 20% in quadriplegic patients (5). Pressure ulcers in the USA have been estimated to be between 1.5 million and 3 million people (4). The common anatomical sites in patients are the ischial, trochanteric, and sacral regions.

In the acute setting, supine patients who are predominantly bedridden, have a slightly different distribution. Study done by the Fourth National Pressure ulcers prevalence survey, which evaluated 6,603 patients found 36% of patients with sacral ulcers, 30% heel ulcer, 6% ischial, trochanteric and malleolar ulcers (6).

Pressure sores in most studies have been implicated to be the cause of death in 7-8% of paraplegics. The average cost per sore admission in the USA is estimated at about US$78,000. The average stay in hospital is about 3 months. The associated medical conditions to the pressure sores development in the USA are:
Cardiovascular disease (41%)
Orthopaedic injury (15%)
Acute neurological disease (27%)

One would expect the disease pattern to be different in our set up as there may be not much cardiovascular accidents as opposed to terminal illness such as HIV/AIDS and other infectious diseases.

1.3 History
Pressure sore has been a well-recognized entity throughout history with early-cited references dating back to the biblical periods, including their demonstration in autopsies performed on Egyptian Mummies.

Many of the early works on the pathogenesis of pressure sores rightfully implicated pressure as the main causal factor.

In 1852, Brown Sequard described the development of ulcers in paraplegic mammals and birds secondary to the effect of continued pressure in the presence of moisture (7).

Paget in 1873, added additional evidence on pressure induced theory on the causation of pressure sores. He also pointed out that the process is accelerated in those individuals who are old or debilitated (7).
Despite this reputable work, the late nineteenth and early twentieth century outlook on pressure sore prevention and treatment was dismal owing to their inevitability as exposed by Charcot's neuropathic theory.

According to Charcot, injury to the central nervous system, released an intrinsic neurotrophic factor regulating nutrition and affecting a decrease in tissue tolerance to pressure resulting in eventual ulceration.

In 1940 Munro also indicated that tissue tolerance to pressure was lowered through abnormal cutaneous vascular reflexes secondary to autonomic dysfunction below the level of cord injury (7). He also felt that aggressive surgical treatment was unjustified since intrinsic factors would eventuate in recurrent ulceration.

After 1940, researchers seemed to concentrate again on pressure as the main issue in the causation of decubitus ulcers.

Growth in 1942, applying pressure to the gluteal muscle region of rabbits, was able to experimentally reproduce pressure sore found in man (7).

Hussein in 1953 also showed similar pathological changes as Growth after applying pressure to rats’ limbs with a pneumatic cuff (7).

The pressure and time to produce histological changes, either reversible or irreversible and that which produces actual ulceration were evaluated by Kosiak through the application of pressure to the Trochanteric and ischial regions of mongrel dogs (7).

Diusdale performed a similar study on paraplegic swine to delineate the absolute constant pressure necessary to produce ulceration as well as the effect of repetitive pressure application and shear forces.

Lindan and co-workers in 1965 studied the normal forces applied to the body surfaces during sitting, supine and prone positions mapping out the areas most susceptible to point pressure (7).
1.4 Pathophysiology

1.4.1 Pressure

It is the single most important feature in the formation of ulcers. The compression of tissue results in ischaemia and if unrelieved will progress and cause necrosis and ulceration. In susceptible patients this sequence of events may be accelerated because of other endogenous factors such as infection, malnutrition, diabetes, or altered neurological states.

If pressure extends beyond the capillary pressure (venous end 12mmHg, and arterial end 32mmHg), then capillary perfusion is impaired and ischaemia ensues. There is an inverse relationship between the amount of pressure and length of time required to cause ulceration. Studies have also shown that muscle is more susceptible to ischaemia than skin. Pressure applied over shorter duration would lead to ischaemic changes in muscles as opposed to the skin.

In a study done by Lindan et al in 1965, (8) using a compressible bed of springs and nails to measure the external distribution of contact pressure in patients supine and seated, they found out that in the supine position, the maximum recorded pressures were 40 to 60 mmHg, near the heels, buttocks and sacrum. In the sitting position, the pressures were greater near the ischial tuberosities with measurement up to 100 mmHg. In normal tissues there is pressure gradients with the pressure being highest over the bony prominence, tapering in all directions, radiating from the bony prominence. This usually results in a conical shaped wound, which is typical of the pressure ulcer, with most tissue destruction directly over laying the bony prominence but still extending to the surrounding tissues.

1.4.2 Infections

The rapid rate of skin breakdown in a pressure sore suggests bacteria process. The compressed skin is thought to have less resistance to bacterial invasion’ This is thought to be in part due to the impaired lymphatic function, ischaemia, denervation and impaired immune function.

A study conducted by Robson and Krizek (9) showed that surgical incisions treated in areas of applied pressure and inoculated with a known concentration of bacteria showed greater bacterial growth than areas not subjected to pressure.

1.4.3 Oedema

This might be thought to be as a result of the increase in the external pressure. Once the external pressure exceeds 12 mmHg, venous engorgement results and the total tissue pressure increases’ As this process continues, end arterial pressure increases; at this point, plasma extravasations occur leading to oedema formation. Increased external pressure leads to the denervation of the tissues. This leads to the loss of the sympathetic tone in the blood vessels, which causes vasodilatation and increased engorgement of vessels and more oedema. Denervation also contributes to lymphatic oedema.

Oedema formation may also be as a result of mediators of inflammation released in response to the trauma of compression. As a result of inflammatory response, there is increased leakage through the cell membrane and capillaries and ultimately increased interstitial fluid accumulation.
Increase in the interstitial pressure, impairs normal tissue perfusion, resulting in poor tissue response to bacterial invasion. There is also dilution of the sebum that normally defends the body against staphylococcus and streptococcus infections.

1.4.4 Shear
This is a factor that is often overlooked in the development of the pressure sores. When a patient slides against the sheets, the skin and subcutaneous tissue tend to adhere to the sheet, whereas the underlying fascia, muscle and bone tend to follow the pull of gravity. The perforating vessels are stretched and may avulse and ultimately lead to tissue ischaemia. Using computed tomographic analysis of patients, Conner and Clack, (10) were able to demonstrate that vertical shear forces result when a patient is in the supine position.

1.4.5 Moisture
Often resulting from incontinence or perspiration, can lead to tissue maceration and facilitate skin breakdown.

In summary, in the pathophysiology of pressure ulcers, unrelieved pressure is the single most important underlying factor. However, other secondary factors play a significant role as shown below:

- Primary Extrinsic factor
  - Pressure
  - Shear
  - Friction

- Secondary (Intrinsic) factors.
  - Local ischaemia/ fibrosis
  - Decreased autonomic control
  - Infection
  - Patient’s age/weight
  - Sensory loss
  - Impaired mobility
  - Incontinence (Stool/Urine)
  - Anaemia
  - Small vessel occlusion
  - Poor mental status
  - Hypoproteinemia

1.5 Grading and Staging of Pressure Ulcers
Pressure ulcers may be graded according to a system developed by the National Spinal Cord Injury Data Collection Centre. This classification is useful when comparing the results obtained by various treatment methods.

One should keep in mind however that the skin manifestation of pressure ulcers might be a tip of the iceberg. By the time the skin changes are seen, the underlying ulcers may be quite extensive since the deeper one goes into the tissues, the more severe the effect of pressure reaching a maximum over the bony prominence. Grading is best done at surgical toilet.

1.5.1 Grading Scale of Pressure Sores
Grade 1: Lesion limited to the epidermis and superficial dermis
Grade 2: Damage involves full thickness of skin down to – adipose tissue
Grade 3: Lesion extends throughout the skin, subcutaneous tissue and underlying muscle
Grade 4: All soft tissue with involvement of bone or joint
The grade of lesion may not reflect the magnitude of the pressure i.e. Grade 1 lesions are not necessarily caused by lesser pressure than Grade 3 ulcers.

1.5.2 Stages of Pressure Sore Development
Are more obvious in light skin individuals.
**Stage 1:** **Hyperemia** – observed within 30 minutes or less, manifested by redness of the skin, which disappear within one hour after pressure is removed.
**Stage 2:** **Ischaemia** – Develop if pressure is continuous for two to six hours. In contrast to hyperemia, redness from ischaemia, requires at least 36 hours after pressure is relieved to disappear
**Stage 3:** **Necrosis** - Pressure not relieved within 6 hours may produce necrosis. This is detected clinically by blueness of the skin (white skinned individuals) or a hard lump similar to a boil. This does not disappear after pressure is relieved.
**Stage 4:** **Ulceration** – Within two weeks necrotic area may become ulcerated and infected. Bony prominence may become involved and destroyed.

1.6 **Risk Factors and Risk Assessment**
Patients who are at risk of developing pressure ulcers include elderly patients. As one ages, the associated skin changes, don’t encourage rapid healing of the skin. The skin epidermal turn over decreases, the dermal epidermal junction flattens, and there are fewer blood vessels. There is also an increase in the dermal collagen, a decrease in the elastic fibres, loss of the basal cells and increase in the skin permeability. There is also a general decrease in the perception of pain as one ages.

Individuals with spinal cord injuries, traumatic brain injuries, and neuromuscular disorders are also at high risk for the development of the pressure ulcers. Other associated risk factors are immobility, malnutrition, faecal and urinary incontinence and altered levels of consciousness. All the above factors are more prevalent among the elderly, compounding the risk that age itself confers. Protein energy malnutrition is a clearly associated risk factor in the development of the pressure ulcer. It may not be easy for one to determine whether an elderly person is malnourished or not. Loss of weight from the baseline, laboratory test such as serum albumin and total cholesterol, which may be low in malnourished patient are not routinely recommended.
1.6.1 Risk Assessment
Risk assessment aims at ways of estimating the likelihood of pressure ulcer development in individual patients. The Norton scale is the most widely used instrument. It assesses 5 parameters.

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<td>Mental condition</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Activity</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Mobility</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Continence</td>
<td>1</td>
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Each parameter is scored on a scale of one to four. A higher number indicating a higher functional risk. A score of 16 was determined to be the threshold for high risk, and was seen as a priority time for applying preventive strategy. Other assessment scales include Braden and Waterlock risk assessment scales. Wellards and Losk compared the above scales in the management of pressure ulcers in spinal cord injuries.

1.7 Preventive Strategies
The preventive measures for the development of pressure ulcers involve:

a) Recognition of high-risk patients. This is by the use of the Norton’s scale in grading patients susceptible to pressure ulcer development.

Early detection of incipient pressure sores and aversion of ulceration/ tissue necrosis.

Measures taken include:

Skin care: This involves frequent cleaning with soap and water. The skin should be kept dry.

Indwelling catheters or urinary faecal diversions procedures should be performed on a high-risk patient. The beds should be free of particulate matter.

Pressure dispersion: This may involve proper positioning of the patient. Use of antispastic drugs such as diazepam, baclofen and dantrolene have also been advocated. Patient with spastic paralysis may also benefit from surgical procedures such as; dorsal rhizotomy, myelotomy implanted spinal stimulation and subarachnoid baclofen pump.

- Use of gel pads has also been advocated.

- Other measures include specialized beds such as the low air loss beds, air fluidized beds and last but not least 2 hourly turning.

1.8 Treatment
The treatment of the pressure ulcers is one of the most challenging areas in plastic surgery.

The treatment can be divided into:

Non-surgical treatment
Surgical treatment
Pressure ulcers should be regarded as a visual manifestation of one or more underlying medical conditions. The ulcer should not only draw attention to itself but also to the patients underlying medical or surgical condition. The general principles of the pressure ulcer treatment comprises the following:-

- Relief of pressure
- Removal of devitalized tissue
- Optimization of the wound environment to promote granulation and epithelization.
- Avoidance of maceration, trauma, friction or shearing force.
- A search for reversible underlying conditions, which may predispose to ulcer development or impede wound healing.

1.8.1 Non Surgical Treatment

1. **Nutrition**

The patients’ nutritional condition must be reviewed. Daily calorie counts should be started as soon as the patient is hospitalized with a minimum calorie intake of between 25 – 35 Cal/Kg of non-protein. Daily protein requirements of 1.5 – 3.0g/Kg should also be given. The serum albumin should be maintained above 2-0g/dl Vitamin A, and Vitamin C should be supplemented as they play a crucial role in wound healing\(^{15}\).

Trace elements especially zinc are also crucial for the wound healing. Zinc is involved in epithelialisation and fibroblast proliferation through its effects on metalloenzymes. Other trace elements copper and iron that are needed for the hydroxylation of lysine and proline must also be supplied. They also participate in the normal collagen metabolism. Other micronutrients should also be supplemented to reach normal nutritional status\(^{16}\).

Blood levels should also be assessed and corrected appropriately. If the patient is unable to take an adequate amount of daily nutrition, supplemental means should be used. This should either be by enteral feeding or parenteral hyper alimentation.

2. **Treatment of Infections**

Concomitant infections may occur in patients with pressure sores. The infections could be urinary tract infections, mainly as a result of catheterization or stasis due to urinary retention in patients with spinal cord injury. Pulmonary infections may also occur due to poor diaphragmatic functions in patients with spinal cord injury. Infections in the pressure sore areas may also spread either locally or systematically to cause osteomyelitis or septicemia as the case may be. In suspected osteomyelitis complete blood counts, erythrocyte sedimentation rate and plain radiographs must be done. Bone biopsy may be done and is considered to be the gold standard in the diagnosis of osteomyelitis.

Before initiation of antibiotics either topical or systemic, wound biopsies should also be taken. For quantitative culture, the accuracy of the tissue biopsies ranges from between 90 – 100%. Appropriate antibiotics should include coverage for gram – ve, and gram +ve anaerobes.

Swabbing cultures are discouraged because the specimen may only represent surface contaminants and may thus be unreliable. Robson demonstrated that bacterial tissue concentrations greater than $10^5$ per gram, constitute wound infection and are associated with decreased wound healing. Concentrations in excess of $10^9$ are often associated with systemic sepsis\(^9\).
3. **Relief of pressure.**
The primary pathology in the development of pressure sores is the sustained pressure in certain body parts. Wound healing would thus not occur in the presence of such pressure, causing ischaemia and infection.

A simple program of turning the patient may relieve pressure. Relieving it for as briefly as 5 minutes every 2 hours can negate the deleterious effects of pressure.

A variety of mattress systems have also been designed to relieve pressure. This includes foam, static flotation, alternating air, low air loss and air fluidized beds. The purpose of these mattresses is to distribute the patients weight more evenly to minimize pressure in any one area. Of special emphasis is the clinitron bed. It is designed with medical grade optical beads fluidized with a constant flow of warm air. It is most effective in reducing the external pressures when patient is supine.

It has the following disadvantages: -
- It is quite heavy, 2000 pounds
- It is very expensive.
- It can cause electrolyte, and water loses especially in the elderly patients.
- In patients with compromised breathing, pulmonary toilet may be impaired.

4. **Management of spasm**
Spasticity is common in patients with spinal cord injuries. The more proximal the lesion is, the higher is the incidence of spasms, almost 100% in cervical lesions, 75% in thoracic and 50% in thoracolumbar regions. If spasms are not eliminated before any surgical procedure, the pressure sores will inevitably recur. Medications available to reduce spasms include diazepan, baclofen and dantrolene. If patients don’t respond to medical therapy, surgical intervention may be indicated. The surgical management, include peripheral nerve blocks, epidural – stimulators, baclofen pumps and rhizotomy. Rhizotomy can be surgical or medical using subarachnoid blocks with phenol. (Phenol rhizotomy)

5. **Contractures Therapy**
Joint contractures may occur in patients with long-standing denervation, unless an aggressive programme of physiotherapy is initiated early, these patients will have a significant problem. Contractures are caused by tightening and fibrosis of the muscles and joint capsules. They are mainly common in the hip contributing to the formation of trochanteric, knee and ankle ulcers.

Physiotherapy should be practiced in order to prevent contractures from occurring and instituted in their treatment. If it is unsuccessful at relieving the contractures, then tenotomies should be performed.

In summary the ultimate treatment of the ulcers themselves is not necessarily surgical. It may be prudent to attempt ulcer closure without surgical means. Proper preoperative assessment and preparation usually allow the ulcer to be observed.

If the ulcer appears to be healing significantly during this time continuation of non-surgical treatment is indicated.
Some patients may never be candidates for surgical correction because of significant medical problems. In this patients, avoidance of unrelieved pressure, control of infection, control of incontinence and improved nutrition may lead to successful ulcer closure.

Ulcer closure has been demonstrated to be accelerated by the use of some topical agents, other than antibiotics. Studies done by Robson et al, demonstrated improved healing in ulcers treated with recombinant human platelets derived growth factors and basic fibroblast growth factors, (19).

1.8.2 Surgical Management of Pressure Sores
Surgical management of pressure sores is based on the following three principles: -
Excisional debridement of the ulcers, its bursa, and any heterotopic calcification.
Partial or complete ostectomy to reduce the bony prominence.
Wound closure with healthy tissue that is durable and can provide adequate padding over the bony prominence.

1. Debridement:
Should be accomplished in the operating room where adequate light, assistance and ability to control bleeding can be obtained. Limited bedside debridement may be useful to facilitate local wound care preoperatively. This usually means deroofing the eschar or opening cutaneous window to allow adequate exposure for dressing change.

During the debridement the patient should be placed in a position that gives the surgeon maximum exposure.

The ulcer line boundary may be difficult to determine and 1% methylene blue solution may be used. Hydrogen peroxide may then be irrigated on the wound to remove excess dye. (20)

In patients where cellutitis or adjacent structural infection is suspected, tissue biopsy should be taken for culture and sensitivity to assist in post operative antibiotics cover and selection of most effective topical antimicrobial agent.

After debridement, the wound can be lightly packed with gauze soaked in saline or topical antimicrobial. Silver sulphadiazine, mafenide, povidone-iodine and dakins solutions are frequently used agents. Although all these agents are bactericidal, they are also toxic to fibroblasts and macrophages and hence affect wound healing. (21)

Only buffered dakins solution as 0.025% is both bactericidal and non toxic to cells involved in wound healing.
2. Ostectomy
The aim of treatment in ostectomy is to remove the bony prominence. The bony prominence acts as a focal point of pressure to the overlying soft tissue. Excision of exposed bone and infected bone may also be necessary to close the wound.

Overaggressive bony excision, may however lead to extensive bleeding, skeletal instability and redistribution of pressure points to adjacent areas; e.g. in ischial ulcers, ischiectomies may be associated with formation of a contralateral ischial ulcer in almost a third of the patients. Bilateral ischiectomies, has resulted in the formation of the perineal ulcers which may be complicated further by the urethral fistulae. (22)

3. Pressure Ulcer Closure
The operative procedure chosen should be customized to the patient as well as the ulcer. When planning a surgical strategy, the surgeon should consider subsequent surgical procedures as well as the present surgery. The choice of the skin flaps versus musculocutaneous flaps depends on not only the location, size and depth of the ulcer but also the previous surgeries.

Primary closure is discouraged since it almost always leaves a subcutaneous “dead space”. In addition, adjacent tissues are usually less compliant than would be necessary for a tension less primary closure.

Skin grafting of pressure sores may be possible with superficial ulceration, but this tends to provide unstable coverage and the success rate is only 30% (23).

Wound closure more often than not requires rotation of local skin, fasciocutaneous or musculocutaneous flaps.

The advantages of musculocutaneous flaps for coverage of pressure sores include the following: -
Excellent blood supply
Provision of bulky padding
Ability to readvance or derotate flaps to treat recurrences
Proven effectiveness in treating infected wounds.

The disadvantages include the following: -
Muscle is the tissue most sensitive to external pressure.
Muscle may be atrophic in elderly patients and in those with spinal cord injuries.
May lead to a functional deformity in ambulatory patients.

The fasciocutaneous flaps have the following advantages: -
Adequate blood supply.
Durable coverage.
Minimal potential for functional deformity.
Better reconstruction of the normal anatomic arrangements over bony prominences.

The disadvantages include the limited bulk for the treatment of large ulcers.

1.8.3 Common locations of pressure sores, which require specific considerations.
1. Ischial Pressure Sores
Ischial pressure sores mainly occur in seated patients.
The recurrence of ischial pressure ulcers is high due to the patients return to the seated position. Conway and Griffith reported a recurrence of upto 75 to 77% regardless of the type of treatment (24). Operatively the patient is placed in a jack knifed flexed position so as to best access the ulcer. This also creates the natural tension applied to this area during sitting and displays the true diameter of the cutaneous defect. As already mentioned flaps should allow coverage of ulcer but not prevent the use of other secondary flaps for pressure sores recurrence. Other factors to consider while constructing flaps are: -

1. Size and depth of the ulcer  
2. Quantity and pliability of the surrounding skin  
3. Presence of previous surgical scars  

Local random flaps such as the medial or laterally based posterior thigh flaps can be used successfully to treat some superficial ulcers. Limitations include, need of skin graft at the donor sites and the inability to use secondary flaps from the region if the perforating vessel are transected. The flap may also lack the necessary bulk to close the wound. Other flaps that can be used for the ischial ulcers include: -

1. The inferior gluteal musculocutaneous flap- based on the inferior gluteal artery. It uses only the lower half of the gluteus maximus muscle. The flap has the following advantages: -

a. It does not eliminate later use of the posterior thigh flap  
b. The function of the gluteus maximus is spared, as the distal attachment of the muscle in the femur is not interfered with.  
2. Superiorly based gluteal flaps.  
    Advantages include: -
    Ability to bring well padded tissue into the wound and to readvance them if necessary. This is possible because of the segmental blood supply in this region. These flaps are mostly designed as V-Y advancement flaps  
1. Tensor fascia lata flap (TFL) can occasionally be used to close ischial ulcers.

2. Sacral Pressure Sores  
Sacral pressure sores occur in the supine patients. Like ulcers elsewhere, they can be treated with a variety of procedures ranging from simple primary closure to free flaps. Excision is carried out in the prone position with the table flat.  

Primary closure usually results in a short-term solution with high recurrence rates. Its use is also limited due to the large cutaneous defect owing to the broad surface of the sacrum. Superficial ulcers can be treated by skin graft but the recurrence rate of upto 70% have been recorded mainly due to the constant pressure on the sacrum. Most employed flaps for sacral defects are the musculotaneous or fasciocutaneous flaps. Borman Huseyin and Maral Tugial reported very satisfactory results with the use of gluteal fasciocutaneous rotation advancement flap with V-Y closure (25). Most musculocutaneous flaps employed are based on the gluteus maximus muscle. The flap can be based superiorly or inferiorly. The flap can be of muscle or muscle and skin, may be rotated or advanced or turned over. Other available flaps include the transverse and vertical lumbosacral flaps which are based on the lumbar perforating vessels. Sacral pressure sores are common in patients with spinal injury. Since the main problem is lack of sensation in such patients, tissue expansion of sensate skin more cranially on the back has been described as one way of improving sensation. There are also various techniques for placing small sensate buttons from intercostal nerves origins.
3. **Trochanteric Pressure Sores**

Trochanteric Pressure Sores usually develop in patients who lie in the lateral decubitus position for too long. As already mentioned, treatment with primary closure and skin grafting will lead to recurrence. The flap most commonly used for treatment of the Trochanteric sores is the tensofascialata musculocutaneos flap. The pressure ulcer excision and osteotomy are preformed with the patient lying on the contralateal side and the ipsilateral leg draped free to allow hip flexion during surgery.

The tensor fascia lata flap is based on the perforating vessels from the muscle. The pivot point of the flap is about 8cm below the anterior superior iliac spine. This flap also possesses the potential to transfer an innervated sensory skin paddle with inclusion of the cutaneous branch of T12.

The Trochanteric region is similar to the ischium when it comes to skin grafting and is usually poorly tolerated except as a temporary biological dressing.

The reason for this is the nature of the underlying bony surface, which for the trochanter and ischium presents as a localised projection, generating high pressures with significant peripheral undermining and sizable cavities.

Another flap that is commonly designed and executed for the Trochanteric sore is the anteriorly based random lateral thigh flap. This flap provides a reliable coverage with ability of future advancement should a recurrence occur. Other flaps, which may be used for the Trochanteric sore include: the gluteal thigh flap, vastus lateralis myocutaneous flap and the gluteus medius tensor fascia lata flap.

1.8.4 **Other Surgical Modalities**

As an alternative to free flap transfers, which often necessitate a violation and scarring of the upper torso, the lower extremity may be sacrificed skeletally, preserving its abundant soft tissue for bulk muscle padding and cutaneous coverage.

Amputations may also improve the patients transferring capacity from bed to chair by decreasing weight and eliminating a spastic or flaccid extremity.

Hemicorpectomy may also be used for intractable life threatening decubitus ulcers. These procedures, should however, be reserved only for patients who are crippled with multiple recurrent recalcitrant ulcerations often complicated by deep seated osteomyelitis not amenable to improved local care and regional flap closure.

An additional conservative measure, which can be taken both prior to and following any surgical procedure is the use of a circumferential body support jacket, which transfers the weight bearing of sitting to the sensate upper thoracic cage region.

1.9 **Complications**

Acute complications related to treating pressure sores include:-

- Haemorrhage
- Cardiopulmonary complications
- Infections

Long term complications include: -
1. Recurrence:
This is the most common complication associated with pressure sores. Recurrence of as high as 95% have been reported in some studies. Prevention of recurrence requires at least the patients or caregivers co-operation and motivation.

The reasons for the high rates of recurrence are multifactoral, but include the following:
- Underlying medical condition that originally contributed to ulcer formation usually persists, such as spinal cord injury or dementia
- Labour intensive nursing care issues e.g. turning the patient, local wound care, avoidance of urine and faecal contamination may not have changed from preoperative setting.
- Other medical conditions such as diabetes, cardiovascular disease are associated with increased rate of recurrence.
- Social factors such as smoking, alcohol may also increase recurrence.

2. Carcinoma
Marjolins ulcer is used to describe carcinoma arising in chronic wound. The most common cell type is the squamous cell carcinoma. They are usually more aggressive and have a poorer survival with 2 year mortality rate varying from 66% to 80%\(^{26,27}\). The metastatic rates from this ulcer are 61% compared with a rate of 34% for Marjolins ulcers arising from burn scars.

2.9 Topical Disinfecting Agents
The direct application of topical disinfecting agents to the wound surface is controversial\(^{28}\). The use of topical antimicrobials such as silver sulphadiazine in the treatment of pressure ulcers was borrowed from experience in the management of burn patients whose wounds frequently become secondarily infected.

Since the rate of infection, causative organisms, and mechanism of infection differ, one may not expect the treatment to be the same.
- Irrigation with saline can retard bacterial growth in open pressure ulcers.
- The use of topical disinfecting agents may actually be counter productive.
- Povidone iodine, acetic acid, hydrogen peroxide and sodium hypochlorite are all cytotoxic to fibroblasts and may impair wound healing.\(^ {29}\)

Topical antimicrobials such as mupirocin and silver sulphadiazine can decrease bacterial counts but however long use of the same may lead to resistant organisms. Topical antibiotics also generally do not penetrate deeply into the ulcer. Hypersensitivity, contact dermatitis and systemic toxicity from drug absorption can all occur with all topical antibiotics. Topical antibiotics are recommended to be used for seven to ten days to prevent bacterial resistance.

Odour can be a major problem with pressure ulcers as with many other wounds. This is mainly due to the anaerobic bacteria, which may colonize the wound. Some workers have advocated the use of 0.75% topical metronidazole gel to help control this problem\(^ {29}\). Topical metronidazole may not however hasten the rate of wound healing.
1.10 Economic Factors
The cost of treating pressure ulcers as mentioned much earlier is exorbitant. In the U.S.A. the cost of treating one patient is estimated to be between $20,000.00 to $50,000.00 (30).

The obvious approach to reducing cost is prevention. The cost in labour and materials would be $15.132 to $43.00 per day, depending on the patients' population (31).

Another factor that affects the cost is the pressure sores extent. Stage III and IV ulcers can cost almost twice as much to treat as stage I or II ulcers. Therefore ulcers must be identified early with initiation of aggressive treatment and preventive programmes.

Other Treatment Modalities
1. Therapeutic Ultra-Sounds for Pressure Sores
Pressure sores have been claimed to be treated by the use of physical therapies such as ultrasound. However in a study done by Flemming and Cullmun, in England in the year 2000, they found out that there was no apparent benefit of ultrasound therapy in the treatment of pressure sores (32).

In a study done by Nussbaum, Biemann and Mustard in the USA, on the role of ultrasound/ultraviolet C, and laser on treatment of pressure ulcers in patients with spinal injury, they claim that ultrasounds/ultraviolet light C may increase the rate of healing and allow faster return to rehabilitation programs and leisure activities for patients (33). A similar study carried in Australia by Lordanon Pangiota et al showed similar results (34).

2. Maggot Therapy
For centuries maggot therapies has been recognized as an aid to wound healing. Earlier physicians incorporated live blowfly larvae in wound dressings. They realized thorough debridement of the wounds. These hastened wound healing. A prospective study carried out by Shermon, Wyclef, Culpe reported in the journal of spinal cord medicine USA (April 1995) showed that maggot therapy was significantly more effective and efficient than the current convention treatment alternative being used (35). Maggot therapy was also safe, simple and inexpensive and more environmentally friendly. It can be a valuable modality in the treatment of pressure ulcers.

3. Hydrotherapy
Studies done by Burke, Holf Sarliema and Stawart, showed that patients on hydrotherapy improved at a significantly faster rate than those on conventional treatment modalities only (36).

4. Electric/Electromagnetic Energy
Studies have been carried out to evaluate the use of electric and electromagnetic waves in the treatment of pressure sores. However to date no conclusion has been reached on whether this has a role in the management of pressure sores (37). It is recommended that studies be carried out with larger sample sizes.

5. Growth Factors
Several growth factors have been used in the management of pressure sores. Growth factors work by either stimulation of fibroblasts, migration, proliferation, vascular angiogenesis, or stimulation of collagen synthesis (38).
A study carried out by Hirshberg, Coleman and Marchant, demonstrated that Topical application of tumour growth factor beta 3 (TGF-beta 3) was useful in the treatment of pressure ulcers (39).
2.0 JUSTIFICATION AND OBJECTIVES
2.1 Justification of the Study
Pressure ulcers are a common medical and surgical condition. Studies done elsewhere suggest a prevalence of up to 5% of all hospital admissions.

Pressure ulcers are more common in patients who are bedridden, malnourished, and patients with spinal injuries.

With the increase in road traffic accidents and other causes of trauma as well as terminal illness such as HIV/AIDS, one would expect an increase in pressure ulcers in our patients.

Pressure ulcers rarely occur in isolation. More often than not they accompany serious medical or surgical conditions.

The management of this condition is thus more often overlooked as more emphasis is put on the main medical/surgical condition the patient has. It is only later when the ulcers are advanced that their care is considered.

No studies seem to have been done locally, as far as this condition is concerned.

This study aims to put more light on the condition, establish a baseline as far as the management of this condition is concerned.

2.2 Study Objectives

Broad Objectives
To determine the presentation and management of patients with pressure ulcers at Kenyatta National Hospital and the National Spinal Injury Hospital.

Specific Objectives
1. To determine the prevalence of pressure ulcers among the inpatients at Kenyatta National Hospital and the National Spinal Injury Hospital.
2. To determine the average age of presentation of this condition
3. To determine the average duration of stay in the hospital for the patients.
4. To determine the various anatomical presentations of this condition and their particular proportions as well as the grades of the ulcers.
5. To establish the main associated medical and surgical conditions.
6. To establish the various treatment modalities offered to the patients’.
7. To determine outcome of the various surgical modalities/options offered to the patients, with this condition.
3.0 MATERIALS AND METHODS

3.1 Study Design
This was a nine-month descriptive prospective study from 1st March to 31st December 2002. The entry point for the patient was when first seen by the Principal Investigator. Patients who were put on medical treatment were followed up for three weeks (These was mainly to determine the treatment regimes and investigations that were carried out). All patients who underwent surgical interventions were followed up for three months so as to determine the outcome of their operations.

3.2 Study Area
This was undertaken at the Kenyatta National hospital and the National Spinal Injury hospital.
Kenyatta National Hospital is a tertiary referral and teaching hospital with a bed capacity of 2500 patients. National Spinal Injury Hospital is a specialised rehabilitation centre for patients with spinal injury with a bed capacity of 25 patients.

3.3 Study Population
These were adult patients admitted at K.N.H and the National Spinal Injury Hospital.

a) Inclusion Criteria
All adult patients admitted in the medical or surgical wards on treatment for pressure ulcers, or pressure ulcers alongside other ailments. This was during the defined period of study.

b) Exclusion Criteria
Patients without pressure ulcers were not eligible for the study. Also excluded were patients with obstetrics or gynaecological conditions, paediatric patients and patients in the intensive care unit.

c) Sample Size
The minimum sample size was derived from the formula:

\[ n = \frac{Z^2 p (1-p)}{d^2} \]

\[ \begin{align*}
  n &= \text{sample size} \\
  p &= \text{Prevalence of pressure sores (estimated at 6.4\% as per the study carried out by Lepisto}^{(40)}\text{).}
\end{align*} \]
\[ Z = \text{Standard normal deviate corresponding to 95\% confidential interval} = 1.96 \]

\[ d = \text{Absolute precision required (set at + or - 5\%)} \]

therefore

\[ n = \frac{1.96 \times 1.96 \times 0.064 \times (1 - 0.064)}{0.05 \times 0.05} = 92 \]

**Variables considered**

1. Demographic Data – Age, Sex, Residence.
2. Duration of hospital stay.
4. Anatomical sites of the ulcers.
5. Grades of the ulcers.
6. Medical/Non surgical treatment being offered.
7. Surgical treatment being offered.
8. Outcome of the surgery.

**4.3 Data Collection**

The study was conducted by the Principal investigator, under the guidance of the supervisor from the Department of Surgery, University of Nairobi.

Patients were actively searched for and recruited for the study by the principal investigator after meeting the inclusion criteria. Informed consent was then sought from the patients (Minors were consented for by their parents/guardians) (Appendix II).

Thorough history and physical examination was then undertaken on the recruited patients with special emphasis on the pressure sores. Information on patients’ management was extracted from the files.

Further information was sought out by the principal investigator having interviews with the doctors, nurses, physiotherapists and nutritionist of the particular units as the case might have been.
Patients in the medical or surgical units who had not been seen by the plastic surgeons had this facilitated by the principal investigator who personally took the consultations to the members of the team.

Due to unavailability of theatre at the National Spinal Injury Hospital, all patients meant for surgery had to be referred to the plastic surgery unit, K.N.H. The principle investigator had to ensure that these patients were fully prepared for surgery. Wherever possible, he was involved in the surgery itself.

Post operatively; all patients had their wounds assessed by the principle investigator regularly upto the third postoperative month so as to assess the outcome of the surgical procedures. This was in liaison with the supervisor.

All the information gathered was then filled in a questionnaire (appendix III), which had been pretested.

3.6 Data Processing and Analysis
All the questionnaires were coded and the collected data entered into the computer using SPSS version10 software programme for analysis.

Descriptive statistics analysed were mean, median, mode and range. In addition, standard normal deviate test was used to make comparisons where appropriate. Results are presented in forms of tables, graphs and diagrams.

3.7 Ethical Consideration
1. Permission to carry out the study was sought from the Kenyatta National Hospital Ethical and Research Committee (Appendix IV).
2. All the information obtained was confidential and was only used for intended purposes.
3. All questionnaires and entry tables bore no patients’ name or ethnicity and were identified by serial numbers and in patient numbers.
4. Informed consent was sought from all the patients.
5. Any relevant information was made available to interested party/parties on request from the principal investigator.
4.0 RESULTS

A total of 113 patients were followed up during the study period, 96 patients from KNH and 17 patients from National Spinal Injury Hospital. One patient was excluded from the study. This patient was lost to follow-up soon after discharge.

4.1 Prevalence
This was determined between 10th to 16th November 2002. At KNH, a total of 1175 were evaluated. Of these 670 were in the medical wards, while 505 were in the surgical wards. Of those in the medical wards, 29 had pressure sores giving a prevalence of 4.32%. Among patients in the surgical wards, 20 patients had pressure sores giving rise to a prevalence of 3.96%. Overall prevalence of pressure sores at KNH was 4.2%.

At the National Spinal Injury Hospital (of the 25 patients present), 17 patients had pressure sores. This resulted in prevalence of 68%. The overall prevalence of pressure sores among the patients in the two hospitals was 5.5%.

4.1.1 Age

Table 1: Patients age distribution

<table>
<thead>
<tr>
<th>Age</th>
<th>KNH</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 – 20</td>
<td>8</td>
<td>3</td>
<td>11</td>
<td>9.7</td>
</tr>
<tr>
<td>21 – 30</td>
<td>21</td>
<td>3</td>
<td>24</td>
<td>21.2</td>
</tr>
<tr>
<td>31 – 40</td>
<td>36</td>
<td>6</td>
<td>42</td>
<td>37.2</td>
</tr>
<tr>
<td>41 – 50</td>
<td>11</td>
<td>3</td>
<td>14</td>
<td>12.4</td>
</tr>
<tr>
<td>51 – 60</td>
<td>12</td>
<td>2</td>
<td>14</td>
<td>12.4</td>
</tr>
<tr>
<td>61 – 70</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>4.4</td>
</tr>
<tr>
<td>&gt; 70</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>TOTAL</td>
<td>96</td>
<td>17</td>
<td>113</td>
<td>100</td>
</tr>
</tbody>
</table>

The modal age group was 31-40 years. The age range was 12 – 74 years of age, with the mean age of presentation at 38.1 years. (Table 1, Figure 1)
4.1.2 Sex

Table 2: Patients’ distribution by sex

<table>
<thead>
<tr>
<th>SEX</th>
<th>HOSPITAL</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>63</td>
<td>14</td>
<td>77</td>
<td>68.1</td>
</tr>
<tr>
<td>Female</td>
<td>33</td>
<td>3</td>
<td>36</td>
<td>31.9</td>
</tr>
<tr>
<td>Total</td>
<td>96</td>
<td>17</td>
<td>113</td>
<td>100</td>
</tr>
</tbody>
</table>

About 68% of the patients were male, while 32% of the patients were female giving rise to a male: female ratio of 2.1:1. (Table 2)

4.1.3 Anatomical sites for ulcers

Table 3: The various anatomical sites for ulcers

<table>
<thead>
<tr>
<th>Anatomical site</th>
<th>HOSPITAL</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacral</td>
<td>58</td>
<td>4</td>
<td>62</td>
<td>19.3</td>
</tr>
<tr>
<td>Trochanteric</td>
<td>114</td>
<td>24</td>
<td>138</td>
<td>43</td>
</tr>
<tr>
<td>Ischial</td>
<td>27</td>
<td>6</td>
<td>33</td>
<td>10.3</td>
</tr>
<tr>
<td>Medial condyles</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>2.5</td>
</tr>
</tbody>
</table>
Trochanteric sores accounted for 43% of the ulcers while sacral and ischial sores contributed to 19.3% and 10.3% respectively. Only 2.8% of the ulcers were supraumbilical.

The average number of ulcers per patient was 2.84. Of the ulcers at KNH 22% were sacral, while at NSIH 6% were sacral. This was statistically significant ($Z = 2.70$, $p < 0.05$). (Table 3)

<table>
<thead>
<tr>
<th>Location</th>
<th>Count</th>
<th>30</th>
<th>10</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral condyles</td>
<td>6</td>
<td>4</td>
<td>10</td>
<td>3.1</td>
</tr>
<tr>
<td>Patella</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0.9</td>
</tr>
<tr>
<td>Medial Malleolus</td>
<td>11</td>
<td>6</td>
<td>17</td>
<td>5.3</td>
</tr>
<tr>
<td>Lateral Malleolus</td>
<td>14</td>
<td>9</td>
<td>23</td>
<td>7.2</td>
</tr>
<tr>
<td>Calcalneal</td>
<td>9</td>
<td>1</td>
<td>10</td>
<td>3.1</td>
</tr>
<tr>
<td>PSIS</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0.6</td>
</tr>
<tr>
<td>Supraumbilicus</td>
<td>6</td>
<td>3</td>
<td>9</td>
<td>2.8</td>
</tr>
<tr>
<td>Others</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>262</td>
<td>59</td>
<td>321</td>
<td>100</td>
</tr>
</tbody>
</table>
4.1.4 Grades of the Ulcers

Table 4: The grades of the ulcers

<table>
<thead>
<tr>
<th>GRADE</th>
<th>HOSPITAL</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>11</td>
<td>6</td>
<td>17</td>
<td>5.3</td>
</tr>
<tr>
<td>II</td>
<td>72</td>
<td>19</td>
<td>91</td>
<td>28.3</td>
</tr>
<tr>
<td>III</td>
<td>117</td>
<td>19</td>
<td>136</td>
<td>42.4</td>
</tr>
<tr>
<td>IV</td>
<td>62</td>
<td>15</td>
<td>77</td>
<td>24.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>262</td>
<td>59</td>
<td>321</td>
<td>100</td>
</tr>
</tbody>
</table>

Grades III and IV contributed to 66.4% of the ulcers. Only 5.3% of the ulcers were grade I. About 28% of the ulcers were grade II. Grade I accounted for 4.2% of ulcers at KNH and 10.1% at NSIH. The difference was statistically not significant. (Z = -1.850, p > 0.05).

Table 4, figure 2

Figure 2: Demonstrates ulcer grades in percentages

4.1.5 Associated medical/surgical condition

Table 5: Associated medical/surgical conditions with the pressure sores

<table>
<thead>
<tr>
<th>MEDICAL/SURGICAL CONDITION</th>
<th>HOSPITAL</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV/AIDS</td>
<td>31</td>
<td>0</td>
<td>31</td>
<td>27.4</td>
</tr>
<tr>
<td>PARAPLEGIA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Accidents</td>
<td>17</td>
<td>14</td>
<td>31</td>
<td>27.4</td>
</tr>
<tr>
<td>b) TB spine</td>
<td>8</td>
<td>1</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>15</td>
<td>40</td>
<td>35.4</td>
</tr>
<tr>
<td>QUADRIplegia</td>
<td>9</td>
<td>2</td>
<td>11</td>
<td>9.7</td>
</tr>
</tbody>
</table>
Of the 113 patients followed up, 35.4% were paraplegic with 9.7% of the patients quadriplegic. A significant proportion of the patients (27.4%) had AIDS. Only 2.7% of the patients had dementia and 5.3% diabetes mellitus. (Table 5, figure 3)

**Figure 3: Associated medical/surgical conditions in percentages**

![Medical/Surgical conditions](image)

<table>
<thead>
<tr>
<th>Medical/Surgical conditions</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV/AIDS</td>
<td>27.4</td>
</tr>
<tr>
<td>Paraplegia</td>
<td>35.4</td>
</tr>
<tr>
<td>Quadriplegia</td>
<td>9.7</td>
</tr>
<tr>
<td>Dementia</td>
<td>2.7</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>5.3</td>
</tr>
<tr>
<td>Head injury</td>
<td>5.3</td>
</tr>
<tr>
<td>Cerebro V. accident</td>
<td>2.7</td>
</tr>
<tr>
<td>Others</td>
<td>11.5</td>
</tr>
</tbody>
</table>

4.1.6 Period of hospital stay in months

**Table 6: Period of hospital stay in months**

<table>
<thead>
<tr>
<th>Months</th>
<th>KNH</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 1 Month</td>
<td>15</td>
<td>1</td>
<td>16</td>
<td>14.1</td>
</tr>
<tr>
<td>1 – 3 Months</td>
<td>29</td>
<td>3</td>
<td>32</td>
<td>28.3</td>
</tr>
<tr>
<td>3 – 6 Months</td>
<td>20</td>
<td>8</td>
<td>28</td>
<td>24.8</td>
</tr>
<tr>
<td>6 – 9 Months</td>
<td>7</td>
<td>3</td>
<td>10</td>
<td>8.8</td>
</tr>
<tr>
<td>9 – 12 Months</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>8.8</td>
</tr>
<tr>
<td>&gt; 1 Year</td>
<td>15</td>
<td>2</td>
<td>17</td>
<td>15.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>17</strong></td>
<td><strong>113</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Overall 57.6% of the patients had stayed in hospital for duration greater than 3 months and 15.2% for duration of more than 1 year. The mean duration of hospital stay was 6.3 months.
About 46% of the patient at KNH had stayed in hospital for a duration less than 3 months while at NSIH only 10.6% of the patients had stayed for this duration. The difference was however not statistically significant. (Table 6)

4.1.7 Residence
Table 7: The patients’ residence in terms of province

<table>
<thead>
<tr>
<th>Residence</th>
<th>KNH</th>
<th>NSIH</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nairobi</td>
<td>18</td>
<td>3</td>
<td>21</td>
<td>18.6</td>
</tr>
<tr>
<td>Central</td>
<td>22</td>
<td>6</td>
<td>28</td>
<td>24.8</td>
</tr>
<tr>
<td>Eastern</td>
<td>21</td>
<td>3</td>
<td>24</td>
<td>21.3</td>
</tr>
<tr>
<td>R. Valley</td>
<td>11</td>
<td>2</td>
<td>13</td>
<td>11.5</td>
</tr>
<tr>
<td>Western</td>
<td>11</td>
<td>2</td>
<td>13</td>
<td>11.5</td>
</tr>
<tr>
<td>Nyanza</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>7.9</td>
</tr>
<tr>
<td>N. Eastern</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Coast</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>17</strong></td>
<td><strong>113</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Overall 64.7% of the patients were from Central, Eastern and Nairobi provinces. North Eastern province had the least number of patients (2) contributing to only 1.7%. (Table 7)
5.0 Investigations

Table 8: Investigations done for the ulcers.

<table>
<thead>
<tr>
<th>Investigation</th>
<th>HOSPITAL</th>
<th></th>
<th></th>
<th></th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KNH</td>
<td>NSIH</td>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pus for culture/sensitivity</td>
<td>18</td>
<td>1</td>
<td>19</td>
<td></td>
<td>86.4</td>
</tr>
<tr>
<td>Tissue Biopsies</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>13.6</td>
<td></td>
</tr>
<tr>
<td>Radiographs</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Blood for C/S</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21</strong></td>
<td><strong>1</strong></td>
<td><strong>22</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Out of a total of 321 ulcers, only 22 ulcers (6.85%) had any investigations done. Pus for culture and sensitivity accounted for 86.4% of the investigations. No radiological investigations were done. (Table 8)

5.1 Medical Treatment

5.1.1 Pressure Dispersion method used

Table 9: Pressure dispersion methods used.

<table>
<thead>
<tr>
<th>Method</th>
<th>HOSPITAL</th>
<th></th>
<th></th>
<th></th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KNH</td>
<td>NSIH</td>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 hourly turning</td>
<td>49</td>
<td>16</td>
<td>65</td>
<td></td>
<td>57.5</td>
</tr>
<tr>
<td>Ripple mattress</td>
<td>13</td>
<td>1</td>
<td>14</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>Water in gloves</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>30</td>
<td>0</td>
<td>30</td>
<td>26.6</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>17</strong></td>
<td><strong>113</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Overall 57.5% of the patients had 2 hourly turning as the pressure dispersion method. Ripple mattress was only utilised in 12.4% of the patients while 26.6% of the patients had no pressure dispersion method employed. (Table 9)

5.1.2 Dressing method

Table 10: Dressing methods employed.

<table>
<thead>
<tr>
<th>Method</th>
<th>HOSPITAL</th>
<th></th>
<th></th>
<th></th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KNH</td>
<td>NSIH</td>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gauze</td>
<td>94</td>
<td>16</td>
<td>110</td>
<td>97.3</td>
<td></td>
</tr>
<tr>
<td>Hydrogel</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>17</strong></td>
<td><strong>113</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Overall 97.3% of the patients had their wounds dressed with gauze while 2.7% of the patients were dressed with hydrogel dressing materials. (Table 10)

5.1.3 Antiseptics used
Table 11: Antiseptics used for cleaning wounds

<table>
<thead>
<tr>
<th>Antiseptics</th>
<th>HOSPITAL</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KNH</td>
<td>NSIH</td>
<td>Total</td>
<td>%</td>
</tr>
<tr>
<td>H₂O₂/Normal Saline/Povidone-iodine</td>
<td>17</td>
<td>4</td>
<td>21</td>
<td>18.6</td>
</tr>
<tr>
<td>Normal Saline/ Povidone-iodine</td>
<td>52</td>
<td>3</td>
<td>55</td>
<td>48.7</td>
</tr>
<tr>
<td>Normal saline and Rifocine</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>8.8</td>
</tr>
<tr>
<td>Normal Saline/Honey/Sugar</td>
<td>15</td>
<td>0</td>
<td>15</td>
<td>13.3</td>
</tr>
<tr>
<td>Savlon</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>5.3</td>
</tr>
<tr>
<td>Others</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>5.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>17</strong></td>
<td><strong>113</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

About 50% of the wounds were cleaned with normal saline and Betadine. A significant proportion of the wounds, (13.3%) were dressed with either honey or sugar. Only 5.3% of the wounds were cleaned with savlon. (Table 11)
5.1.4 Topical antibiotics

Table 12: Topical antibiotics used

<table>
<thead>
<tr>
<th>Topical Antibiotic</th>
<th>KNH</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silversulphadiazine</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2.7</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>Non</td>
<td>92</td>
<td>14</td>
<td>106</td>
<td>93.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>17</strong></td>
<td><strong>113</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Only 6.2% of the patients had topical antibiotics applied to their wounds. In the majority (93.8%) of patients topical antibiotics were not used. (Table 12)

5.1.5 Nutritional Supplementation

Table 13: Nutritional supplementation

<table>
<thead>
<tr>
<th>Methods</th>
<th>KNH</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral supplement</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>Enteral tube feeding</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Parenteral feeding</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td>None</td>
<td>91</td>
<td>15</td>
<td>106</td>
<td>93.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>96</strong></td>
<td><strong>17</strong></td>
<td><strong>113</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Overall 93.8% of the patients had no nutritional supplementation. Only 7 patients (6.2%) had nutritional supplementation, which included oral supplement, enteral tube feeding and parenteral feeding. (Table 13)
5.1.6 Antispasticity Drugs used

Table 14: Antispasticity drugs used among those with spinal injury (n=51)

<table>
<thead>
<tr>
<th>Drugs</th>
<th>KNH</th>
<th>NSIH</th>
<th>TOTAL</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baclofen</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>7.8</td>
</tr>
<tr>
<td>Diazepam</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>7.8</td>
</tr>
<tr>
<td>None</td>
<td>30</td>
<td>13</td>
<td>43</td>
<td>84.4</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>17</td>
<td>15.1</td>
<td>100</td>
</tr>
</tbody>
</table>

Only 15.6% of patients with spinal injury were managed on antispasticity drugs. These drugs were baclofen and diazepam in equal proportions (Table 14).

5.2 Surgical Intervention

A total of 10 patients followed up during the study period had surgical procedures. Of these eight patients were paraplegic secondary to accident; one had spinal bifida while one had head injury. The mean age for these patients was 37.5 years. The average duration of hospital stay was 1 year 8 months. The range being 0.5 year – 2 ¾ years.

5.2.1 Anatomical Sites

Table 15: Anatomical sites of the pressure ulcers of patients operated on

<table>
<thead>
<tr>
<th>Sites</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacral</td>
<td>6</td>
<td>23.1</td>
</tr>
<tr>
<td>Trochanteric</td>
<td>15</td>
<td>57.7</td>
</tr>
<tr>
<td>Ischial</td>
<td>5</td>
<td>15.3</td>
</tr>
<tr>
<td>Calcaneal</td>
<td>1</td>
<td>3.9</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>100</td>
</tr>
</tbody>
</table>

About 58% of the ulcers operated on were Trochanteric, 23.1% were sacral, while 15.3% and 3.9% were ischial and calcaneal sores respectively. (Table 15, figure 4)
Figure 4: Demonstrates the various anatomical sites operated on in percentages

5.2.2 Grades of the ulcers operated on

Table 16: Grades of ulcers operated on

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grade II</td>
<td>2</td>
<td>7.4</td>
</tr>
<tr>
<td>Grade III</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Grade IV</td>
<td>22</td>
<td>81.5</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
<td>100</td>
</tr>
</tbody>
</table>

Overall 81.5% of the ulcers operated on were grade IV while 11% were grade III and 7.4% were grade II ulcers. (Table 16)
5.2.3 Surgical Procedures done

Table 17: Surgical procedures done

<table>
<thead>
<tr>
<th>Surgical Procedures</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin graft</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>7.4</td>
</tr>
<tr>
<td>Primary closure</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3.7</td>
</tr>
<tr>
<td>Fasciocutaneous flaps</td>
<td>22</td>
<td>0</td>
<td>22</td>
<td>81.5</td>
</tr>
<tr>
<td>Myofasciocutaneous flaps</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3.7</td>
</tr>
<tr>
<td>V-Y Plasty</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3.7</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>1</td>
<td>27</td>
<td>100</td>
</tr>
</tbody>
</table>

Fasciocutaneous flaps contributed to 81.5% of the procedures done. Myofasciocutaneous flaps and V-Y plasty each contributed to 3.7% of the surgical procedures done. (Table 17, figure 5)

Figure 5: Surgical procedures done in percentages

5.2.4 Outcome of surgery at 1 month after surgery

Table 18: Outcome of surgery at 1 month after surgery

<table>
<thead>
<tr>
<th></th>
<th>Full take</th>
<th>Partial take</th>
<th>Failed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin graft</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Primary closure</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Fasciocutaneous flaps</td>
<td>12</td>
<td>5</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>Myofascio C. flaps</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>V-Y Plasty</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>5</td>
<td>6</td>
<td>27</td>
</tr>
</tbody>
</table>
At 1 month after surgery, about 59.3% of the surgeries done had taken fully, while 22.2% of the operations had failed. (Table 18)

Figure 6: Surgical procedures and their outcome at 1 month after surgery

![Surgical procedures and their outcome at 1 month after surgery](image)

Out of a total of 22 fasciocutaneous flaps done, 12 had taken fully (54.5%) while 5 had failed. Myofasciocutaneous flaps and V-Y plasty, 1 each had taken fully. (Figure 6)

5.2.5 **Outcome of surgery at 3 months after surgery**

Table 19: Outcome of surgical procedures at 3 months after surgery

<table>
<thead>
<tr>
<th>Surgical procedures</th>
<th>Full take</th>
<th>Partial take</th>
<th>Failed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin graft</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Primary closure</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fasciocutaneous flaps</td>
<td>10</td>
<td>5</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Myofascio C. flaps</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>V-Y Plasty</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td><strong>5</strong></td>
<td><strong>9</strong></td>
<td><strong>27</strong></td>
</tr>
<tr>
<td><strong>%</strong></td>
<td><strong>48.1</strong></td>
<td><strong>18.5</strong></td>
<td><strong>33.4</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

At 3 months after surgery 48.1% of the surgical procedures done had still taken fully, while 33.4% had failed. (Table 19)
Of the 22 fasciocutaneous flaps performed, 10 had taken fully (45.5%) while 7 had failed (32%). Myofasciocutaneous flaps and V-Y plasty 1 each had taken fully. (Figure 7)
5.3 Study Limitations

1. Not all required information could be gathered from all patients, as some of them were very sick.
2. Reluctance was noted among some members of the nursing cadre to discuss pressure ulcers in their units as they felt it was a reflection of their weakness in the management.
3. Poor recording of the surgical procedures done was noted in some cases.
6.0 DISCUSSION

The point prevalence of pressure ulcers at KNH was 4.2 percent, while at the National Spinal Injury Hospital was 68 percent with an overall prevalence of 5.5%. This is in keeping with the study carried out by Young (1) who demonstrated a prevalence of 3-5% of all hospitalised patients. However, other studies have quoted a higher prevalence rate with Lepisto (40) quoting a prevalence of up to 6.4 percent, Amlung (41) in a national pressure survey found a prevalence of 14.8 percent while Gosnel et al (42) found an incidence of 8.4%.

The prevalence is obviously higher in chronic caregiver facilities with figures as high as 53.2 percent (43). In the spinal injury patients’ prevalence of between 25 – 85 percent (4), have been quoted in literature. It is thus not surprising that the prevalence at the National Spinal Injury Hospital was 68 percent.

About two-thirds of the patients were from Nairobi, Central and Eastern provinces. The most logical reason for this is the proximity of these provinces to both the KNH and the NSIH.

More than 90 percent of the patients studied were less than 60 years of age. The mean age of presentation was 38.1 years. This contrasts with studies done elsewhere. Thoroddseu (44) in a consecutive sample of 3,048 patients had a mean age of 75 years. More than 80% of the patients in his study were more than 70 years of age.

The reason for this could be that while HIV/AIDS and spinal injury were the main medical conditions in our patients, in the developed world, it is mainly stroke and dementia that accounts for most of the cases with the pressure sores. These do occur in elderly patients.

Of the patients studied 68.1 percent were male patients, while only 31.9 percent were females. This gives male to female ratio of 2.1:1. The most probable reason for this is that the male population is more prone to injuries as opposed to the females due to the mobility nature of their lifestyle. A study carried out by Spector (45) demonstrated that male patients were at a more risk of pressure sore development than female. Bergquist (46) also demonstrated that males were more predisposed to pressure ulcer development than females.

About 60 percent of the patients had stayed in hospital for duration greater than 3 months. The range of hospital stay was between 2 weeks and 3 years with an average duration of stay...
of 6.3 months. The average duration of hospital stay among patients studied seemed to be lower than what has been found in other studies. Study carried out by Heinmann (47) demonstrated a mean duration of hospital stay of 307 days (approximately 10 months) with a median of 123 days (approximately 4 months). The maximum duration of hospital stay was 6 years.

Of the patients studied 35.4 percent of the patients were paraplegic while AIDS contributed to 27.4 percent. Dementia, diabetes mellitus and cerebrovascular accidents had a combined contribution of only 10.7 percent. This is a sharp contrast as in the Western world where two thirds of the patients with pressure sore either have cerebrovascular accident or dementia (48).

A total of 321 ulcers were encountered during the study. The average number of ulcers per patient was 2.84. This is in keeping with a study carried out by Jaul (49) who demonstrated an average of 2.8 ulcers per patient.

Trochanteric sores accounted for 43 percent of the ulcers. Sacral, ischial and trochanters accounted for a total of 72.6 percent of the ulcers. Overall 97.2 percent of the ulcers were below the umbilicus. This is in keeping with most studies, which demonstrate that upto 90 percent of the ulcers are below the umbilicus (40,42,44,48).

Grades III and IV accounted for 66.4 percent of the ulcers studied. Only 5.3 percent of the ulcers were grade I. Lepisto and Errickson (40) in their study demonstrated that most of the ulcers were grade II. In this study grade II ulcers were 28%. Heinmann (47) demonstrated in his study that upto 50 percent of the ulcers were grade I, with grades II and III contributing to a total of 38 percent. Grade IV in his study contributed to 12 percent as compared to 24 percent in this study. An apparent low prevalence of grade I ulcers in this study could be as a result of dark skinned patients that were mainly encountered. It is much easier to demonstrate a grade I lesion in a light skinned individual as opposed to a dark skinned person.

Out of a total of 321 ulcers, only 22 (6.85%) ulcers had any investigations done. Of this 19 ulcers had pus for culture and sensitivity, while only 3 ulcers had tissue biopsy for culture and sensitivity. No radiological investigations were done. The role of radiological investigations in pressure sores is significant in ruling out bone infection (49,50). Studies done
Pressure dispersion is a fundamental principle in the management of pressure sores. Several pressure dispersion methods have been in use over the years. The most common pressure dispersion method employed was 2 hourly turning of patients (57.5%) while 12.4 percent of the patients were on ripple mattresses. A significant proportion of patients (26.6%) had no pressure dispersion method employed. A small proportion of patients (3.5%) had water filled gloves employed in prevention of calcaneal sores. Sharp and Burr in their study on pressure ulcer prevention and care in Australia, also demonstrated this method in use (52). Two-hourly turning as pressure dispersion method is a method that needs a lot of motivation and morale by the nursing staff and the patients for it to be successful. It is labour intensive and time consuming.

Of the dressing methods employed, 97.3 percent of the patients had their wounds dressed with gauze dressing materials. Only 2.7 percent of the patients were dressed with hydrogels. Most studies have demonstrated gauze dressing to be more expensive and time consuming as compared to either hydrocolloids or hydrogels (53,54,55). Hydrogel dressings maintain moisture in the wounds which encourage epithelialisation and hence rapid wound healing (56).

The most commonly used antiseptic was povidone-iodine contributing to 67.3 percent of the antiseptics used to clean wounds.

A significant number of patients’ wounds, (13.3%), were cleaned and dressed with either honey or sugar. However, there was no criteria whatsoever at both hospitals as to which antiseptics to use. The use of honey or sugar as a method of treatment for wounds has been widely used and quoted in literature (7).

Only 6.2 percent of the patients had topical antibiotics applied to their wounds, of this silversulphadiazine contributed to 42.8 percent, while metronidazole ointment to 57.2 percent. This is consistent with a study carried out by Kucan et al in 1981 (21) who demonstrated that silversulphadiazine was one of the most commonly used topical antibiotics. Of the patients studied 93 percent had no topical antibiotics used. This is also consistent with most studies, which discourage indiscriminate use of topical antibiotics (29).
antibiotic should only be used after culture and sensitivity results and only for a short duration so as to prevent bacterial resistance. Most antibiotics may be cytotoxic to fibroblasts and may impair wound healing.

About 94 percent of the patients had no nutritional support. Most studies have demonstrated that nutritional support positively influences the rate of pressure ulcers healing (15,16). An adequate nutritional diet with both emphasis on macro and micronutrients must be put in place.

Of the patients with spinal injury only 15.6 percent (n=51) had antispasticity drugs employed. These were valium and baclofen in equal proportions. Inadequate control of spasms, would inevitably result in the recurrence of the pressure sores, and make the treatment protracted.

The mean age of the patients operated on was 37.5 years. Of the ulcers operated on 57.7 percent were Trochanteric while 23.1 percent were sacral sores. The commonest ulcer grade operated on was grade IV (81.5%). Fasciocutaneous flaps was the commonest surgical procedure (81.5%). Myofasciocutaneous flaps contributed to 3.7 percent of the operations with skin grafts 7.4 percent. About 60 percent of the surgical procedures done had taken fully at one month after surgeries. This had however decreased to 48.1 percent at 3 months after surgery.

Outcomes of surgical management of pressure sores have varied from author to author. The underlying medical/surgical conditions, the patients’ age, as well as the aggressiveness of pressure dispersion influences the success rates. Conway and Griffith (24) reported a recurrence rate of upto 75 percent regardless of the type of treatment offered. Jiburum and Achebe (57) who operated on 28 patients with 61 pressure sores, 29 of which were trochanteric reported a success rate of 72.1 percent. They recommended the use of tensor fascia lata for the trochanteric sores. Gusenoff (58) reported a success rate of 59 percent at 6 months of follow up. He reported very good results with the use of tensor fascia lata flap for the treatment of the trochanteric sores.

7.0 CONCLUSION
The study comes up with the following conclusions.
1. The prevalence of the pressure ulcers at KNH was 4.2 percent and 68 percent at the National Spinal Injury Hospital. The overall prevalence was 5.5 percent.

2. The mean age of presentation was 38 years with a modal age group of 31 – 40 years.

3. The average duration of hospital stay was approximately 6 months. Majority of the patients had stayed in hospital for duration greater than 3 months.

4. Paraplegia was the commonest medical condition associated with pressure sores, followed by AIDS.

5. The commonest anatomical site with pressure sores was the trochanter followed by sacrum and ischium in that order.

6. Grade III was the commonest ulcer grade encountered, while grade I was the least.

7. The most commonly used pressure dispersion method was the 2 hourly turning.

8. Gauze dressing was the most commonly used dressing method while povidone-iodine was the most commonly used antiseptic.

9. The most commonly operated ulcers were the trochanter. Fasciocutaneous flaps were the most commonly carried out surgical procedure. More than half of the surgical procedures done were successful at 1 month of follow-up. This was however reduced to slightly less than a half at 3 months of follow-up.
8.0 RECOMMENDATIONS

1. More studies need to be carried out to assess the cost/benefit and the efficacy of the various dressing methods with respect to pressure sores.

2. Investigations for pressure ulcers should be done more frequently. This should include haematological, wound biopsies as well as radiological investigations.

3. There is need to improve on pressure dispersion methods with more utilization of special mattresses.

Antispasticity drugs should be used more often on patients with spinal injury.

5. There is need to enstrenghen nutritional support for patients with pressure ulcers.
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APPENDIX I

PHOTOGRAPHS

Photograph 1: Shows patient who had left Trochanteric sore repaired with fasciocutaneous flap. This has taken fully. This photograph was taken 2 months after surgery.

Note: Split thickness skin graft was used to fill the raw area after the flap was rotated.
Photograph 2: This photograph is of a patient who had left Trochanteric sore repaired with a rotational flap. This patient had an initial operation that was not successful. This photograph was taken 2 months after the second operation.
Photograph 3: This photograph is of the same patient as photograph 2 above. This photograph was however taken 3 months after surgery.
Photograph 4: This photograph shows a patient with right Trochanteric sore that was repaired with fasciocutaneous flap. This patient had a recurrence after the first operation. The second operation was however successful. This photograph was taken three months after the second operation.
Photograph 5: This photograph shows a patient with right Trochanteric sore. This patient had 2 attempted repair of the sore without success. The wound is now well granulated and is ready for another repair.
Photograph 6: This photograph is of the same patient as photograph 5 above. This was however taken shortly before the patient was taken for surgery.
APPENDIX II

INFORMED CONSENT AGREEMENT.

I …………………………………………… (Subject’s name) having full capacity to consent for myself and having attained my ………………..Birth day, do hereby consent to my participating in the research study. OR (I…………………………………………….name) parent/guardian of …………………………….. do hereby consent for my child to participate in the research study) pressure Ulcers presentation and Management’ at Kenyatta National Hospital/ National Spinal Injury Hospital under the direction of DR. F.W. NANG’OLE.

The implication of my participation, the nature, duration and purpose, the methods and means by which it will be conducted and the inconveniences and hazards which may be reasonably expected to have been explained to me by

…………………………………………………………..

I have been given the opportunity to ask questions concerning this investigational study, and many such questions have been answered to my full and complete satisfaction. Should any questions arise, I may contact DR. F.W. NANG’OLE at Telephone No. 0733 - 864249 BOX 2212 K.N.H. NBI.

I understand that I may at any time during the course of this study revoke my consent and withdraw myself from the study without prejudice, however I may be requested to have myself undergo further examinations if in the opinion of the doctor such an examination is necessary for my well being.

SUBJECT’S NAME…………………………. WITNESS
SUBJECT’S SIGNATURE…………………..
STUDY NUMBER…………………………
DATE……………………………………..
Appendix III
Questionnaire for Presentation and Management of Pressure Sores at K.N.H. and National Spinal Injury Hospital

Date: ……………..

1. Study Code No. □□□□
2. IP. NO. □□□□□□□□

A. Demographic Characteristics

I. Residence .................................................................

II. Age (in years)

1) 0 - 10 □
2) 11 - 20 □
3) 21 - 30 □
4) 31 - 40 □
5) 41 - 50 □
6) 51 - 60 □
7) >60 □

I. Sex

1) Male □
2) Female □

B. Date of Admission .................................

Date of Discharge .................................

Period of hospital stay (In days) ............................

1) ≤ 1 month □
2) 1 – 3 months □
3) 3 – 6 □
4) 6 – 9 □
5) 9 – 12 □
6) > 1 year □

A. Current Medical/Surgical Condition/S Alongside Pressure Ulcers

1. HIV/AIDS □
2. Paraplegia

   Due to a) Accidents □
   b) TB Spine □
   c) Others □
3. Quadriplegia

   Due to a) Accidents
   b) TB Spine
   c) Others

4. Diabetes Mellitus

5. Cerebro vascular accidents

6. Head injury

7. Dementia

8. Others

D. Anatomical Sites for the Ulcers

1) Sacral
2) Trochanteric
3) Ischial
4) Medial Knee Condyles
5) Lateral Knee condyles
6) Patella
7) Medial Malleolus
8) Lateral Malleolus
9) Calcaneus
10) Supraumbilical sores
11) Others

E. Grades of The Ulcer

1) Grade I
2) Grade II
3) Grade III
4) Grade IV

F. Investigations Done Specifically For The Ulcer

1. Pus for culture/sensitivities
2. Blood for culture/sensitivities
3. Tissues biopsies for a) Culture/sensitivities
   b) Histology
4. Radiological investigations
   a) X rays
   b) CT Scans
G. Medical Treatment/s Being Offered

I. Pressure Dispersion Method
   1. 2 hourly turning
   2. Ripple mattress
   3. Others.

II. Wound Dressing Methods
   1. Dressed with gauze
   2. Dressed with Hydrogel dressing material
   3. Exposed dressing method
   4. Others

III. Antiseptic Solutions being used
   1. Hydrogen peroxide with Normal Saline and Betadine
   2. Normal Saline and Betadine
   3. Normal Saline and Ricofine
   4. Normal Saline with Honey/sugar
   5. Savlon
   6. Others

II. Antibiotics used
   1. Topical antibiotics
      a) 
      b) 
      c) 

V. Nutrition support
   1. Oral supplement
   2. Enteral tube feeding
   3. Parenteral feeding
   4. Others

H. Surgical Treatment For The Ulcers
I.
   1. Skin Grafts
   2. Primary closure
   3. Fasciocutaneous flaps
4. Myofasciocutaneous flaps
5. V.Y Plasties
6. Others

II. Outcome of surgery 1 month after surgery
1. Skin Grafts
   a) Full take
   b) Partial take
   c) Failed
2. Primary Closure
   a) Full take
   b) Failed 1st closure
3. Fasciocutaneous flaps
   a) Full take
   b) Partial take
   c) Failed flaps
4. Myofasciocutaneous flaps
   a) Full take
   b) Partial take
   c) Failed flaps
5. V. Y PLASTY
   a) Full take
   b) Partial take
   c) Failed
6. Others
   a) Full take
   b) Partial take
   c) Failed

III. Outcome of surgery 3 months after surgery
1. Skin Grafts
   a) Full take
   b) Partial take
   c) Failed
2. Primary Closure
   a) Full take
   b) Failed closure

3. Fasciocutaneous flaps
   a) Full take
   b) Partial take
   c) Failed

4. Myofasciocutaneous flaps
   a) Full take
   b) Partial take
   c) Failed

5. V. Y PLASTY
   a) Full take
   b) Partial take
   c) Failed

6. Others
   a) Full take
   b) Partial take
   c) Failed