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TRAUMA PATIENTS

DR JOSEPH K KARANU MMED ORTHOPEDICS
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ABSTRACT

Introduction

Patient management involves addressing the ailment that the patient presents with, but in addition, it necessitates involving the patient in the management of their ailment. The issue in this research was whether immobilised patients in orthopaedics were informed about the complications of their management and whether they actually consented to that line of management or were forced by circumstances.

Study Objectives

Broad objective
To establish the knowledge level of immobilized orthopaedic patients on the complications of their immobilization.
Specific objective

1. To determine the knowledge level of patients on the complications of immobilization in the orthopaedic department.
2. To correlate the education level of patients and their knowledge on the complications of immobilization.
3. To determine, from the patient, whether immobilization was as a result of choice or circumstances.
4. To assess what actions have been taken, by the knowledgeable patients, to avoid the complications of immobilization.

Methodology

This study involved administering a questionnaire to all immobilised and eligible patients in the orthopaedic wards. The questionnaire was intended to establish the issues raised by the objectives of the study. Descriptive statistics were used for continuous variables such as age of the patient. Counts and respective proportions were used for tabulation of categorical valuables such as gender, education level, type of immobilization, reason for immobilization and whether immobilization was by choice or not. Bivariate associations to correlate the education level of patients and their knowledge on the complications of immobilization were assessed by Pearson chi-squares or fishers exact test as was deemed appropriate, p values were reported. All statistical tests were evaluated at 5% level of significance. Bivariate associations were used to correlate knowledge level and the avoidance of complications.

Results.

Immobilised patients in this study were mainly males between the ages of 18 to 44years. Most patients had at least primary school education. The knowledge level on complications of prolonged immobilization was low among these patients and was not influenced by the patient's education level. The actual knowledge levels ranged from an average of 12.8 for musculoskeletal complications, to 3.6 % for cardiovascular complications and 4.4% for other complications. Most patients were immobilised out of circumstance and not out of choice. Knowledge on complications of prolonged immobilization could not be demonstrated to prevent the occurrence of the said complications.

Recommendations

More effort needs to be put into education of patients on the complications of prolonged immobilization. This might require the development of a consent form that would require to be filled for anyone who is immobilised for a certain duration.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Immobility is defined by the Medical dictionary as the procedure of making a normally moveable part of the body immovable and this physical inactivity may occur, for example, through disease, injury or following major surgery [CITATION onl \l 1033]. This immobilization is specific in that the patient is unable to independently move or change positions. The immobility affects physical function and psychosocial status adversely. Internal degeneration of musculoskeletal tissue occurs, affecting movement, coordination and endurance. The inactivity leads to the slowing down of major organ systems. Musculoskeletal complications include loss of muscle strength and endurance, contractures and soft tissue changes, disuse osteoporosis and degenerative joint disease, while the cardiovascular complications include an increased heart rate, decreased cardiac reserve, orthostatic hypotension and venous thromboembolism[CITATION DKD93 \l 1033]. The stasis precipitates thrombus formation in the vascular system and disorders in neural system. Immobility affects the peristaltic activity and therefore there is development of constipation. In orthopaedic trauma terminology, the term complication has come to mean an undesired turn of events specific to the care of a particular injury and the systemic complications are fat embolism, thromboembolic disorders and multiple organ system dysfunction whereas the local complications include soft tissue damage, vascular problems, post traumatic arthrosis, peripheral nerve injury and complex regional pain syndrome [CITATION Ske \l 1033]. Decreased activity also leads to loss of trabecular bone, and hence disuse osteoporosis [CITATION Rei16 \l 1033].

Immobilization was a frequent occurrence in the management of orthopaedic complications but has seen a gradual decline, especially in the developed world, with the development and acceptance of orthopaedic implants and techniques. In the developing world, implants have also become accepted, but their use is limited by the scarcity of resources in terms of theatre time, implants and the related finances. This results in more patients immobilized for longer periods through skeletal traction. Indeed quite a number of patients in Kenyatta National Hospital are managed definitively by skeletal traction in the orthopaedic wards. There are certain relative indications for non-operative treatment of fractures and these include previously non-ambulatory or demented patients, septic patients, patients with unstable medical conditions, and patients with significant skin breakdown over proposed surgical sites [CITATION Ske \l 1033].

The patient management as well as the probable complications need to be communicated to the patient and all arising queries addressed. Herein lies the problem, Heikinnen at al discovered that patients' knowledge and expectations were greater than the knowledge they perceived that they received. [CITATION Amb07 \l 1033]. In Heikinnen's study it was discovered that the patients received less knowledge on their conditions than they had anticipated to receive and it also emerged the patient's expectations, on knowledge received, correlated with age and professional education. The patient level of knowledge on the complications of prolonged immobilization may be influenced by his or her age, socio-economic status as well as their education level and profession. This knowledge level on the complications of their prolonged immobilization may in turn influence their opinion and consent as to surgical management of their condition or management by immobilization. The compounding factor to this, is of course the availability of the relevant resources including the appropriately trained personnel. In some cases, non operative management may prove to be more cost effective than operative management. In a study that compared arthroscopic surgery to non operative management for osteoarthritis of the knee, the authors found that operative management was less economically viable than non operative management [CITATION JDM16 \l 1033]

CHAPTER TWO: LITERATURE REVIEW

2.1 PATIENT KNOWLEDGE

2.1.1 Non Operative Treatment of Fractures and Patient Knowledge

Non operative treatment can usually be done for most fractures, especially the extra articular ones, bearing in mind the costs and complications of the surgery, as well as the willingness of the patient to undergo surgery. The basic methods of non-operative fracture management include reduction by traction and manipulation of the fracture followed by immobilization of the reduced fracture using casts, splints, braces and skeletal traction [CITATION RBu06 \l 1033]. With non-operative techniques, a certain amount of mechanical, analytical and tactile skills must be learned. This is in order to ensure adequate management of the fracture despite non operative measures being used. There have been a number of reports where non operative treatment of fractures has gained better results than operative management. Indeed Wood et al, while reporting on the management of thoracolumbar burst fractures, reported that less pain and better function was experienced by those treated non operatively [CITATION Kiran \l 1033]. In contrast to this, Brauer et al did an economic evaluation of operative versus non operative management of displaced intra-articular calcaneal fractures, where they found that operative management resulted in a lower rate of subtalar arthrodesis and a shorter time off work compared with non operative management [CITATION CBrec \l 1033].

This research is on the knowledge level of patients on the effects of prolonged immobilization. The knowledge level, in addition to having the patient psychologically prepared in the event that the complications may occur, also aids in mitigating against some of the complications. Effects such as pressure sores and thrombo-embolism would be avoided by a patient who attempts to make movements despite being immobilized. Pressure between the bony prominences and external surface occludes the capillaries leading to ischemia and pressure sores [CITATION KAg12 \l 1033], where a knowledgeable patient attempts to diminish this pressure by periodic movements, then less probability of sores would occur. Malarvizhi and Hemavathy conducted a study on knowledge of complications among immobilized patients in orthopaedic wards in India and they found that knowledge level was poor, with no correlation with demographic variables such as age or sex at the level of $p<0.05$[CITATION AMa15 \l 1033]. One of the recommendations from this Indian study was education and continuous feedback monitoring to try and bridge this gap between the patient and caregiver levels of knowledge. The Indian study

did not correlate the education level of the patients with their knowledge on possible complications.

2.1.2 Musculoskeletal Complications

2.1.2.1 Loss of Muscle Strength and Endurance

Muscle strength and endurance tends to decrease with prolonged immobilization. The loss of muscle strength is not uniform and is differential. In a study conducted at The Johnson space centre by NASA there was differential muscle atrophy and a larger loss in strength relative muscle area [CITATION ALeec \l 1033]. The loss of muscle strength, in addition, is not limited to the period of immobilization, but persists well beyond the time when mobilization is commenced. Hortobagyi and Dohm found that two weeks after spontaneous recovery, there still was an average strength deficit of 11%, in previously normal subjects [CITATION THoil \l 1033]. This complication is reduced both in magnitude and extent by shortening the period during which the patient is immobilized, as well as instituting exercises even when the patient is immobilized. This complication is related to the patient knowledge of the complications in that a patient with information on this complication is more likely to engage in isometric exercises while immobilised. In a published 12 week randomized controlled trial of a novel intra-dialytic progressive resistance exercise training program versus control therapy conducted in haemodialysis and non haemodialysis, progressive resistance exercises resulted in increased muscle volume and strength in both groups [CITATION CmRep \l 1033]. This study on haemodialysis patients was conducted because muscle wasting is a common complication afflicting maintenance haemodialysis patients, and it is associated with decreased muscle function, exercise performance, physical function and quality of life [CITATION CmRep \l 1033].

2.1.2.2 Contractures

Immobilized joints undergo several changes that result in decreased joint movement, stiffening and deformity. Prominent among the changes that result are proliferation of fibro-fatty connective tissue to cartilage surfaces, atrophy of cartilage, ulceration at points of cartilage-cartilage contact, disorganization of cellular and fibrillar ligament alignment, weakening of ligament insertion sites owing to osteoclastic resorbtion of bone and sharpey's fibres, regional osteoporosis of the involved extremity, increased force requirement for joint cycling and

increased ligament compliance [CITATION Akene \l 1033]. Joint mobilization tends to counter these effects and hence immobilized patients are encouraged to move their joints despite the immobilization and immobilization itself is designed not to immobilize the joints as much as possible.

There are new techniques that are being experimented on, in an attempt to reduce joint stiffness in immobilized patients. One such technique is backed by laboratory research: unilateral Knee joints of rats were immobilized with an internal fixator and either 50 micro-millilitres of High molecular weight hyaluronan injections or 50 micro-millilitres of saline (control group) was administered intra-articularly once a week after surgery. The study demonstrated that HMWHA injections suppressed inflammatory, fibrotic and hypoxic conditions observed in the immobilized joint capsule [CITATION KKa15 \l 1033]

2.1.2.3 Disuse Osteoporosis

Insufficient physical activity as encountered in immobilized patients is one of the most important overall risk factors for osteoporosis. Detectable demineralisation results from substantial losses of calcium which is accompanied by sizeable losses of nitrogen reflective of muscle atrophy [CITATION Whe84 \l 1033]. This therefore implies that the bone loss may be due to multiple factors including diminished direct physical forces on bone, decreased muscle pull on the periosteum as well as circulatory and other changes [CITATION Whe84 \l 1033]. A study of patients confined to bed has shown that, on average, trabecular bone decreases by about 1% a week, yet, when physical activity is resumed, bone density increases by 1% a month, considerably slower than its loss [CITATION Rei16 \l 1033]

2.1.2.4 Soft Tissue Changes

Maintenance of normal muscle structure and composition requires repetitive use, and the changes in the patterns of tissue loading can strengthen or weaken normal tissues [CITATION JBu95 \l 1033]. The original theory was that immobilization is better for recovery of both soft tissues and bone, but studies have repeatedly demonstrated the converse. In one such study, the hind limbs of mice were immobilized with plaster cast for different periods of time, and the atrophy of the anterior tibial muscle was examined by measuring fibre cross sections. In this study there was a decrease in fibre diameter observed during the first week and red fibres were found to be more susceptible, whereas at the ultra-structural level there was loss and fragmentation of myofibrils, mitochondria and the sarcotubular system [CITATION Appeb \l 1033]. The recovery process depends on how long the immobilization proceeded as well as pre

immobilization activity. Where the muscle activity was high before the period of immobilization, recovery was faster with resumption of almost normal pre-immobilization status

2.1.3 Cardiovascular Complications

2.1.3.1 Increased heart rate and Decreased Cardiac Reserve

The increase in resting heart rate may be due to a decrease in vagal tone and the increase in maximum heart rate may be due to an increased release of norepinephrine and an increased sensitivity of cardiac beta adrenergic receptors [CITATION Krine \l 1033]. These immobilised patients develop a paradoxical increase in heart rate at rest and therefore their capacity to moderate cardiac activity with increased physical activity is inhibited

2.1.3.2 Orthostatic Hypotension

Stroke volume decreases due to a decrease in preload, which in turn is decreased because of a corresponding reduction in plasma volume [CITATION Krine \l 1033]. Rapid diuresis occurs within the initial 24-48hrs of bed rest resulting in decreased plasma volume and the venous compliance increases by 20-25% with bed rest resulting in venous pooling in the lower extremities when an upright posture is resumed [CITATION Krine \l 1033].

2.1.3.3 Venous Thromboembolism

The venous pooling, decreased muscle activity and antecedent inactivity predispose these patients to venous thromboembolism. In addition to the immobilization, these patients are already risk candidates for venous thromboembolism by virtue of the trauma. Risk factors for development of venous thromboembolism and potentially fatal pulmonary embolism following trauma include the presence of advanced age, prolonged immobilization, severe head trauma, paralysis, pelvic and lower extremity fractures, direct venous trauma and severe injuries that result in shock or that produce the need for multiple transfusions [CITATION Knuer \l 1033].

2.1.3.4 Fat Embolism

Fat embolism indicates the often asymptomatic presence of fat globules in the lung parenchyma and peripheral circulation after long bone or other major trauma. Early immobilization of fractures reduces the incidence of fat embolism and the risk is further reduced by operative

correction rather than conservative management, further, the patient with multiple fractures has higher risk of fat embolism than the one with single fracture [CITATION AGu07 \l 1033].

2.1.4 Other Complications

There are other complications that may occur as a result of the primary injury or the immobilization itself. These include peripheral nerve injuries, complex regional nerve syndrome (Sudeck's atrophy), vascular injuries as well as psychological problems such as depression.

2.2 Correlation on Patient knowledge, Education and Gender

2.2.1 Education Level

The presumption is that the higher the education level, then the more knowledgeable the patient is supposed to be on their treatment option as well as the complications associated with this management. In a study aiming to evaluate the effect of patient's education level and previous counselling on medication knowledge, it was discovered that a higher education level positively affected medication knowledge ($P<0.5$) [CITATION AMA13 \l 1033]. Another study on patient knowledge on hepatitis C also found higher knowledge levels among the more educated patients [CITATION MSu11 \l 1033]

2.2.2 Gender

In a society that is male dominated, then male patients are likely to be more exposed to print and social media, and hence they should be more knowledgeable about complications. In a study to evaluate factors that influence medication knowledge, it was found that gender had no effect on the knowledge [CITATION AMA13 \l 1033]

2.3 Reason for Immobilization

The patients may be immobilised as a temporary measure while they await the definitive management. This group may have no influence on how long they'll be immobilised, particularly in our setup, because it all depends on when the resources, such as implants, theatre space and

the qualified personnel become available. The patients may also be immobilised because the immobilization is the definitive management and no operative interventions are planned. Indeed, a study done in Rochester, Minnesota, found that patients diagnosed after 1985 were less likely to require joint surgery [CITATION Eda03 \l 1033]. The study implies that trends in medical disease management have changed. The last group of patients is those immobilized because they decline to have surgery. In a study done in Cameroon, the author of the study discovered that nearly one fifth of patients presenting to a surgical clinic with a treatable condition did not ultimately receive needed surgery due to financial and sociocultural factors [CITATION BJL16 \l 1033].

2.4 Actions Taken to Avoid Complications

There are certain actions that patients can take in order to avoid some of the complications associated with prolonged immobilization. Loss of muscle strength and joint contractures can be avoided by exercising the affected joints and muscles. Pressure sores can be alleviated by frequently relieving the pressure exerted onto precariously placed pressure points. The knowledgeable patient would best be placed to undertake these complication evasive measures. A study conducted in Saudi Arabia revealed that a majority of the sampled diabetic patients knew that timely treatment can prevent or delay eye damage in diabetic patients; consequently, 95% of the participants went for regular ocular examinations [CITATION BKr16 \l 1033].

2.5 Problem Statement

Immobilization is a major consequence of the management of lower limb and back injuries in orthopaedics. The immobilization may be as a result of trauma necessitating traction as a temporary measure preceding definitive management, or as the definitive mode of management. In either case, the complications are both real and can be life threatening. Traditionally the doctor made all decisions for the patient with little information being imparted to the patient and no consent being sought from the patient, as to the method of management. This has changed, with patient rights being an ever present influence on the information that patients receive about the management of their condition. This point will be under assessment in this study as we assess the knowledge level on the complications of immobilization.

2.6 Value of the study

1. This study will be of value to orthopaedic surgeons and medical personnel managing immobilized patients in hospitals, as it will emphasize the need for educating patients on the possible complications of management methods used on them.
2. It will enable bridging the patients' knowledge gap on the complications of prolonged immobilization in hospitals.

2.7 Research objectives

Broad objective

To establish the knowledge level of immobilized orthopaedic patients on the complications of their immobilization.

Specific objective

1. To determine the knowledge level of patients on the complications of immobilization in the orthopaedic department.
2. To correlate the education level of patients and their knowledge on the complications of immobilization.
3. To determine, from the patient, whether immobilization was as a result of choice or circumstances.
4. To assess what actions have been taken, by the knowledgeable patients, to avoid the complications of immobilization.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research design

The research design is a clinical prospective cross sectional descriptive study

3.2 Study area

Kenyatta National Hospital, at the time of the study, had a capacity of 1800 beds, with a catchment area that was national, occasionally receiving referrals from The Eastern Africa region[CITATION Wik13 \l 2057]. The hospital then had four orthopaedic wards, one of which admitted patients under the age of 12 years. The adult wards each normally had 60 to 140 patients, despite them having been designed for 32 patients, which represented about 140% occupancy rate. Of these patients 40%, would be immobilized by skeletal traction. On average, each ward had about 20 patients on traction at any one time. Quite often the limitation to placing patients on traction was the lack of beds that could be utilized to apply traction.

3.3 Study population

The study was conducted in The Orthopaedic Department of Kenyatta National Hospital. It involved all patients immobilised through skeletal, skin traction, or plaster of Paris, whether as a temporary measure or as the definitive management.

3.3.1 Inclusion criteria

All eligible patients immobilized by numerous methods including skin traction, skeletal traction and plaster of Paris in the orthopaedic wards were targeted.

3.3.2 Exclusion criteria

Patients that were excluded were all patients below the age of 18 years, as well as any demented or consciously impaired patient. Patients who failed to give consent, or who withdrew from the study after initially consenting were also excluded

3.4 Sample size

A preliminary survey of the orthopedic wards revealed the following numbers of immobilised patients:

Ward 6A	23
Ward 6C	12
Ward 6D	32
Total	67

Sample size calculation for proportions [CITATION Rob89 \l 2057] was utilised.

$$n=\frac{Z^2(P(1-P))}{d^2}$$

where

Z is a critical value for 95% confidence interval=1.96

P is the estimated prevalence of knowledge of complications of immobilization=60%

d is the estimated level of precision=5%

n is the number of patients required

$$n=\frac{1.96^2(0.6(1-0.6))}{0.05^2}$$

$$n=\frac{3.84(0.6(0.4))}{0.0025}$$

$$n=\frac{0.921984}{0.0025}$$

$$n=368.79$$

$$n=369$$

The final sample size was calculated by applying Finite Population Correction (FPC) to N=60. Average of 60 patients on traction at any one time. The minimum estimated number of cases n

within the proposed study period required for this study was 52 cases[CITATION Rob89 \l 2057].

$$n_f = \frac{n}{1+\frac{n}{N}}$$

$$n_f = \frac{60}{1+\frac{60}{369}}$$

$$n_f = \frac{60}{1+0.163}$$

$$n_f = \frac{60}{1.163}$$

$$n_f = 51.591$$

$$n_f \approx 52$$

where N was the study population

Adjusting for a 15% non-response rate

$$n_f = 52(1.15) = 59.8 \approx 60$$

The sample size came to a minimum of 60 study participants

3.5 Data Collection Procedures

The patients were identified from the currently admitted patients under skin, skeletal traction, or immobilization by other means, such as plaster of Paris. Also included were any patients admitted over a period of four weeks from the commencement of the study.

Once the patients were selected, informed consent was obtained from them. The patients then had the predetermined questionnaire administered by the researcher or one of his two assistants. The assistants were a registered nurse and a colleague in the masters in medicine program. A number was assigned to each patient and this number was used in subsequent stages of the

research. The actual name of the research participant would only be known by the chief researcher and his two assistants. Once the questionnaire was administered, the patient was then informed about the possible complications of prolonged immobilization that the patient was not aware of. The patient was then reviewed again two weeks later to see whether any of the stated complications had occurred. The questionnaires would be safely kept under lock and key for 5-10 years, then destroyed, while the soft copy will be stored safely under password protection.

3.6 Validity testing tool for study

Data was entered into SPSS (Statistical Package for Social Sciences) version 21 (SPSS Inc), cleaned, verified and password protected. The personal identifiers in the data were identified before importation into the statistical analysis package for confidentiality of the cases identity and attributes.

3.7 Data processing and statistical analysis

All collected data was kept safe and confidential and was only handled by the people involved in the survey process. Data was collected using data collection sheets a sample is appended in the dissertation. Confidentiality of information was maintained by assigning each patient a research number that was only known by the researcher and his two assistants. In addition, limiting the number of researchers also assured maintenance of confidentiality.

To determine the knowledge level of patients on the complications of immobilization in the orthopaedic department at Kenyatta National Hospital descriptive statistics used included Means (standard deviations) or medians (inter quartile range) for continuous variables such as age of the patient. Count and respective proportions were used for tabulation of categorical valuables such as gender, education level, type of immobilization, reason for immobilization. Bivariate associations to correlate the education level of patients and their knowledge on the complications of immobilization were assessed by Pearson chi-squares or fishers exact test as deemed appropriate, the p values were reported. All statistical tests were evaluated at 5% level of significance. Counts and respective proportions were also used to tabulate whether immobilization was out of choice or consequence. Bivariate associations were used to correlate knowledge level and the avoidance of complications.

3.8 Data presentation

Data was presented in the form of tables, histograms and pie charts as was deemed appropriate.

3.9 Work Plan

ACTIVITY	PREDECESSOR	OPTIMISTIC TIME	NORMAL TIME	PESSIMISTIC TIME
Proposal presentation	-	May 2017	May 2017	May 2017
Ethical approval	Proposal presentation and corrections	June 2017	July 2017	January 2018
Data collection	Ethical approval	July 2017	August 2017	May 2018
Data analysis and writing of dissertation	Data collection	August 2017	August 2017	September 2018
Submission of dissertation	Data analysis and writing of dissertation	August 2017	September 2017	February 2019

3.10 Budget

Stationary	Ksh 40 000
Statistician fee	Ksh 30 000
Assistants	Ksh 50 000
Miscellaneous	Ksh 20 000
Total-	Ksh 140 000

3.11 Ethical considerations

Ethical approval was sought from research and ethics committee at the Kenyatta National Hospital and permission sought from the Head of Orthopedic department in Kenyatta National Hospital, as well as the research and projects head of department. Informed consent was obtained from all patients in the study. For patients who were able to write, then their signature was obtained, whereas for those unable to write, then the left thumb print was taken. Any patients who declined to consent or withdrew from the study at any point were not discriminated against and were excluded from the study. Having completed the questionnaire all patients were educated on all possible complications of prolonged immobilization. No monetary gain was made from this study, nor was any undue influence, to alter results, accepted. Confidentiality of information was maintained by assigning a number to each patient and using this number in subsequent stages of the research. The actual name of the research participant was only known by the chief researcher and his two assistants. In addition, limiting the number of researchers also assured maintenance of confidentiality. The ethical considerations in this study were taken into account and the ethical principles of autonomy, justice, non-maleficence and beneficence were incorporated.

3.12 Study Limitations

The main limitations to the study included the fact that patient knowledge on the complications of prolonged immobilization was likely to be altered after the first group of interviews, hence the period for data collection was shortened.

The other limitation was the ability to interview patients who could not communicate in a language known to the Researcher, his assistants or available interpreters.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the findings of the study. The findings are presented and interpreted based on the objectives of the study. A total of one hundred and forty six questionnaires were filled in all adult orthopedic wards during the study period. The questionnaires were analysed in order to answer the research questions

4.2 Data Presentation and Analysis

4.2.1 Characteristics of respondents

The majority of patients (94; 64.4%) admitted in orthopedic wards were aged between 18 and 44 years of age. Approximately twenty nine percent (42 patients) were aged between 45 and 65 years. The number of patients aged above sixty five (>65) years was ten (10) making 6.8% of the population. Male gender made the highest proportion of patients admitted in the orthopedic wards at eighty nine percent (89%; 130 patients). The population was made up of people of different levels of education. Those with no education made the minority at 6.2% (9 patients). Those with primary education were the majority (47.9%; 70 patients). Forty seven (47) patients had secondary education (32.2%). A total of twenty patients (20) had their highest level of education being tertiary, which made a proportion of 13.7%. Different types of immobilization were used in the orthopedic wards. The majority (39.7%; 58 patients) of the patients were put on traction. This was followed by spinal injury with 17.8% (26 patients) on skull traction. Twenty two (22) patients were immobilized by use of a cast making a proportion of 15.1%. A proportion of 13% (19) of the respondents had external fixators. Fourteen patients (9.6%) bed rest and post amputation were three (2.1%) patients. TB spine, bed rest, wound infection and pelvic injury had one patient each making 0.7% respectively. Only twenty six patients (17.8%) agreed to have

made the choice of immobilization. Table 4.1 below illustrates the frequencies and proportions of characteristics of the respondents.

Table 4.1: Characteristics of the respondents

		Characteristics of respondents		
Serial No.	Demographic characteristics	Variables	Frequency	Percentage
1	Age in years	18-44 YEARS	94	64.4
		45-65 YEARS	42	28.8
		> 65 YEARS	10	6.8
2	Gender	FEMALE	16	11
		MALE	130	89
3	Level of education	NONE	9	6.2
		Primary	70	47.9
		Secondary	47	32.2
		Tertiary education	20	13.7
4	Type of Immobilization	Bed rest	1	0.7
		CAST	22	15.1
		Wound infection	1	0.7
		Pelvic fracture	1	0.7
		Traction-Skeletal and skin	58	39.7
		Spinal injury	26	17.8
		Tb spine	1	0.7
		Post amputation	3	2.1
		External fixator	19	13.0
		Bed rest	14	9.6
5	Reason for Immobilization	As definitive treatment	52	35.6
		Preceding definitive treatment	94	64.4
6	Choice on	NO	120	82.2

	Immobilization	YES	26	17.8

4.2.2 Knowledge Level of Patients on Complications of Immobilization

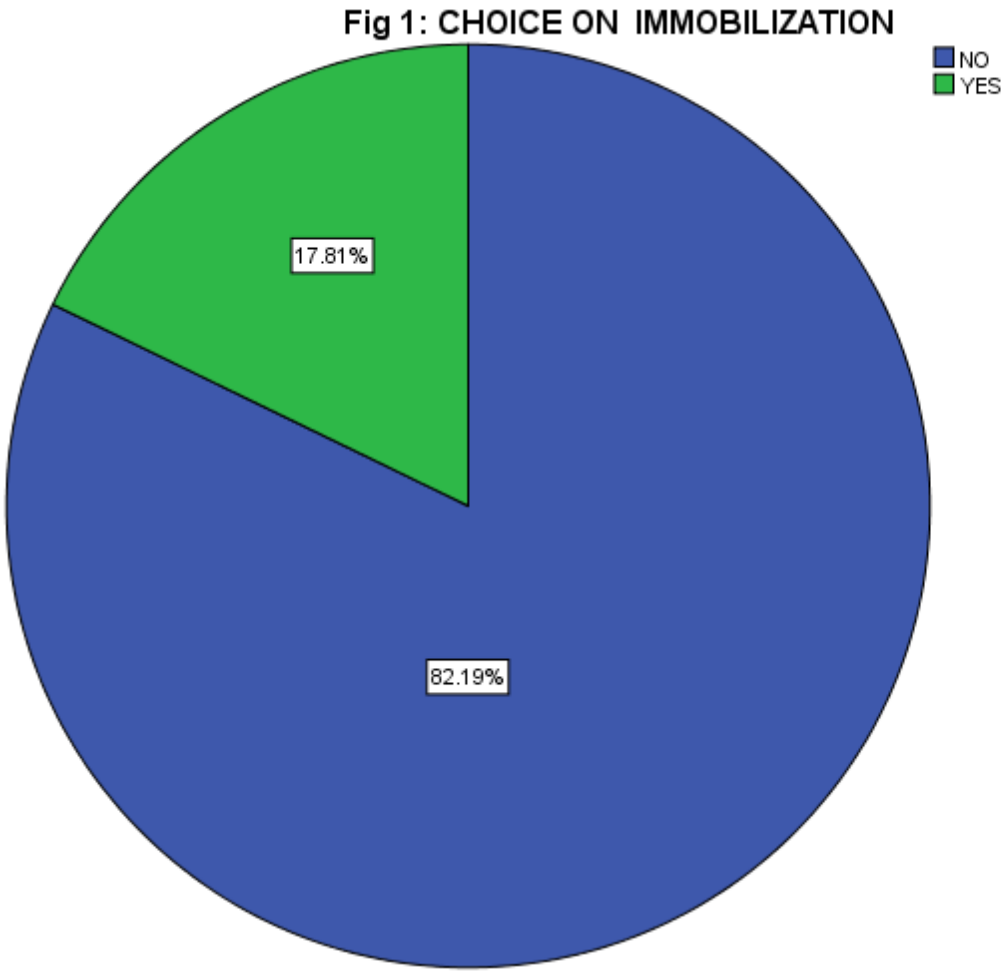
The respondents were asked about different complications which come as a result of immobilization. The complications were divided into three groups; Musculoskeletal, Cardiovascular and others. Musculoskeletal was subdivided as; contractures, osteoporosis and soft tissue changes. The knowledge level on musculoskeletal complications was low. Twelve (12) respondents (8.2%) had information on contractures as a complication of immobilization, the majority (134; 91.8%) did not have information on contractures as a possible complication of immobilization. Only nine respondents (6.2%) had knowledge of osteoporosis as a complication of immobilization, the majority (137) of the respondents (93.8%) did not have this knowledge. Thirty five respondents (24%) had knowledge on soft tissue changes as a possible complication. The knowledge on cardiovascular complications was very low. No patient had knowledge on decreased cardiac reserve being a complication of prolonged immobilization. All (100%) the respondents had no knowledge on decreased cardiac reserve being a possible complication of immobilization. Only 15 patients (10.3%) had knowledge on orthostatic hypotension as a possible complication of prolonged immobilization. A big proportion (131; 89.7%) of the respondents had no knowledge on orthostatic hypotension as a possible complication. Only six respondents (4.1%) reported to know venous thromboembolism as a possible complication of immobilization. No patient had knowledge of fat embolism as a possible complication of prolonged immobilization. All (100%) the respondents had no knowledge on fat embolism. The patients' knowledge of other complications which results from immobilization as follows; bedsores (28; 19.2%), body weakness (14; 9.6%), backache (5; 3.4%), (2; 1.4%), paralysis (2; 1.4%), Back pain & constipation (1; 0.7%), Pain (1; 0.7%), stress (1; 0.7%) and obesity (1; 0.7%). Table 4.2 below illustrates the presence/ absence of knowledge on possible complications of immobilization.

Table 4.2: Level of Knowledge on Complications of Immobilization

Serial No.	Complication	Presence of knowledge	Frequency	Percentage
1	**Musculoskeletal**			
1a	Contractures	NO	134	91.8
		YES	12	8.2
1b	Osteoporosis	NO	137	93.8
		YES	9	6.2
1c	Soft tissue changes	NO	111	76
		YES	35	24
2	**Cardiovascular**			
2a	Decreased cardiac reserve	NO	146	100
		YES	0	0
2b	Orthostatic hypotension	NO	131	89.7
		YES	15	10.3
2c	Venous Thromboembolism	NO	140	95.9
		YES	6	4.1
2d	Fat Embolism	NO	146	100
		YES	0	0
3	**Other Complications**	NONE	91	62.3
		Weakness	14	9.6
		Back pain, constipation	1	0.7
		Pain	1	0.7
		Stress	1	0.7
		Backache	5	3.4
		Bed sores	28	19.2
		Infections	2	1.4
		Obesity	1	0.7
		Paralysis	2	1.4

4.2.3: Immobilization as a Result of Choice or Circumstance at Kenyatta National Hospital

For the majority of the respondents (120; 82.19%), immobilization at Kenyatta National hospital was out of circumstance but not as a result of a choice. Figure 1 below shows the proportions on whether the immobilization was out of choice or circumstance.



4.2.4: Relationship between Patients' Education Levels and Their Knowledge on Complications of Immobilization

Binary logistic regression model was used to predict the relationship between the patients' level of education and their knowledge on possible complications of immobilization.

4.2.4.1: Relationship between Patients' Education Level and Knowledge on Contractures

Adjusting for secondary and tertiary education, patients with primary education were not better than those without formal education. This means having primary education did not improve patients' knowledge on contractures (P-value, 0.99). The p-value of 0.99 shows there was no statistical significance. Adjusting for primary and tertiary education, patients with secondary education were 69.2% less likely to have knowledge on contractures compared to those without education (P-value 0.105). The result was not statistically significant. Adjusting for primary and secondary education patients with tertiary education were 72.7% less likely to have knowledge on contractures as possible complication of immobilization (P-value 0.273). The P-Value being greater than 0.05 means we fail to reject the null hypothesis hence, increase in level of education did not have any impact on knowledge on contractures as a possible complication of immobilization. In conclusion there was no difference between those who were educated and those not educated in terms of knowledge on contractures as a possible complication of immobilization. Table 4.3 below presents the binary logistic model.

Table 4.3: Logistic Model on Patients' Education Level and Knowledge on Contractures

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	EDUCATION			3.380	3	.337			
	Primary (1)	-19.817	13397.657	.000	1	.999	.000	.000	.
	Secondary (2)	-1.179	.727	2.632	1	.105	.308	.074	1.278
	Tertiary (3)	-1.299	.818	2.525	1	.112	.273	.055	1.354
	Constant	-1.386	.559	6.150	1	.013	.250		

a. Variable(s) entered on step 1: EDUCATION.

4.2.4.2: Relationship between Patients' Education Level and Knowledge on Osteoporosis

Adjusting for secondary and tertiary education, patients with primary education were 2.4 times more likely to have knowledge on osteoporosis as a complication compared to those with no

education (P-value 0.558). Adjusting for primary and tertiary education, respondents with secondary education were 15% less likely to have knowledge on osteoporosis as compared to those without education (P- value 0.891). Adjusting for primary and secondary education, patients with tertiary education were 1.8 times more likely to have knowledge as compared to those with no education (P-value 0.621). The P-values were greater than 0.05 hence we fail to reject the null hypothesis. Thus, there is no difference on the knowledge of osteoporosis as a complication of immobilization between patients with education and those without education. Table 4.4 below illustrates the binary logistic model.

Table 4.4: Logistic Model on Patients' Education Level and Knowledge on Osteoporosis

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	EDUCATION			1.245	3	.742			
	Primary (1)	.865	1.476	.344	1	.558	2.375	.132	42.832
	Secondary (2)	-.162	1.184	.019	1	.891	.851	.084	8.655
	Tertiary (3)	.570	1.151	.245	1	.621	1.767	.185	16.884
	Constant	-2.944	1.026	8.236	1	.004	.053		

a. Variable(s) entered on step 1: EDUCATION.

4.2.4.3: Relationship between Patients' Education Level and Knowledge on Soft Tissue Changes

Adjusting for primary and tertiary education, patients with secondary education were 69.4% less likely to have knowledge on soft tissues changes compared to those with no education (P-value 0.028). This means those without education were more likely to have knowledge on soft tissue changes than those with secondary education. The results suggest that having secondary education reduced the chance of the patient having the knowledge on soft tissue changes. Adjusting for secondary and tertiary education, patients with primary education were 84.7% less

likely to have knowledge on soft tissues changes compared to those with no education (P-value 0.103). There was no difference in knowledge on soft tissue changes between those with primary education and those without. Adjusting for primary and secondary education, patients with tertiary education were 62.7% less likely to have knowledge on soft tissues changes compared to those with no education (P-value 0.082). Thus there is no difference in the knowledge on soft tissue changes between those with tertiary education and those without. Table 4.5 below shows the binary logistics model on relationship between patients' level of education and knowledge on soft tissue changes.

Table 4.5: **Binary Logistics Model on Relationship between Patients' Education Level and Knowledge on Soft Tissue Changes**

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	EDUCATION			5.831	3	.120			
	Primary (1)	-1.879	1.152	2.660	1	.103	.153	.016	1.461
	Secondary (2)	-1.186	.540	4.826	1	.028	.306	.106	.880
	Tertiary (3)	-.985	.566	3.025	1	.082	.373	.123	1.133
	Constant	-.201	.449	.199	1	.655	.818		

a. Variable(s) entered on step 1: EDUCATION.

4.2.4.4: Relationship between Patients' Education Level and Knowledge on Decreased Cardiac Reserve

Relationships could not be established since all the respondents did not have knowledge on decreased cardiac reserve as a possible complication of immobilization.

4.2.4.5: Relationship between Patients' Education Level and Knowledge on Orthostatic hypotension

Adjusting for secondary and tertiary education, respondents with primary education were 29.2% less likely to have knowledge on orthostatic hypotension compared to those with no education (P-value 0.78). The p-value indicates there was no statistical significance hence there was no difference in knowledge on orthostatic hypotension between respondents with primary education and those without. Adjusting for primary and tertiary education, those with secondary education were 46.9% less likely to have knowledge on orthostatic hypotension compared to those without education (P-value 0.404). The p-value indicates there is no statistical significance hence there is no difference on knowledge on orthostatic hypotension between patients with secondary education and those without formal education. Adjusting for primary and secondary education, patients with tertiary education were 32.5% less likely to have the knowledge compared to those without education (P-value 0.616). The results were not statistically significant as the P-values were above 0.05 hence fail to reject the null hypothesis that increase in level of education does not affect the patients knowledge on orthostatic hypotension as a possible complication of immobilization. Table 4.6 below shows the logistic model

Table 4.6: Logistic Model on Relationship between Patients' Education Level and Knowledge on Orthostatic Hypotension

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	EDUCATION			.705	3	.872			
	Primary (1)	-.345	1.232	.078	1	.780	.708	.063	7.919
	Secondary (2)	-.633	.758	.696	1	.404	.531	.120	2.347
	Tertiary (3)	-.394	.785	.252	1	.616	.675	.145	3.141
	Constant	-1.735	.626	7.673	1	.006	.176		

a. Variable(s) entered on step 1: EDUCATION.

4.2.4.6: Relationship between Patients' Education Level and Knowledge on Venous Thromboembolism

Adjusting for secondary and tertiary education, patients with primary education had the same level of knowledge on venous thrombosis as those having no formal education. This means that primary education did not have impact on the knowledge on venous thrombosis compared to those with no education (p-value 0.999). Adjusting for primary and tertiary education, having secondary education made the patient to be 87% less likely to have knowledge on venous thrombosis as compared to those with no education (P-value 0.104). Adjusting for primary and secondary education, Tertiary education also made the patient 38.6% less likely to have knowledge on venous thrombosis (P-value 0.609). The results were not statistically significant hence we fail to reject the null hypothesis. Increasing the level of Educational does not have an impact on knowledge on venous thrombosis. Table 4.7 displays the model.

Table 4.7 Logistic Model on Relationship between Patients' Education Level and Knowledge on Venous Thromboembolism

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	EDUCATION			2.718	3	.437			
	Primary (1)	-19.006	13397.657	.000	1	.999	.000	.000	.
	Secondary (2)	-2.037	1.253	2.643	1	.104	.130	.011	1.520
	Tertiary (3)	-.488	.955	.262	1	.609	.614	.094	3.987
	Constant	-2.197	.745	8.690	1	.003	.111		

a. Variable(s) entered on step 1: EDUCATION.

4.2.4.7: Relationship between Patients' Education Level and Knowledge on Fat Embolism

Relationships could not be established since all the respondents did not have knowledge on fat embolism as a possible complication of immobilization.

4.2.5: Actions taken to avoid the Complications, as a Result of their Knowledge or Lack of it.

None of the respondents developed decreased cardiac reserve, fat embolism, Venous Thromboembolism and osteoporosis as complications secondary to immobilization.

4.2.5.1: Relationship between Knowledge on Contractures as a Complication and Development of Contractures

The respondents who knew about contractures as a complication were more likely to develop contractures than those who didn't have the knowledge (P=value 0.999). The results were not statistically significant. Table 4.8 below displays the results.

Table 4.8 Relationship between Knowledge on Contractures as a Complication and Development of Contractures

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	CONTRACTURES(1)	17.426	11602.712	.000	1	.999	36995609.008	.000	.
	Constant	-21.203	11602.712	.000	1	.999	.000		

a. Variable(s) entered on step 1: CONTRACTURES.

4.2.5.2: Relationship between Knowledge on orthostatic hypotension as a Complication and Development of the complication

The results suggested that 74.2% of the patients who had knowledge on the complication were less likely to develop it compared to those who did not have the knowledge (P-value 0.126). The p-value shows there was no statistical significance hence no difference between those with knowledge and those without in the development of orthostatic hypotension. Table 4.9 below displays the results.

Table 4.9: Relationship between Knowledge on orthostatic hypotension as a Complication and Development of the complication

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	ORTHOSTATIC_HYPOTENSION(1)	-1.355	.886	2.339	1	.126	.258	.045	1.464
	Constant	-1.872	.760	6.073	1	.014	.154		

a. Variable(s) entered on step 1: ORTHOSTATIC_HYPOTENSION.

4.2.5.3: Relationship between Knowledge on Soft Tissue Changes as a Complication and Development of the complication

The patients who had knowledge of soft tissue changes as a complication 26.3% more likely to develop complications of the soft tissue changes compared to those with no knowledge on the same (p-value 0.644). The results were not statistically significant hence there was no difference in development of soft tissue changes as a complication between those with knowledge and those without. Table 4.10 below illustrates the model.

Table 4.10: Relationship between Knowledge on Soft Tissue Changes and Development of the Complication

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	SOFT_TISSUE_CHANGES(1)	.234	.506	.213	1	.644	1.263	.469	3.405
	Constant	-1.576	.448	12.341	1	.000	.207		

a. Variable(s) entered on step 1: SOFT_TISSUE_CHANGES.

4.2.5.4: Relationship between Knowledge on Pain as a Complication and Development of the complication

There was no statistically significant difference in development of pain between those who had knowledge on pain and those who did not have (p-value 0.913). Table 4.11 below shows the results.

Table 4.11: Relationship between those who had knowledge on pain and those who had none and development of pain

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	OTHERS_PAIN(1)	-.114	1.109	.010	1	.918	.893	.101	7.850
	Constant	-1.792	1.080	2.752	1	.097	.167		

a. Variable(s) entered on step 1: OTHERS_PAIN.

4.2.5.5: Relationship between Knowledge on weakness as a Complication and Development of the complication

There was no statistically significant difference on development of weakness as a complication between patients with and those without knowledge on weakness as a complication from immobilization (p-value 0.122). Table 4.12 demonstrates the results.

Table 4.12: Model on Relationship between having Knowledge on Weakness as a Complication and Development of the Complication

Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	OTHERS_WEAKNESS(1)	-2.228	1.442	2.389	1	.122	.108	.006	1.818
	Constant	-2.639	1.035	6.500	1	.011	.071		

a. Variable(s) entered on step 1: OTHERS_WEAKNESS.

CHAPTER 5 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

DISCUSSION

The total number of patients recruited for the study was 146, more than double the number set as the minimum sample size for the study. This, in addition to the fact that of all 146 patients, only 17.8 % or 26 patients agreed to the treatment option involving immobilization while the rest (82.2%) were immobilised out of circumstance. The basic premise is that majority would not have immobilised if they had an option. Furthermore, only 52 patients (35.6%) were immobilised as the definitive treatment, whereas 94 patients (64.4%) were only immobilized as a temporary measure while awaiting definitive management. This finding tallies with a study done in Cameroon where nearly one fifth of patients presenting to a surgical clinic with a treatable condition did not ultimately receive needed surgery due to financial or sociocultural factors [CITATION BJL16 \l 1033]. In this Cameroon study, thirty four of one hundred and seventy five participants declined surgery recommended by their physician. Twenty six of thirty four participants declining surgery cited procedure cost, which on average, equalled 6.4 months' income, as their primary decision factor. Chu et al described it well when they said that surgically treatable problems account for a significant proportion of disease burden in resource-limited settings, but are neglected due to lack of skilled professionals, adequate infrastructure and equipment, and the perception that surgical services are complex and expensive [CITATION KChay \l 1033]. In Kenyatta National Hospital, the surgical and ward charges need to be paid for by the patient, either from their pocket or through insurance or National Health Schemes such as The National Health Insurance Scheme. This, in addition to certain implants that may be

required in some of the surgeries precludes the option of surgery for most of these patients, and hence would explain why majority were immobilised out of circumstance rather than choice

The patients recruited into the study were aged between 18 and 44 years (64%), the age group that's frequently involved in trauma. It was important to exclude those under 18 years because of the complexities of getting consent from the parent or guardian as well as getting the required information from the care giver instead of the actual patient. 45 to 65 year olds formed 29% of the respondents and those above 65 years of age formed 6.8% of the respondents. However, the fact that patients below the age of eighteen years or those who were demented or consciously impaired were excluded from the study, tended to skew the data in a particular direction. Elderly patients would most likely provide the bulk of demented or consciously impaired patients in the ward. Despite this, most patients were admitted following trauma of one form or another and related to this was the high number of male patients (89%). This aspect would better have been analysed by the inclusion, in the questionnaire, of a question on the cause of the sustained fracture or injury. The figures in this study tally with proportions from a substantial number of trauma centres. In the emergency department of Marmara University Hospital (Turkey), over a one year period in 2004, most of the cases were male at 67% and the median age was 42 [CITATION HAkan \l 1033]. This Marmara study analysed a total of 636 cases.

The knowledge level on all the complications of prolonged immobilization was quite low, ranging from an average of 12.8% for musculoskeletal complications, to 3.6 % for cardiovascular complications and 4.4% for other complications. Looking at the actual breakdown, knowledge on soft tissue changes was 24%, bed sores 19.2% as compared to 0% for decreased cardiac reserve and fat embolism. The patient therefore had more knowledge on the complications that were more frequent and visible among their fellow patients than on those that were occult. This finding was similar to Malarvizhi and Hemavathy, in India, where patients had more knowledge on bed sores (65%) and muscle atrophy (47.5%) as compared to other complications [CITATION AMa15 \l 1033]. Furthermore the notion appears to be that prolonged immobilization is generally problem free and that the complications are more associated with the interventional methods of treatment. This notion is further supported by the fact that there is a consent form that is required to be filled for every patient supposed to undergo surgery, but none for immobilization. Malarvizhi and Hemavathy graded their knowledge levels on complications of immobilization into three broad groups- inadequate knowledge, moderately adequate knowledge and adequate knowledge. In their results, they found 50% of the participants had inadequate knowledge, 40% had moderate level of knowledge, whereas only 10% had adequate knowledge [CITATION AMa15 \l 1033]. These figures, on cursory look, appear to imply that the patients in that study had a higher level of knowledge than this one, however, that

study had a smaller sample size of 30 patients and in addition to that, their questionnaire had simple yes or no responses, which implied that even the unknowledgeable patient had a 50% chance of getting the responses correct.

The population in this study was made up of people with different levels of education, with the majority (97.8%) having at least primary education. This tallies with the literacy rate in Kenya, which is defined as the number of people 15 years and above, who can read and write, and is placed at 78% [CITATION UNI15 \l 1033]. The significantly high percentage of people with at least primary education is also a result of the free primary education program that has been in effect since 2003. Patient with no education were 6.2%, those with primary education 47.9%, those with secondary education were 32.2% and whereas those with tertiary education were 13.7%. The education level of the patient, had no effect on the knowledge level, contrary to what might be expected. The only section where results tended to contradict this was when it came to soft tissue changes. Patients with secondary education were 69.4% less likely to have knowledge on soft tissue changes compared to those with no education (P-value 0.028). This goes against the premise that higher education comes with more knowledge. In a Pakistani study to assess the effect of gender and literacy skills on diabetic complications and care, the authors also found that literate patients had similar knowledge scores to illiterate patients [CITATION KHaly \l 1033]. This contrasts to some other studies, including one that assessed whether formal education improves patient knowledge of hepatitis C in vulnerable populations. In this study, 201 hepatitis C infected patients underwent 2 hour standardized education on the disease and were later assessed on their knowledge levels. In that study it was found that baseline knowledge scores were higher in patients with at least a high school education [CITATION MSu11 \l 1033].

In terms of action taken to avoid complications as a result of knowledge on the complications, in most cases there was no knowledge on the complications. Where there was some knowledge on the complications then there was no statistically significant difference in complication occurrence between those who knew and those who did not know about the complications. The section on relationship between knowledge on contractures and the development of contractures (4.2.5.1), as well as that on the relationship between knowledge on soft tissue changes as a complication and development of the complication (4.2.5.3) appear to imply that those without knowledge were better protected from those complications than those with the knowledge. However, what could not be established is whether the knowledge came before, or as a consequence of treatment for the complication; furthermore, the results were not statistically significant. The results in this section are in contrast to a Saudi Arabian study, where knowledge levels on the ocular complications of diabetes mellitus resulted in 95% of the diabetic patients

presenting themselves for ocular exams [CITATION BKr16 \l 1033]. The low knowledge level on the complications of prolonged immobilization meant that it was not even possible to discuss some of the interventional, experimental methods that could be undertaken to avoid these complications, such as HMWHA injections to the joints to avoid contractures [CITATION KKa15 \l 1033].

CONCLUSION

Immobilised patients in this study were mainly males between the ages of 18 to 44years. The knowledge level on complications of prolonged immobilization was low among these patients and was not influenced by the patient's education level. Most patients had at least primary school education. The immobilization was mostly out of circumstance rather than choice. Knowledge on complications of prolonged immobilization could not be demonstrated to prevent the occurrence of the said complications.

RECOMMENDATIONS

More effort needs to be put into education of patients on the complications of prolonged immobilization. This might require the development of a consent form that would require to be filled for anyone who is immobilised for a certain duration. Whereas the consent form does not influence the ultimate mode of management for the patient's injury, it provides the care giver an opportunity to educate the patient on the various complications he may get from the immobilisation. Where the patient declines the immobilisation then he or she would be at liberty to seek treatment elsewhere.

Suggested topics for further research include

- Recovery rates post termination of immobilization
- Care giver knowledge on complications of immobilization as compared to patient knowledge
- Trabecular bone decrease rates in immobilized patients

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