# A COMPARISON OF ABBREVIATED BURNS SEVERITY INDEX AND THE REVISED BAUX SCORE IN PREDICTING SEVERITY AND MORTALITY IN MODERATE TO SEVERE BURNS IN KENYATTA NATIONAL HOSPITAL

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**PRINCIPAL INVESTIGATOR:**

**DR .MURIITHI CRISPUS MWANGI**

**H58/87064/2016**

**Department of Surgery,**

**The University of Nairobi.**


**Supervisors:**

Dr. Joseph Kimani Wanjeri

Dr. Daniel Kinyuru Ojuka

## DECLARATION

I declare that this dissertation is my original work and has not been submitted for academic or career pursuits in any other institution.

Signature _____ Date 28/05/2021

Dr. Muriithi Crispus Mwangi

H58/87064/2016

**CERTIFICATE OF SUPERVISORS**

This dissertation has been submitted for examination with our approval as the supervisors:

1. _____ 28/May/2021

Signature Date

Dr. Joseph Kimani Wanjeri, MB ChB, MMed (Surg), IPTM (Tel Aviv), MPH

Consultant Plastic Surgeon, Lecturer

Department of Surgery

University of Nairobi

2. _____ 28/5/2021

Signature Date

Dr. Daniel Kinyuru Ojuka

Consultant General Surgeon, Lecturer

Department of Surgery

University of Nairobi

**DEPARTMENTAL APPROVAL**

This research proposal was presented at the General Surgery departmental meeting of the University of Nairobi on 30th April 2020 and is hereby approved for presentation to the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee.

**Chairperson**

Dr Kiboi Julius Githinji

Senior Lecturer and Consultant Neurosurgeon

MB ChB, MMed (UoN)

Department of Surgery, School of Medicine

University of Nairobi

Signature: _____ Date: 3/6/2021

## LIST OF ABBREVIATIONS

| | |
|---|---|
| A&E | Accident and Emergency |
| ABSI | Abbreviated Burn Severity Index |
| APACHE II | Acute Physiology and Chronic Health Evaluation |
| AUC | Area under the Curve |
| AUROC | Area under Receiver Operating Characteristic |
| BOBI | Belgian Outcome of Burn Injuries |
| FLAMES | Fatality by Longevity, Apache II score, measured extent of Burn, and Sex |
| KNH | Kenyatta National Hospital |
| NPV | Negative Predictive Value |
| PPV | Positive Predictive Value |
| RBS | Revised Baux Score |
| ROC | Receiver Operating Curve |
| TBSA | Total Body Surface Area burned |
| WHO | World Health Organization |

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**ABSTRACT**

**Background:**

Scoring systems in burns' injury aid in determining severity of injury, type of management and the prediction of outcome. They facilitate accurate decision-making and provide guidance to the patients' families. Ideally, these tools should be simple, reliable, objective, and applicable in clinical setting. The routine use of trauma scores do not perform well when applied to burns injuries .This thus spells out the need to find an accurate and reproducible scoring system in our setup.

**Objective**:

To establish the accuracies of the Revised Baux score and the Abbreviated Burn Severity Index in predicting outcome in patients with moderate to severe burns, and subsequently compare the two tests.

**Methodology:**

This was a prospective cohort study done over a period of 6 months at the Kenyatta National Hospital, which is a tertiary center of burn care management. On each of the patients, data was collected on demographics, total body surface area (TBSA) burnt, presence of inhalational injury and full thickness injury. The Revised Baux score (RBS and Abbreviated Burn Severity Index (ABSI) were administered to each patient concurrently and either mortality or survivability respectively, were observed and documented after 30 days. Analysis was done using SPSS version 23. Descriptive data was summarized in means (STD deviations), modes, frequencies, and percentages. Sensitivity, specificity, positive predictive and negative predictive values were determined. Area under the curve was also calculated for the two scores. Binomial test was used to compare z-values for the AUC for the two scores. P value of 0.05 was considered statistically significant at 95% confidence interval.

**Results:**

A total of 163 patients were recruited. Average age was 16 years ±18.05 with an M: F ratio of 1.2:1. The overall mortality rate was 20.9%. The weighted accuracies of the ABSI and the RBS was 92.4%% and 79.5%% respectively. The ABSI had a higher sensitivity 94.3% and PPV 97.3% than that of the RBS. The two tests showed good AUROC values of 0.90 and 0.87 for the ABSI and the RBS respectively for the prediction of outcome in burns patients. The two AUROCs were then compared based on binomial ROC curve estimation, and there was no statistical significance difference (p =0.395) between the two tests.

**Conclusion:**

Both the ABSI and the RBS were noted to be simple to calculate and accurate in predicting outcome and documenting burn injury severity in our set-up. Albeit the ABSI had a slightly higher area under the curve than the RBS, there was no statistically significant difference between the two tests. This concludes that both ABSI and the RBS would perform equally in predicting outcome in moderate to severe burns in our setup.

## CHAPER ONE: INTRODUCTION

A burn is an injury to the skin or other organic tissue that is induced largely by heat, but can also be induced by radiation, radioactivity, electricity, friction, or chemical contact. Its injury is a serious pathology, that leads to morbidity that is severe and significant mortality responsible for an approximately 265 000 annual deaths with most of which are in middle- and low-income countries and close to two thirds experienced in African and South-East Asia regions as per the World Health Organization (WHO) (1). Local studies have shown burns to constitute 3% of all injuries in hospital and 16-37% of all injuries in children (2). In the year 2000 Nthumba, in his study on the outcome of burns in KNH, investigated parameters such as hospital stay length, morbidity, complications and mortality and noted the nonexistence of a scoring system for burns patients in the institution.

Patients with burns mortality predictive models have been developed in the recent decade e.g., the APACHE II, ABSI, BOBI, the Ryan model, the Smith model, revised Baux and model.

Two of the most widely popular prediction models in recent times that have been endorsed by various burn care institutions are the ABSI and the RBS. Each of these scorings has its disadvantages and advantages. Although it is well documented there may be other factors of predictor for burn patients' survival, conflicting results are shown in recent studies. The availability of various burn injury mortality models of prediction suggests that there is no model that is idea ideal for accurate outcome prediction in every population.

In 2008, a study done by Ndung'u A.WHO on the efficacy of ABSI in prediction of mortality concluded that admission prediction scoring was indeed effective in our setup(3). Nevertheless, the adoption of the ABSI in our local burn care centers has been slow, ostensibly

due to number of parameters that require documentation. No other study on models of predicting mortality in burns victims has been undertaken since. Furthermore, no study has been done locally on the efficacy of the Revised Baux Score in a Kenyan population.

The perfect model should be befitting in terms of its simplicity, reliability, and objectivity. Studies have also shown demographic variations in the prediction of mortality when scores are used.

There is however dearth of data on the use of the RBS in predicting mortality in our setting. Therefore, this study seeks to determine the accuracy of the Revised Baux Score together with the revised Baux score nomogram and compare it to the already used ABSI as seen in moderate to severe burns patients in Kenyatta National Hospital.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 BACKGROUND INFORMATION

Burn injuries are among the very common and devastating human body afflictions ever right when fire came around. Some of the records that were earliest for treatment of burn were described in Egypt. Written in 1600 BC, Smith Papyrus, which promoted the resin and honey salve use in burn treatment (4) and in the 1500 BC, Ebbers Papyrus described the wide substances variety use in burn wounds treatment (5). In 600 BC, the Chinese explained the use of tea leave abstracts and tinctures for the treatment of burns.

There was an exponential knowledge and biomedical research increase from the 18th to early 20th century in burn care, like the acknowledgement of the significance surface area of burn and Reverdin skin grafting (6)and by Sneve in 1905 (7). In 1797, John Kentish wrote an essay on burns(8) and two years later, Earle also wrote about the management of burns (9).

From a systemic review of literature on severe injuries by burn in Europe from 1985 to 2009 published in the BMC critical care in 2010, the severe burn yearly prevalence was 0.2 to 2.9/10,000 inhabitants with a falling trend with time. Close to 50% of patients were below 16 years of age, and patients that were male were ~60%. Flames, hot fluids, and hot objects/surfaces were the most dominant total population causes, but in children, scalds clearly dominated. Usually, mortality was ranging 1.4% and 18% and is reducing with time. Risk factors that were main for death were higher burned surface area total percentage, old age as well as associated chronic diseases. The most regularly death causes reported were the sepsis and organ failure. The major reasons of early death (<48 hours) were inhalation injury and burn shock(10).

In a systemic review of burns in sub-Saharan Africa published in October 2014, the average age of burns injuries was 15.3 years. Children at age 10 and under accounted for above 80% patient population with burns. 55% of those that experienced burns constituted males. The most common cause of thermal injuries were hot fluids, representing 59% of all burns, whereas 33% represented flame burns. The average burn mortality was around 17% that is the one death for every five burn victims(11).

In a retrospective study done by Nthumba in 2000, he noted that 63.3% of burns seen at Kenyatta National Hospital were due to scald by hot liquids, 36.7% by naked flame and the remainder by various other agents. He also noted an overall mortality rate of 14.4% where males were 44.3% while females represented 55.7%, and a ratio of male to female was 1.00 to 1.3. 68.9% of those that died in the week one of admission, 12% in the wee that followed, 3.6% in the 3$^{rd}$ week, and 15.6% after the week three of admission. The mean age of dead patient's was19.3 years. They had a mean TBSA percentage of 50.4%. Scalds were noted to be most prevalent in the pediatric population while naked flame burns were more in the adult population (12).

In 2017, a study done by Wanjeri et al on 202 patients that showed with burns injuries in KNH, they found that the hot fluids were main reasons for the burns (n=93, 46.3%), then next was fire/flame (n=81, 40.3%). Other substances and electricity accounted for 5.5% (n=11, 5.5%) and 6.5% (n=13, 6.5%) respectively. Twenty-five (n=25, 30%) of the fire burns/flames were related to cooking stoves explosion and eight (n=8, 9.9%) were because of wick lamps explosion. In the category of hot fluids, water and tea presented the most common reason for burn injuries, whereas in the category of electrical burns, electrical wires that were exposed were accountable for 46.2% (n=6, 46.2%) of the electrical injuries (13).

Burn injuries have traditionally been classified by the American Burn Association according to the mechanism of the burn, the burn injury extent and depth. According to mechanism of injury, burns can be classified as Electrical, thermal, Radiation burns and Chemical. For the

purpose of surgical intervention, the depth classification system of first, second, third- and fourth-degree burns has been replaced by superficial, superficial partial-thickness, deep partial-thickness, and full-thickness(14).

Superficial burns deem to comprise only skin epidermal layer. They don't blister however, they are dry, painful, red, and blanch with pressure. After the following 2 or 3 days, there is subsidence in the pain and erythema, and by around day 4, the epithelium injured peels away from the epidermis that is newly healed. There is spontaneous healing of the superficial injuries with no consequences that are permanent.

Superficial partial thickness mainly involves the papillary dermis. They commonly present with blisters, erythema, intact capillary refill, and pain sensation. These burn types overall heal within range of 7 to 21 days and is not usual for scarring. There is extent of burns of deep partial thickness into the reticular dermis and differs in character from burns of superficial partial thickness. There is hair follicles damage by deep burns including glandular tissue and are painful to pressure only. They majorly blister frequently, are waxy dry or wet, and have colorization that is variable and mottled ranging from patchy cheesy white to red. They do not blanch with pressure.

Full thickness burns involve subcutaneous fat, fascia, muscle, or bone. They have no capillary refill and thrombosed subcutaneous vessels may be visible. There is absent pain sensation.

Classification of burn severity according to American Burn Association (15) and American College of Surgeons (16) is summarized in the table below:

**Table 1:Clasification of Burn Severity American Burns *Association***

| Criteria and Care | Minor Burn | Moderate Burn | Major Burn |
|---|---|---|---|
| Criteria | | | |
| TBSA | In adults is <10%, in children or elderly ranges from5-10%, burns that are of full thickness is >2% | In adults it ranges from 10–20%, in children o elderly is 5-10%, 2–5% for burns of full thickness | Adults have >20%, children and elderly have >10% and, >5% for burns of full thickness |
| Other | | Electrical burn of low voltage, suspected injury of inhalation, circumferential burn, associated medical problem influencing the infection (e.g., diabetes, sickle cell disease) | Electrical burn of high voltage, chemical burn, any burn that is clinically significant eyes, face, ears, major joints or genitalia, associated injuries that are clinically significant (e.g., fracture, other major trauma) |
| Care | Outpatient management | Hospital admission with experience in burns managing | Burn center referrals |

The burn size is represented as a percentage estimate of the TBSA that has experienced second-degree or third-degree burns. Area estimation can be found by the help of standardized body charts, like the children Lund– Browder chart that considers age-related changes in surface area, and in older patients "Rule of Nines" (17). The law of the Rule of Nines allocates 9% of the total surface area of the body traditionally to the head and neck and the same to each upper extremity. It also allocates each anterior trunk, lower extremities, and posterior trunk 18%; and the 1% remaining is allocated to the genitalia. When burns are small, area estimation bases on burn size comparison to the patient's hand palm, that accounts for about 1% of the total surface area of the body (18). Errors in burn size estimation, usually causing overestimation, are more frequent when physicians guess the burn size and hence the adoption of standardized body charts (19).

In determining the severity of the injury, both the depth and area of the burn must be evaluated, and an accurate estimation of the burned skin area is critical in the initial assessment so that appropriate fluid resuscitation may be delivered. Studies have shown overall survival or mortality is dependent largely on the patient's age, the extent of injury (which includes TBSA and depth of the burn) and the absence or presence of injury of inhalation (20).

In Kenyatta National hospital, about 60% of the fire casualties sustain inhalation injuries of whom 43-68% succumb. Fire accounts for 76% of all deaths from burns, 70% of these deaths occurring in the first week of admission pointing towards probable respiratory compromise and toxic gas inhalation (21).

Early detection of bronchopulmonary injury is important in survival improvement after a speculated injury of inhalation (22). Some of the clinical signs of inhalation injury signs include:

• Smoke exposure history in an enclosed space (unconscious or stuporous patients).

• Presence of singed nasal vibrissae/ facial burns/bronchorrhea/ auscultatory findings/sooty sputum (wheezing or rales).

• Laboratory findings:  carbon monoxide elevated levels and/or hypoxemia.

• Chest X-ray (The method is insensitive due to very seldom abnormal admission studies and that can remain normal for as long as 7days postburn).

• Bronchoscopy: the presence of edema, erythema, carbonaceous deposits, bronchorrhea, or Obstruction signifies inhalation injury which can then be graded using the Gamelli scale as mild, moderate or severe.

## 2.2 EVOLUTION OF PREDICTOR SCORES

Mortality continues to be the single most important outcome measure for both burn injury research and in clinical practice. There are a few probability equations and formulae that are potentially valuable however complex mortality have been postulated. These admission scoring systems for the prediction of mortality serves several purposes including: (23–27)

1. Reduction of dependence of the physicians on the clinical intuition

2. Help in specific prognostic variables relative influence understanding

3. Assisting in the categorization of the severity of injuries

4. Patient groups stratification into various modalities of treatment and hence aid in patient management. This enables easy triaging of patients, as well as referral or transfer to appropriate facilities.

5. The assessment and documentation of treatment economic impacts.

6. For purposes of review and multi-center studies and comparisons

One of the earliest attempts to develop patient injury severity indices was in 1949 by Bull and Squire, when they plotted for varying age groups the mortality against the area of burn. In 1961 Professor Serge Baux in his thesis, developed the Baux score that also aimed to quantify the relationship between burn size, age and mortality(28). The patient's age added to TBSA equaled their probability of death. In the years to follow, the clinical significance of inhalation trauma was well accepted (29).

The (ABSI), by Tobiasen J et al, produced a relatively easy scoring system to identify and triage high-risk patients. This model used age, TBSA, injury of inhalation, gender and full thickness burns presences to create a score and associated survival probability (23).

The predictors models proposed by Smith(30) and Ryan(31) utilized age, TBSA and inhalation injury. In 2008, McGwin et al. expanded these models to account for the presence of pneumonia and trauma at the time of injury.(32) In recent times the Belgian Outcome of Burn Injury (BOBI) was the product of 6 national burn centers in Belgium from 1999-2004 using data from 5246 patients (33).

The FLAMES study published in 2008 by Gomez et al. proposed a hybrid scoring model utilizing both burn specific risk factors and initial APACHE II scores (34,35).

In 2010, Osler et al revised the score of original Baux to involve the injury of inhalation. A logistic regression model conducted preliminary indicated that percent burns and age account to almost equal mortality and that the injury of inhalation presence added 17 years (or 17% burn) equivalent. These observations proposed an RBS: Age +Percent Burn +17 * (Inhalation Injury, 1 yes, 0 no). Osler proposed that the RBS is adequately simple for mental calculation,

and its inverse logit transformation (provided with a calculator or nomogram) can offer precise mortality predictions(36).

In 2015, D.J. Williams and J.D. Walker from Welsh Centre for Burns, Swansea designed a nomogram that could carry out calculations to an accuracy of higher degree, and performance evaluation on a patient data set randomly generated so as the nomogram could give results that are accurate and repeatable. The nomogram involved a 0.003 percentage point's bias, and agreement limits of 0.3619 to 0.3550 and a coefficient of repeatability of 0.29 percentage points. The nomogram was discovered to offer means of that were simple and of low cost for simultaneously visualizing, calculating, and recording mortality that is predicted by use of the Revised Baux Score; and was accurate enough for use as the primary calculation method or as a result (from other means) cross-checking method(37).

## 2.3 COMPARISON OF MORTALITY PREDICTION SCORES

Advancements in critical care to include the adoption of early excision and grafting, goal-directed fluid resuscitation and topical burn treatments have reduced mortality from severe burns. In theory, these improvements in care should diminish the predictive strength of older models.

In a retrospective study done in Arizona Burn Center published in the annals of burns and fire disasters in June 2018 on a comparison of injury scoring systems in predicting burn mortality, Data was collected on 122 patients. Of those, 114 met inclusion criteria. The average (± SD) age was 38.7 ± 22.4 years and patients who died were more likely to be older (54.4 ± 19.8 vs. 32.9 ± 20.6, p=.001). Most patients (82%) were male and there was no difference in mortality by sex. The average burn size was 39.2% ± 20.1 TBSA and the overall mortality was 27.2%. Patients who died presented with more severe injuries, as evidenced by higher injury severity score (ISS), greater total body surface area burned (57.1 ± 24.3 vs. 32.5 ± 13.1, p>0.001),

percent full thickness burn (41.0 ± 33.0 vs. 10.8 ± 15.4, p>0.001), and higher APACHE II score (23.6 ± 8.3 vs. 10.3 ± 6.8, p>0.001). Each published burn scoring equation was used to calculate patients' probability of death (Table I). Predicted mortality was compared to observed mortality in each model. This resulted in a separate probability of death for each scoring system. Receiver operating characteristic (ROC) curves were computed in determination of each system overall accuracy in mortality prediction, as evidenced by the AUC. From this study, they concluded The FLAMES and revised Baux score demonstrated superior performance and can be broadly applied across research and clinical settings (38). The revised Baux score is particularly reproducible and easy to calculate with the use of a nomogram (Appendix B).

**Table 2:Table comparing outcomes of different Burns predictor models**

| Score | Sensitivity | Specificity | Accuracy | H-L (p) | AUC±SE |
|---|---|---|---|---|---|
| **BAUX Revised** | 74.2 | 92.7 | 87.6 | 4.78 (0.781) | 0.93±0.02 |
| **ABSI *** | 61.3 | 92.8 | 84.2 | 6.53 (0.479) | 0.90±0.03 |
| **Smith** | 64.5 | 91.5 | 84.1 | 4.73 (0.786) | 0.92±0.03 |
| **Ryan** | 9.7 | 98.8 | 74.6 | 6.57 (0.010) | 0.83±0.04 |
| **McGwin** | 61.3 | 93.9 | 85.0 | 5.79 (0.671) | 0.93±0.02 |
| **BOBI**** | 58.1 | 91.6 | 82.5 | 10.30 (0.067) | 0.87±0.04 |
| **FLAMES** | 80.6 | 94.0 | 90.4 | 3.52 (0.898) | 0.96±0.02 |
| **APACHE II***** | 79.2 | 86.7 | 85.1 | 5.41 (0.713) | 0.89±0.03 |
| **Native (AzBC)** | 86.2 | 92.9 | 91.2 | 1.93 (0.983) | 0.96±0.02 |

*Estimated intercept = -7.92
**Estimated intercept = -4.49
***Estimated intercept = -4.38

In a retrospective cross-sectional study carried out in Indonesia, there was comparison of RBS and ABSI scoring systems were compared(39). 111 medical records of patient's burn that had previous treatment at Yogyakarta tertiary care center were sampled in the study. Of the 111 patients, males represented 81 while female represented 30. The patient's burn injury outcomes showed: 97 patient survival and 14 death. There existed significant relations between burned body total surface area percentage, and injury of inhalation with the score of ABSI of ≥ 8. The ABSI score of ≥ 8 patients have a relatively higher risk by 4.1-fold to die in comparison to patients who scored < 8 but didn't clog a significant level statistically.

However, the RBS score ≥ 60 patients have a relatively lower risk by 2.43-fold to die in comparison to score RBS<8 patients, it statistically didn't reach significant levels. The study conclusion draws that both ABSI and RBS score systems are simple to calculate, and that the more accurate one was the ABSI for acute burn injury prediction. Also noted was that the injury of inhalation presence and large TBSA were significant mortality predictors.

In another study done in a Malaysian intensive care unit for burns on mortality predictors and validation of score of burn mortality prognostic validation published in the BMC Emergency Medicine in November 2019, it comprised acute burn injuries treated patients between 1 January 2010 to 31 December 2017(40). Patient risk factors to predict in mortality of in-patient burn age, gender, TBSA, mechanism of injury, mechanical ventilation, inhalation injury, presence of tracheotomy, burn injury time to Burns Intensive Care Unit admission and initial burn injury center where administration of the first emergency treatment was done. These variables were analyzed by use of multivariate and univariate analysis for death outcomes. All patients were retrospectively scored by use of the five-burn mortality prognostic scores. Mortality of burn predictive ability was analyzed by use of the Area under Receiver Operating Curve (AUROC). A 525 total patients (153 females and 372 males) with age average of $34.5 \pm 14.6$ years were involved. There were 62 deaths and 463 survivors (a mortality rate of 11.8%). The primary objective outcomes, that was patients with burns mortality, indicated that amongst the risk factors for burn mortality that remained after multivariate analysis were older age ($p = 0.004$), wider TBSA burn ($p < 0.001$) and mechanical ventilation presence ($p < 0.001$). Secondary objective outcomes indicated good AUROC value for the burn deaths prediction for all prediction scores of five burn (Baux score; AUROC:0.9, ABSI score; AUROC:0.92, Ryan score; AUROC:0.87, BOBI score; AUROC:0.91 and RBS; AUROC:0.94). The revised Baux score provided the best AUROC value of 0.94 for burns mortality prediction. The conclusion was that the RBS was the most accurate risk score for burn mortality for mortality prediction albeit in a Malaysian burn's population.

Laura Pompermaier conducted a study in 2017 called Result of burn care: the mortality viewpoint in Linköping University, Sweden (41), in which the study group (n= 772) was evaluated for the impact of their pre-existing medical problems on the outcome of burn injuries. Eighty-five percent of those who survived the burn (620/725) had no medical issues prior to the incident. Patients who died (47/772) were more likely than those who survived (p0.05) to have one or more co-existing conditions. Except for two individuals who had two diseases between the age groups of 40-49years and another group of between ages 50-59 with one patient having four conditions, the presence of pre-existing medical diseases among patients younger than 60 years was limited to one. Patients more than 60 years old often had one to two disorders, whereas the presence of more than two disorders was a rarity even among the oldest. The conclusion was that according to the data collected in the study, the hypothesis that pre-existing medical conditions from a single Centre improve models for the prediction of mortality was not supported.

Given the variability in results for different mortality predictor models in different burn injury populations, there is not a single best model for burn patient's mortality prediction. The fact that existing models are differently weighted versions of nearly the same variables speaks more to the heterogeneity of burn patients.

### 2.4: PROBLEM STATEMENT

Burns in Kenya remain to be a major cause of morbidity and mortality. According to earlier, descriptive studies done in Kenya, burns account for up to fifteen percent of trauma cases as seen in Kenyatta National Hospital, which is Kenya's main referral hospital. This can be taken as a close to accurate representation of the proportion of burns injuries suffered in the country.

The ability to properly triage and allocate the limited resources available in terms of ICU care and specialized burn care would be invaluable. Predictors of mortality in burns models have

evolved with time and they have also been shown to produce different predictor strengths with varying demographics.

Hitherto, only the ABSI has been used in Kenya and the RBS hasn't yet been proven in the Kenyan population. Having a definitive predictor of mortality in burns patients that would be easy to use, easy to calculate and function as a point of care tool in triage of burns injury patients would prove to be indispensable. So far, the data we have on the effectiveness of various Burn's predictor models is scarce.

## 2.5: CONCEPTUAL FRAMEWORK

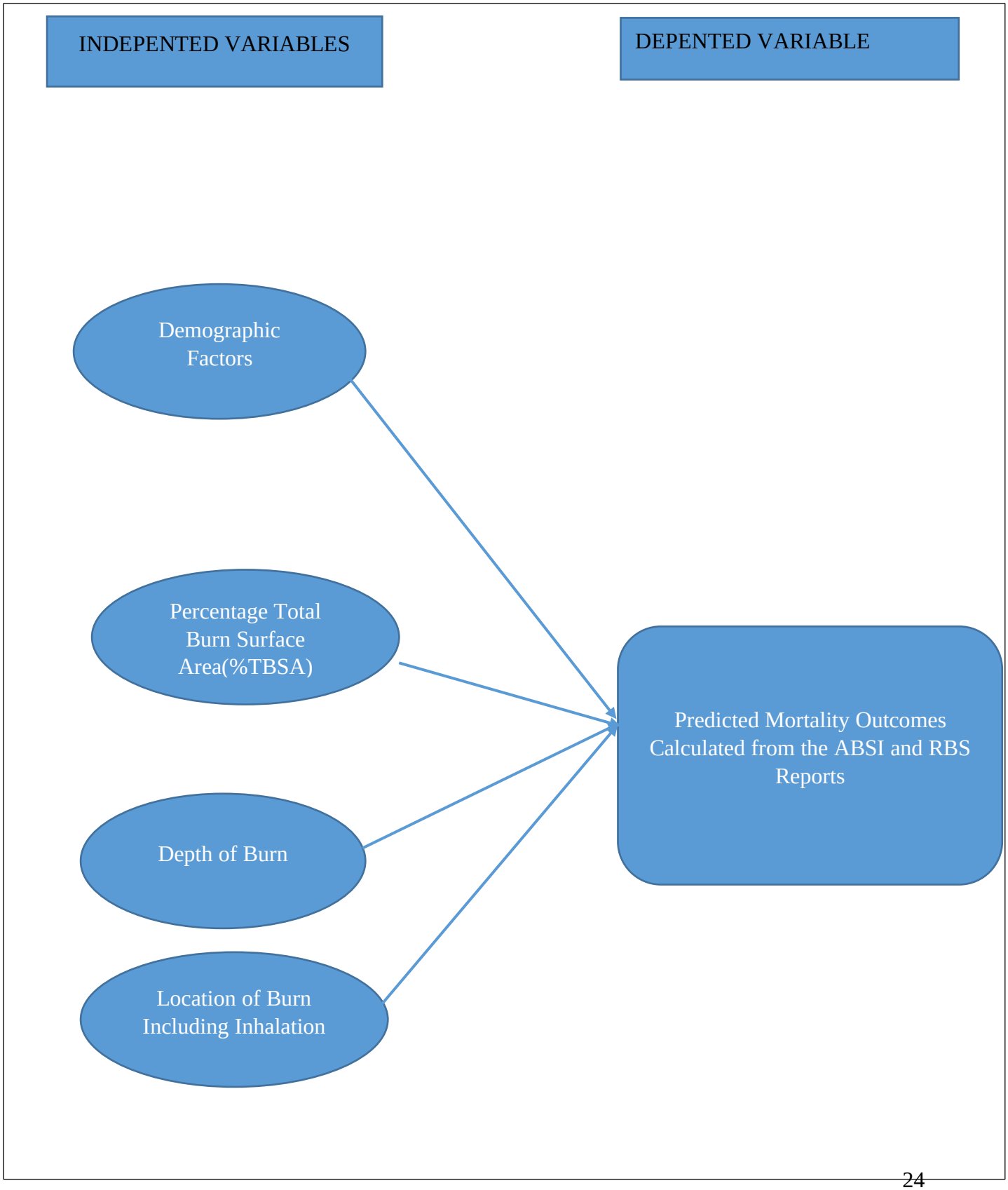




*Figure 1: Conceptual Framework*

## 2.6 STUDY JUSTIFICATION

As shown by Nthumba in 2000, burns contribute about fifteen to twenty percent of trauma patients seen at the Kenyatta national hospital. Most moderate and all severely burns patients are currently admitted to the burn's unit, which is currently limited in terms of resources. Hitherto, the only study done to predict mortality in our population was done more than ten years ago by Ndung'u in 2008 which utilized age, sex, TBSA, depth of burn and presence or absence of inhalation injury. Since then, improvements in critical care have reduced mortality resulting from severe burns, which may affect the predictive strength of older models. Additionally, in 2010, Osler et al revised the original Baux score, which has proven to be simple, easy to use and accurate in predicting mortality in moderate to severe burns injury (36). Until date, the RBS and revised Baux Score nomogram have not been validated in our local population. The need for an admission scoring in burns injury patients cannot be overstated. When in place, it will aid in point of care assessment of initial severity of the burns injury and help in predicting the likely outcome. It will also be invaluable in adequate allocation of resources to burns patients and aid in the counseling of relatives to burns victims.

## 2.7: RESEARCH QUESTION

Is there a difference in the accuracy of predicting mortality between the RBS and the ABSI in moderate to severe burns injury as seen in Kenyatta National Hospital?

### 2.7.1 HYPOTHESIS

**$H_O$:** There is no difference in outcome in the assessment of KNH burn injury patients using either the Abbreviated Burn Injury Severity Index or The Revised Baux Score.

**$H_A$:** The outcome of KNH Burn Injury patients is not the same when assessed with either The Abbreviated Burn Severity Index or the Revised Baux Score.

## 2.8: OBJECTIVES

### 2.8.1 BROAD OBJECTIVE

To compare the Abbreviated Burns Severity Index and the Revised Baux score in predicting severity and mortality in moderate to severe burns in Kenyatta National Hospital

### 2.8.2 SPECIFIC OBJECTIVES

I. To determine the RBS accuracy in mortality prediction in moderate to severe burns patients in KNH
II. To determine the ABSI accuracy in Predicting Mortality following moderate to severe burns patients in KNH
III. To compare the outcomes of the revised Baux Score and Abbreviated Burns Severity Index

## CHAPTER THREE: METHODOLOGY

### 3.1 MATERIALS AND METHODS

This was a prospective cohort study done over a period of 6 months at the Kenyatta National Hospital, which is a tertiary center of burn care management. On each of the patients, consent was obtained and the Revised Baux score (RBS) and the abbreviated burn severity index (ABSI) was performed concurrently. The scores for each were then calculated using the RBS nomogram and the ABSI tables. The patients were then followed up for a period of 30 days or until mortality within the 30 days. The observed mortality and the predicted mortality were then charted, and accuracy calculated.

### 3.4 SAMPLE SIZE DETERMINATION

Using Fischer formula for sample size calculation of finite population:

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

Where

$N$ = sample size

$Z$ = Z statistic for 95% level of confidence = 1.96

$P$ = Estimated prevalence of mortality in moderately to severely burnt patients= 12% (41)

$d$ = margin of error = 5%

Hence sample size = $\frac{1.96^2 \times 0.12(1-0.12).}{}$

$0.05^2$ = 162.269184 rounded off to 162 patients

*Equation 1**: Fischers formula***

### 3.6: RECRUITMENT

#### 3.6.1 INCLUSION CRITERIA

1. Patients admitted with moderate to severe burns at KNH secondary to flames, hot fluids, gases, objects, or surfaces.
2. Patients presenting within 24 hours of post-burn period.
3. Patients who consent to the study

#### 3.6.2 EXCLUSION CRITERIA

1. Patients transferred from other institutions for continuation of burn injury management.
2. Patients treated as outpatients.
3. Those who decline to consent to the study.
4. Patients with burns from causes other than flames and hot fluids.
5. Purely inhalation burns without any cutaneous burns.

#### 3.6.3 DATA ANALYSIS

Data was collected and analyzed using SPSS version 23. Descriptive data was summarized in means (STD deviations), modes, frequencies, and percentages. Paired t- test was further used to assess for statistically significant differences between the RBS and ABSI scores from which ROCs were developed to assess for differences in the areas under the curve. At the 95 percent confidence interval, a P value of 0.05 was declared statistically significant. Odds ratios were calculated to compare death and survivability between patient with ABSI

score of above and below 8 and RBS values of above and below 60.Data was presented in tables and ROC curves.

### 3.6.4 **ETHICAL CONSIDERATION**

KNH-UoN Research and Ethics committee approved this study before it proceeded. Data obtained was treated with confidentiality.

## 4.0 RESULTS

During the duration of this study, there were a total number of 163 participants recruited who had moderate to severe burns as classified by the American burn association. The percentage of males recruited was 55.1 % (n=89) and females was 44.9% (n=74). The male to female ratio was 1.2:1.The average age of patients in this study was 16yrs, with oldest patient being 75years and the youngest being 4 months, Standard deviation ±18.05(Table 3)

There was an overall mortality rate of 20.9 % (n=34). Majority of the non survivors were female 30% (n=22) whereas males had a mortality of 13 % (n=12).

**Table 3: Demographics**

| | **No of patients** | **Percentages** |
|---|---|---|
| **Age** | | |
| **0-20** | 101 | 62.3 |
| **21-40** | 42 | 25.8 |
| **41-60** | 16 | 9.4 |
| **61-80** | 4 | 2.5 |
| **Sex** | | |
| **Female** | 74 | 44.9 |
| **Male** | 89 | 55.1 |

The average TBSA was noted to be 27.44% with majority of the burns (41.8%, n=64) being within the 21-40 TBSA range. Majority of those who died an average TBSA of 47.62% ± 24.135 while those who survived had an average TBSA of 21.26 ± 10.724.

There was a total inhalation injury of 41.6 % (n=68) and a total of 19.1 % (n= 31) of the patients sustained full thickness burns (table 4)

*Table 4: **Average proportions of critical variables***

| **VARIABLE** | **PERCENTAGE %** |
|---|---|
| **TBSA** | 27.44% |
| **PRESENCE OF INHALATION INJURY** | 41.6% |
| **PRESENCE OF FULL THICKNESS BURNS** | 19.1% |

For the RBS, 125(76.7%) of the patients had a predicted mortality ranging between 0-10%. Of these, there was a predicted mortality of 2 patients but an observed mortality of 15 patients was noted. Patients with an RBS score ≥60 had a relatively higher risk by 0.277(p=0.041) fold compared to patient who had score of < 60.This result was statistically significant (Table 5). Most of the patients in the RBS grouping fell within the expected mortality predictions with a weighted accuracy of the RBS being 78.64% (Table 6).

**Table 5: OUTCOME DIFFERENCE BETWEEN THE ABSI AND THE RBS**

| **ABSI SCORE** | **OUTCOMES** | | **P value** | **OR (95% CI)** |
|---|---|---|---|---|
| | **SURVIVED** | **DIED** | | |
| **≥8** | 28 | 15 | ≤0.001 | 5.152(2.347-11.305) |
| **<8** | 101 | 19 | | |
| **RBS SCORE** | | | **P value** | **OR(95% CI)** |
| **≥60** | 4 | 5 | 0.041 | 0.277(0.076-1.016) |
| **<60** | 125 | 29 | | |

**Table 6; Observed Vs Predicted outcome for Revised Baux Score**

| RBS score | Number of patients | Average Predicted mortality (%) | Number expected to die | Observed mortality (%) | Number who died | Accuracy % | Sensitivity | Specificity |
|---|---|---|---|---|---|---|---|---|
| 0-10 | 125 | 1.61 | 2 | 12 | 15 | 89.6% | 13.33 | 100 |
| 11-20 | 11 | 15.27 | 1.68 | 27.3 | 3 | 88% | 56 | 100 |
| 21-30 | 8 | 25.63 | 2.05 | 12.5 | 1 | 86.9% | 100 | 85 |
| 31-40 | 3 | 37.33 | 1.12 | 66.7 | 2 | 70.1% | 56 | 100 |
| 41-50 | 4 | 46.75 | 1.87 | 75 | 3 | 71.8% | 62.33 | 100 |
| 51-60 | 2 | 60 | 1.2 | 100 | 2 | 60% | 60 | 100 |
| 61-70 | 2 | 66 | 1.32 | 50 | 1 | 84% | 100 | 68 |
| 71-80 | 2 | 75 | 1.5 | 50 | 1 | 75% | 100 | 50 |
| 81-90 | 3 | 75 | 2.25 | 100 | 3 | 75% | 75 | 100 |
| 91-100 | 3 | 94.67 | 2.83 | 100 | 3 | 94.3% | 94.33 | 100 |
| **Total** | **163** | | | | | **79.52%** | **71.7%** | **90.3%** |

For the ABSI, majority of the patients 59(36.2 %) fell within the 4-5 ABSI score group with expected versus observed survival being 98% and 93.2 % respectively. Patients who had an ABSI score of >8 had a 5.15-fold higher risk of dying than patients who had an ABSI score of <8 (Table 5).There was a statistical significance between those two populations

(p<0.001).Most of the observed values fell within the expected outcomes with a weighted accuracy of 92.4% calculated for the ABSI.(Table 7).

**Table 7: Observed vs Expected outcome for the Abbreviated Burns Severity Index**

| **ABSI SCORE** | **Number of patients** | **% Died** | **% Discharged** | **How many survived** | **Expected survival %** | **How many were expected to survive** | **Accuracy** | **Sensitivity** | **Specificity** |
|---|---|---|---|---|---|---|---|---|---|
| 2-3 | 30 | 16.7 | 90 | 27 | >99% | 29.7 | 91% | 100% | 10% |
| 4-5 | 59 | 11.9 | 93.2 | 55 | 98 | 57.82 | 95.1% | 100% | 29.5% |
| 6-7 | 32 | 21.9 | 78.1 | 25 | 80-90 | 25.6 - 28.8 | 88.1% | 100% | 84.21% |
| 8-9 | 17 | 29.4 | 70.6 | 12 | 50-70 | 8.5 - 11.9 | 100% | 99.17% | 100% |
| 10-11 | 15 | 40 | 60 | 9 | 20-40 | 3-6 | 80% | 66.67% | 100% |
| 12-13 | 10 | 88.9 | 11.1 | 1 | <10 | 1 | 100% | 100 | 100 |
| **Total** | **163** | | | | | | **92.4%** | **94.31** | **70.62%** |

The ABSI had a greater sensitivity, positive predictive value, and negative predictive value than that of the RBS, as shown in table 8. The RBS had a greater specificity (90.3%) when compared to the ABSI (70.62%).

Using the sensitivity and false positive rate (1-specificity) the receiver operating characteristic (ROC )curves for the RBS and ABSI were plotted (figure 2) and the areas under the curves (AUROC) calculated for each score(table 8).

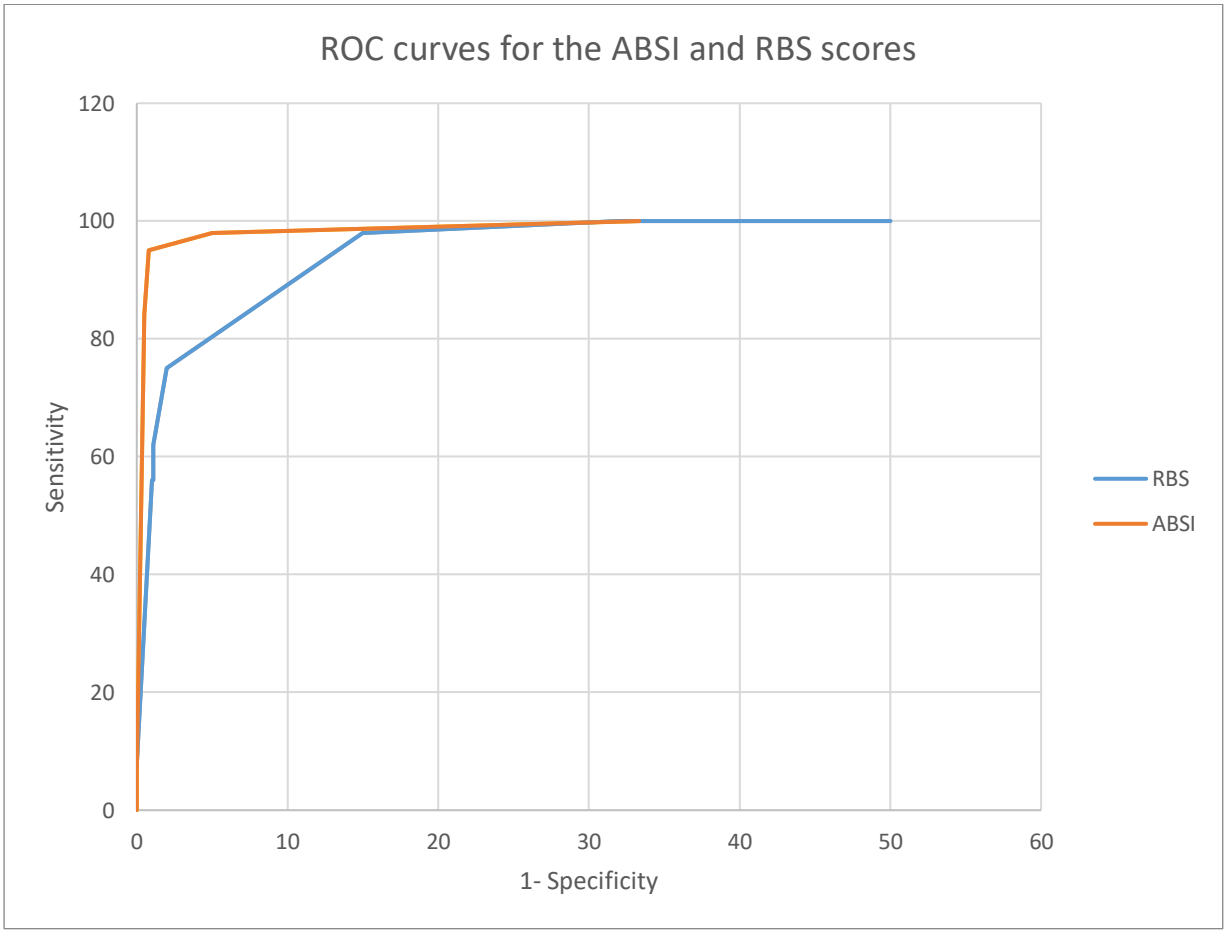


***Figure 2: Figure illustrating ROC curves for the ABSI and RBS.***

The ABSI showed a slightly higher AUROC of 0.90 compared to AUROC of 0.87 of the RBS. The differences in the AUCs were compared based on binomial ROC curve estimation. There was no statistical significance between the two tests (p value = 0.395) .Both tests achieved an AUROC of > 0.5 thus showing that both tests are accurate and hence applicable in our population.

**Table 8: Table summarizing Areas under the Curve for the ABSI and RBS**

| Score | Sensitivity(%) | Specificity(%) | Weighted Accuracy(%) | PPV(%) | NPV(%) | AUC |
|---|---|---|---|---|---|---|
| **ABSI** | 94.31% | 70.61% | 92.40% | 97.3 | 94.1 | 0.90 |
| **RBS** | 71.7% | 90.3% | 79.52% | 89.12 | 57.54 | 0.87 |

## 5.0 DISCUSSION

Currently, due to the variability in results of burns predictor models, there has been a diversity in predictors of mortality in burns patients. In most of the scores, there are certain variables that are commonly employed in the prediction of mortality. These variables include age ,the TBSA and the presence of inhalation injury(42).The relative weighting of the above three variables thus creates the variability between the scores.

As noted earlier from the results of the study, majority of the participants were discharged (78.7%, n = 129) while 20.9% died (n = 34). Most deaths were noted to have occurred within the first week (n=23,69.7%).This result was very similar to the 68.9 % of deaths in the first week noted by Nthumba in 2000(12).Mortalities in burns characteristically shows two peaks. The early deaths occurring in the first week and while the other peak is at three weeks(23).Mortalities in the first week have more to do with the injuries sustained at the time of injury, whereas the deaths occurring at later weeks is due to other complications e.g. sepsis. In this study, the general demographics were similar to other studies done in our population with majority of the patients ranging between the ages of 0-20 years old (62.3%, n = 101) while the least were between 60-80years (2.5%, n = 4).The mortalities of the 0-20 age group were 32.4 % (n=11) whereas it was 67.6% for those aged 21-80 (n=23).In a study done by Jeschke et al on the threshold, age and burn size associated with poor outcomes in the elderly after burn injury, they were not able to establish a clear cut-off age that differentiates or predicts between survival and death. Despite that, they noted the risk of death increased linearly with increasing age(43).Death in older ages is mainly associated with skin thinning and reduction in immunity which subsequently leads to deeper burns and inability to fight off post burn infections(43).

Effectively, the RBS and ABSI had majority of the pediatric group than the adult group. This is in keeping with the fact the data was collected during a pandemic which was subsequently associated with prolonged periods of indoor activities. These figures coincide with a study by Wanjeri et al in 2017 which also noted that majority of burns cases (80.9%) occurred in the

home setup with most of the patients 42.6% being of the pediatric age group ranging between 0-4 years(13).

Majority of the observed outcomes with the RBS fell within the expected outcomes with the RBS having a weighted accuracy of 79.5%. The largest discrepancy was in the RBS group 0-10% predicted mortality where more patients (n=15) died than expected (n=2).Of the patients who died ,those aged under 0-20 years were 64.2% and those aged above 20 were 35.8%.This group influenced the sensitivity of the RBS . Patients with an RBS score ≥ 60 had a relatively higher risk of mortality by 0.277 fold (p=0.041) compared to patient who had score of < 60.This result was statistically significant thus revealing the higher the RBS the higher the chances of mortality. Generally, with respect to age, there was no significant difference noted on the scores (0.629, 0.890 for the ABSI and RBS score respectively). This notwithstanding ,Karimi, Seyed-Abbas et al noted that for children under the age of 15 years, age had a positive prognostic value while TBSA and inhalation injuries had negative prognostic values in relation to mortality(44). Hence, in contrast to the adult population, burn injury related mortality may be predicted more accurately by a slightly modified pediatric R-Baux score formulae and subsequently a nomogram that hitherto has not been developed.

For the ABSI, patients who scored ≥8 had a 5.15-fold higher risk of dying than patients who had an ABSI score of <8 (p≤0.001).This revealed that the higher the ABSI score the lower the chances of survival, which is comparable to the studies done previously. Most of the outcomes were also within the expected values with lowest accuracy in the 10-11 group (80%) followed by 6-7 group (88.1%).This is comparable to the study by Ndung'u which also found discrepancies in the 2-3 group and the 6-7 group. A small sample size could explain the reduced accuracies in the 10-11 group. Germann G et al also found that there are certain groups like the 6-7 group that patient factors may influence the discrepancies(26). In this study, since most of our population was of the pediatric age group, factors like malnutrition and susceptibility to infections could play a role.

The ABSI had a slightly greater AUROC than that of the RBS (0.90 to 0.87 respectively). This notwithstanding, there was no statistical significance between the areas under the curve of the two tests (p value = 0.395). This illustrates that either of tests can be used to accurately predict outcome in our setup. Since the RBS is technically simpler to calculate and has fewer variables incorporated to the score, it would be the easier of the two tests to be employed as a point of care assessment tool.

As noted earlier, prediction of outcome in burns patients is not only useful to the caregivers and the patients, but also the relatives, who can be counselled accordingly based on scientific criteria. Since the two tests are reproducible and have been shown to be accurate in our set up, then their uptake as a point of care tool would guide the clinician, based on scientific criteria, on which patients should attract more resources and act as a guide in the clinical management of the patients.

## 6.0 CONCLUSION

The mortality of in our patients suffering from burns injuries continues to be relatively high. This has been shown by the results of this study and comparable to previous studies.

The <20-year age group bares the biggest burden of burn injuries.

By using the ROC analysis, and binomial comparison of AUROCs of both the RBS and the ABSI the two tests were noted to be accurate in predicting the percentage mortality and the estimated survival respectively. Since there was no statistical significance between the two tests, either test would be ideal as a point of care assessment tool in our setup. Since the RBS has fewer variables and is technically simpler to calculate with assistance of the RBS nomogram, it would be easier of the two tests to be incorporated into our day-to-day assessment of burns injuries in our setup.

## 7.0 RECOMMENDATION

1. Both tests can be used as a point of care tool in assessment of the outcome of burns patients.

2. Since the RBS is technically simpler to perform, it can be the easier of the tests to perform with the aid of the RBS nomogram.

3. Since the demographics of our population have consistently shown that a largely pediatric population is affected by burns, further studies should be conducted on the RBS in the pediatric age group with possible adaptation of a pediatric revised Baux score.

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**ANNEXES**

**Annex 1: CONSENT RESEARCH TOPIC**

A COMPARISON OF ABBREVIATED BURNS SEVERITY INDEX AND THE REVISED BAUX SCORE IN MODERATE TO SEVERE BURNS AS SEEN IN KENYATTA NATIONAL HOSPITAL

**ENGLISH VERSION**

This form is to ask for Consent from patients and/or their kin who present to KNH with thermal burns and who would be assessed via the Abbreviated Burn Severity Index questionnaire revised Baux Score nomogram for the purpose of predicting outcome.

**Principal investigator:** DR. MURIITHI CRISPUS MWANGI

**Institution:** School of Medicine, Department of surgery- University of Nairobi

**Supervisors**: DR. JOSEPH KIMANI WANJERI and DR. DANIEL KINYURU OJUKA

This informed consent has three parts:

- Information sheet (to share information about the research with you)
- Certificate of Consent (for signatures if you agree to take part)
- Statement by the researcher

**Part I: Information sheet**

My name is Dr. Muriithi Crispus Mwangi, a surgical post graduate student at the University of Nairobi's School of Medicine. I am carrying out a study entitled **"A COMPARISON OF ABBREVIATED BURNS SEVERITY INDEX AND THE REVISED BAUX SCORE IN MODERATE TO SEVERE BURNS AS SEEN IN KENYATTA NATIONAL HOSPITAL"**

These two predictor scores consider certain variables that are present at the time of admission that can be used to accurately predict the outcome for the individual patient. I seek to find out which of the two scores delivers the best predictor of outcome in our local population.

I will ask you a few questions and make some observations as pertaining to your injuries (or that of your dependent). I am inviting you to willingly take part in this study

1. ***Benefits of the Study***

The results of the study may inform management decisions of similar patients in the future to better their care. It will shed light to information hitherto not known for instance, the comparison of efficacy in predicting outcome between the Abbreviated Burns Severity Index and the revised Baux Score in patients presenting to KNH, which is one of the findings this study seeks to determine.

2. ***Costs and Potential Harm***

If you decline to participate in the study, be assured that your decision will not jeopardize the required care for the patient. Furthermore, this study poses no harm to the patient and there will be no extra cost incurred for participating in the study. There will be no financial grant to the participants.

3. ***Your Obligation***

If you agree to participate, you will be asked to provide a few personal information of the patient/yourself, other details related to the burn incidence and patient's condition or symptoms before, during and after the fire incidence.

4. ***Confidentiality***

All the information gathered will be taken in confidence and no one will see it except my assistant, my supervisors and I, all who are duty-bound to ensure confidentiality.

The patient's name or identity will not appear in any research document. The information about the patient will be identified by a unique research number and only the researchers can relate the number to you/your patient as a person. Other than for (2) above, your information will only be used for this study and will not be shared with anyone else unless authorized by the Kenyatta National Hospital/University of Nairobi - Ethics and Research Committee (KNH/UoN-ERC).

### *5. Study Credibility and Legitimacy*

My two supervisors approved this study. It was appraised and approved by the Chairman of the Department of Surgery, School of Medicine at the University of Nairobi. It was then submitted to KNH/UoN-ERC, which reviewed and approved it to be done for a duration of six months. KNH/UoN-ERC is the regulatory body in the hospital whose work is to make sure research process is safe for the participants and that you are protected from harm.

### *6. Whom to Contact?*

You can ask questions or seek clarifications about the study any time you wish to. If need be, you may also talk to anyone you are comfortable with about the research before deciding.

If you have any query about the research, you want addressed by another person other than the researchers, please feel free to contact the following who will address your concerns:

a) Secretary, KNH/UoN-ERC

P.O. Box 20723 -00202

KNH, Nairobi

Tel: +254-020-2726300-9 ext. 44355

Email: KNHplan@Ken.Healthnet.org or uonknh_erc@uonbi.ac.ke

Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

Facebook: https://www.facebook.com/uonknh.erc

b) Research Supervisors from University of Nairobi

- DR JOSEPH KIMANI WANJERI

  Department of Surgery, School of Medicine, University of Nairobi

  P.O. Box 19676-00202, KNH, Nairobi

  Tel: 0202726300

  Cell: 0722708051

  Email: kimwanjeri@hotmail.com, joseph.wanjeri@uonbi.ac.ke

- DR. DANIEL KINYURU OJUKA

  Department of Surgery, School of Medicine, University of Nairobi

  P.O. Box 19676-00202, KNH, Nairobi

  Tel: 0202726300

  Cell: 0722 322246

  Email: danielojuka@gmail.com

c) Principal Researcher:

DR. MURIITHI CRISPUS MWANGI

Department of Surgery, School of Medicine, University of Nairobi

P.O. Box 101-00202, KNH, Nairobi

Mobile phone: 0720 636093 (reachable any time)

Email: muriithicm@gmail.com

**Part II: Consent Certificate (**confidential once signed) **Research *Track Number* _____**

…….....…..freely give consent to take part in the study conducted by Dr. Muriithi Crispus Mwangi, the nature of which has been explained to me by him/his research assistant. I have been informed and have

understood that my participation is voluntary and understand that I am free to withdraw from it any time I wish and this will not in any way alter the care given to me/my patient. The results of the study may or may not benefit me/my patient directly but may benefit similar future patients. Furthermore, it will help Medical professionals to better understand "**A COMPARISON OF ABBREVIATED BURNS SEVERITY INDEX AND THE REVISED BAUX SCORE IN MODERATE TO SEVERE BURNS AS SEEN IN KENYATTA NATIONAL HOSPITAL**

SIGNED CONSENT……

(Patient/Kin)

Date.....

DD/MM/YY

SIGNED ASSENT ….....

Thumb print of participant if Unable to sign due to illiteracy

Date……

DD/MM/YY

**Statement by a witness if participant is illiterate**

I have witnessed the accurate reading of the consent form to the participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of witness……

Signature of witness…….

Date….....

**Part III: Statement by the researcher**

I have clearly read out the information sheet to the participant, and to the best of my ability made sure that the participant understood the following:

- All information gathered will be treated with confidentiality.
- Refusal to participate or withdrawal from the study will not compromise the quality of care and treatment given to the patient.

The results of this study might be published in a reputable journal to enhance the knowledge of the **"A COMPARISON OF ABBREVIATED BURNS SEVERITY INDEX AND THE REVISED BAUX SCORE IN MODERATE TO SEVERE BURNS AS SEEN IN KENYATTA NATIONAL HOSPITAL"**

In addition, I confirm that the participant was given opportunity to seek clarification about his concerns in the study, and all the queries clarified to the best of my ability.

I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the participant and duly signed by the participant.

Name of researcher taking consent……

Signature of researcher taking the consent……

Date……

…

**Annex 2: MADA YA UTAFITI**

**MADA YA UTAFITI: ULINGANISHO WA RIPOTI YA UKALI WA MICHOMO NA ALAMA YA BAUX ILIYOSAHIHISHWA KATIKA MICHOMO YA MOTO MKALI KAMA INAVYOONEKANA KATIKA HOSPITALI YA TAIFA YA KENYATTA**

**TAFSIRI YA KIWAHILI**

Fomu hii ni ya kuomba idhini kutoka kwa wagonjwa na/au jamaa zao ambao wanafika Hospitali ya kitaifa ya Kenyatta na majeruhi ya moto yaliyo tibuka, watakaotathminiwa kupitia Dodoso la ripoti ya Ukali wa Michomo na “nomogram” ya Alama ya Baux iliyosahihishwa upya kwa lengo la matokeo ya kutabiri.

**Mtafiti mkuu:** DKT. MURIITHI CRISPUS MWANGI

**Wahadhiri wasimamizi**: DKT. WANJERI KIMANI na DKT OJUKA DANIEL.

Wote wa kitengo cha upasuaji cha Chuo Kikuu cha Nairobi na hospitali kuu ya Kenyatta.

Makubaliano haya yana sehemu tatu:

- Maelezo kuhusu utafiti huu.
- Cheti cha Kibali (kitakacho tiwa sahihi na wahusika wanaokubali kujumuishwa utafitini)
- Ithibati ya mtafiti

**Sehemu ya kwanza: Maelezo**

### *1. Utangulizi*

Jina langu ni Dkt. Muriithi Crispus Mwangi, mwanafunzi wa kuhitimu katika mafunzo ya upasuaji katika Chuo Kikuu cha Shule ya Dawa ya Nairobi. Langu ni kufanya utafiti kuwa na haki ya " **ULINGANISHO WA RIPOTI YA UKALI WA MICHOMO NA ALAMA YA BAUX ILIYOSAHIHISHWA KATIKA MICHOMO YA MOTO MKALI KAMA INAVYOONEKANA KATIKA HOSPITALI YA TAIFA YA KENYATTA** "

Alama hizi mbili za utabiri zinazingatia baadhi ya vigezo ambavyo viko wakati wa uandikishaji ambao unaweza kutumiwa kwa usahihi kutabiri matokeo kwa mgonjwa mmoja. Ninafuta kujua ni lipi kati ya alama mbili ambazo hutoa matokeo mazuri katika jamii yetu.

Nitakuuliza maswali machache na kufanya baadhi ya uchunguzi juu ya majeraha yako (au ya tegemezi yako). Ninakualika kwa hiari kushiriki katika utafiti huu

### *2. Faida ya Utafiti huu*

Matokeo ya utafiti huo yanaweza kuwajulisha uamuzi wa usimamizi wa wagonjwa kama huo katika siku zijazo ili kuboresha huduma zao. Itakuwa kumwaga mwanga kwa taarifa hata hivyo haijulikani kwa mfano, kulinganisha ya ufanisi katika matokeo ya kutabiri kati ya index ya ukali wa Michomo na alama ya Baux ya mwisho katika waathirika wa moto kuwasilisha kwa KNH, ambayo ni moja ya matokeo ya utafiti huu inataka kuamua.

### *3. Gharama na Madhara za Utafiti*

Natoa hakikisho kwamba hata kama hutaki kushiriki kwenye utafiti huu, wewe au mgonjwa wako hutakashifiwa na utapata matibabu yanayostahili. Utafiti huu haupanii kuleta madhara aina yoyote kwa muathiriwa. Hautatozwa fedha za ziada kwa minajili ya utafiti huu wala hakuna fedha mhusika atapewa.

### *4. Jukumu Lako Katika Utafiti*

Ikiwa utakubali, utaulizwa maswali machache ya kibinafsi yanayo kuhusu, maelezo ya tukio, na hali ya muathiriwa kabla, wakati na baada ya tukio.

### *5. Faragha ya Habari za Mhusika*

Habari zote zitakazo kusanywa kwa ajili ya utafiti zitabanwa na watafiti na ha zitatolewa ovyo. Jina au kitambulisho cha mgonjwa haitanakiliwa popote ila tu atapewa nambari maalum ya utafiti. Watafiti watatumia mbinu fiche itakayo kutambulisha kwao. Licha yaliyokaririwa (2), habari za mgonjwa zitatumiwa tu kwa ajili ya utafiti huu na hazitatolewa kwa yeyote pasipo na idhini ya Kamati ya Maadili ya Utafiti wa Hospitali Kuu ya Kenyatta na ile ya Chuo Kikuu Cha Nairobi (kwa ufupi KNH/UoN-ERC).

### *6. Uhalali wa Utafiti huu*

Utafiti huu umekubaliwa na wahadhiri wasimamizi wangu, ukapigwa msasa na Mwenyekiti wa kitengo cha upasuaji wa chuo kikuu cha Nairobi ambaye aliuwasilisha kwa Kamati ya Maadili ya Utafiti wa Hospitali Kuu ya Kenyatta na ile ya Chuo Kikuu Cha Nairobi (KNH/UoN-ERC) ambayo iliidhinisha uweze kufanywa kwa muda wa miezi sita. Kamati hii ndio ihakikishayo usalama wa wanaohusishwa kwa utafiti na kwamba hawadhuriwi kwa vyovyote vile.

### *7. Jukwa la Malalamishi na Habari Zaidi*

Waweza kutuuliza maswali yoyote wakati wowote au umuulize yeyote utakaye kuhusu mchakato wa utafiti huu kabla au hata baada ya kukubali kuhusishwa.

Iwapo una swali lolote kuhusu utafiti huu ambao waona heri lishughulikiwe na mtu mwingine isipokuwa watafiti, waweza kuwasiliana na wafuatao ambao wako tayari kuushughulikia ipasavyo:

a) Katibu, KNH/UON-ERC

S.L.P 20723-00202

KNH, Nairobi

Simu: +254-020-2726300-9 ext 44355

Barua pepe: KNHplan@Ken.Healthnet.org Au uonknh_erc@uonbi.ac.ke

Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

Facebook: https://www.facebook.com/uonknh.erc

b) Wahadhiri Wasimamizi Kutoka Chuo Kikuu cha Nairobi:

- DR JOSEPH KIMANI WANJERI

Idara ya upasuaji, shule ya tiba, Chuo Kikuu cha Nairobi

S.L.P. Box 19676-00202, KNH, Nairobi

Tel: 0202726300

Seli: 0722708051

Barua pepe: kimwanjeri@hotmail.com, joseph.wanjeri@uonbi.ac.ke

- DR. DANIEL KINYURU OJUKA

Idara ya upasuaji, shule ya tiba, Chuo Kikuu cha Nairobi

S.L.P. Box 19676-00202, KNH, Nairobi

Tel: 0202726300

Seli: 0722 322246; Barua pepe: danielojuka@gmail.com

c) Mtafiti Mkuu (mimi)

DKT. MURIITHI, Crispus Mwangi

Kitengo cha Upasuaji, Chuo kikuu cha Nairobi

S.L.P. 19676-00202

KNH, Nairobi

Rununu: 0720636093 (wazi usiku na mchana)

Barua pepe: muriithicm@gmail.com

**Sehemu ya Pili: Cheti cha Kibali** (siri baada ya kutiwa sahihi) **Nambari *Maalum*_____**

Mimi …….....…. ninakubali kwa hiari kuhusishwa kwa utafiti unaoendelezwa na Dkt. Muriithi Crispus Mwangi kuambatana na maelezo yeye mwenyewe/ msaidizi wake amenipa. Ninaelewa kwamba nimehusishwa kwa hiari na kwamba niko huru kujiondoa wakati wowote nitakao hata bila sababu, na hii haitaathiri kwa namna yoyote matibabu ipasayo. Aidha naelewa kwamba matokeo ya utafiti huu huenda usi nifaidi binafsi lakini huenda ukawa wa manufaa siku zijazo kwa waathiriwa wa moto kama nilivyo. Kuna uwezekano utafiti huu utaongeza maarifa kwa taaluma ya utabibu kuhusu "**ULINGANISHO WA RIPOTI YA UKALI WA MICHOMO NA ALAMA YA BAUX ILIYOSAHIHISHWA KATIKA MICHOMO YA MOTO MKALI KAMA INAVYOONEKANA KATIKA HOSPITALI YA TAIFA YA KENYATTA**"

SAHIHI (KIBALI HALISI) ……

(Mgonjwa/jamaa)

Tarehe.....

Siku/mwezi/mwaka

KIBALI MAALUM …….....……

Chapa cha kidole gumba cha kushoto kwa wasio na elimu ya kusoma na kuandika

Tarehe ……

Siku/mwezi/mwaka

**Taarifa ya shahidi ya makubaliano na mhusika asiyejua kusoma**

Nimeshuhudia mgonjwa akisomewa kwa njia inayoeleweka kwa rahisi, naye akapewa fursa nzuri ya kuulaza maswali. Nina dhibitisha mhusika alipeana kibali kwa hiari yake mwenyewe.

Jina la shahidi.....……

Sahihi la shahidi.....…….

Tarehe.....……

……Siku/mwezi/mwaka

**Sehemu ya tatu: Taarifa ya Mtafiti**

Nimesomea mhusika na kadiri ya uwezo wangu kumuelewesha yafuatayo:

- Habari zozote zitokazo kwake zitawekwa siri.
- Kukataa kupeana kibali cha kuhusishwa kwa utafiti huu haitaathiri matibabu anayostahili.
- Matokeo ya utafiti huu kwa jumla utachapishwa katika jarida la kisayansi au utabibu ama upasuaji kuweza kuchangia maarifa ya "**ULINGANISHO WA RIPOTI YA UKALI WA MICHOMO NA ALAMA YA BAUX ILIYOSAHIHISHWA KATIKA MICHOMO YA MOTO MKALI KAMA INAVYOONEKANA KATIKA HOSPITALI YA TAIFA YA KENYATTA**"

Nimehakikisha kwamba mhusika amepewa fursa kamili ya kuuliza maswali kuhusu kuhusika kwake kwa utafiti huu na kwamba kwa kadiri ya uwezo wangu nimemuelewesha ipasavyo.

Ninahakiki kwamba mhusika hajalazimishwa kupeana kibali kuhusika kwenye utafiti huu bali amekubali kwa hiari.

Nakala ya kibali hiki kimewasilishwa kwa mhusika naye akatia sahihi ipasayvo.

Jina la mtafiti aliyepewa kibali cha mhusika……

Sahihi ya mtafiti mhusika.....……

Tarehe……
……

Siku/mwezi/mwaka

**Annex 3: ABSI QUESTIONAIRE**

**QUESTIONAIRE**

Serial number.....

Date and time of admission.....

Referral from.....

KNH as primary Hospital.....

**MEDICAL INFORMATION ABOUT THE BURN**

1. Abbreviated Burn Severity Index

| **VARIABLE** | **PATIENT CHARACTERISTIC** | **SCORE** |
|---|---|---|
| MALE | | |
| FEMALE | | |
| AGE IN YEARS | | |
| INHALATION INJURY | | |
| FULL THICKNESS BURN | | |
| %TBSA BURN | | |
| TOTAL | | |

2. Burn depth
    i) All superficial.....
    ii) Mostly superficial.....

iii) Mostly or deep.....

3. Burn type

   i) Flame.....

   ii) Scald.....

4.

   i) Time of injury.....

   ii) Time seen at Casualty.....

   iii) Interval.....

5. Management in KNH

   i) Patient admitted to general ward.....

   ii) Patient admitted to burns unit.....

   iii) Patient admitted to ICU.....

6. Outcome

   i) Discharged.....

   ii) Died.....

   iii) Date and time of discharge or death.....

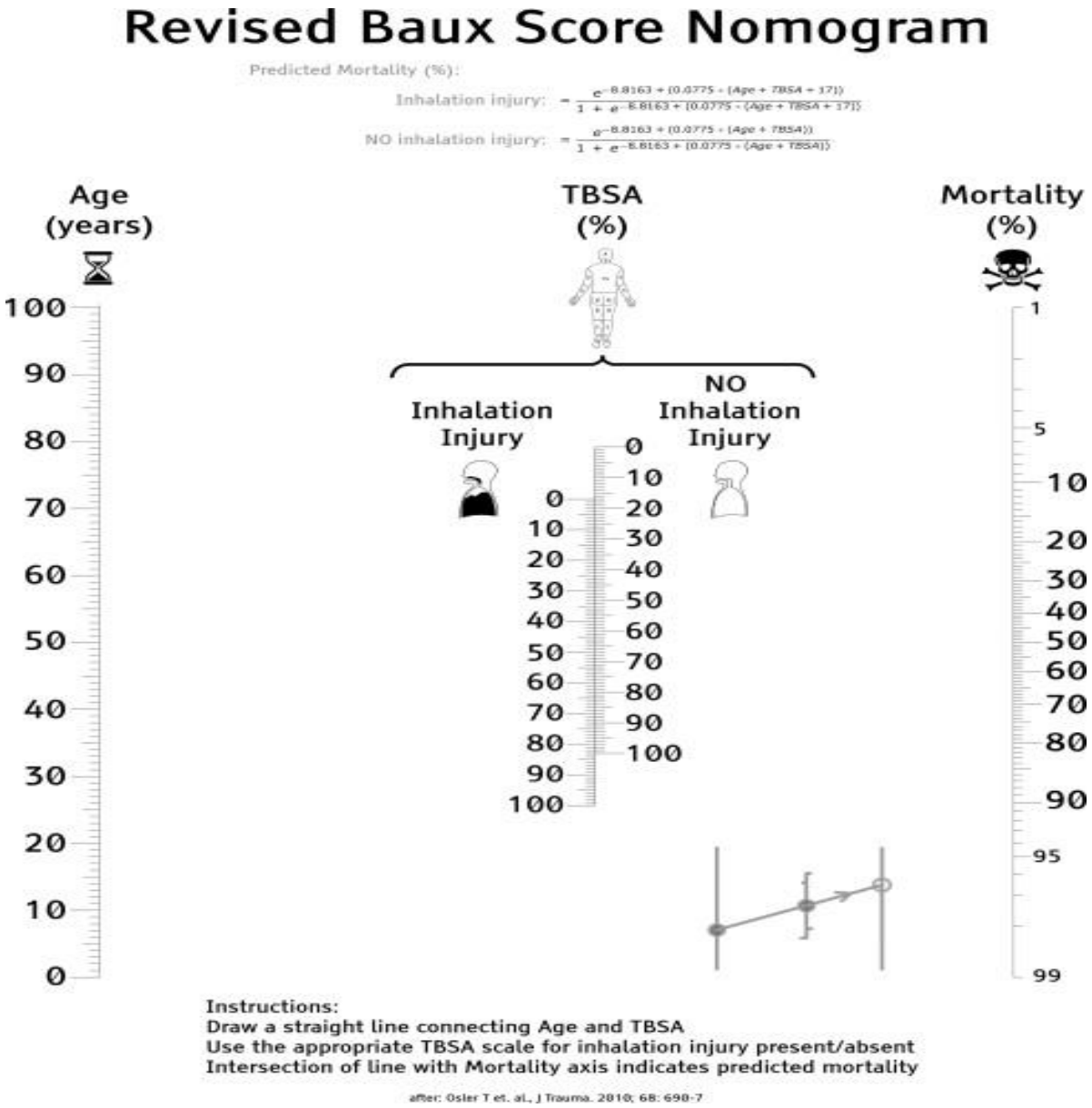
   iv) Time between admission and time of discharge or death.....

**ABSI Scoring**

| Variable | Patient characteristic | score |
|---|---|---|
| Sex | Female | 1 |
| | Male | 0 |
| Age in years | 0-20 | 1 |
| | 21-40 | 2 |
| | 41-60 | 3 |
| | 61-80 | 4 |
| | 81-100 | 5 |
| Inhalational injury | Present | 1 |
| Full thickness burn | Present | 1 |
| % TBSA burned | 1-10 | 1 |
| | 11-20 | 2 |
| | 21-30 | 3 |
| | 31-40 | 4 |
| | 41-50 | 5 |
| | 51-60 | 6 |
| | 61-70 | 7 |
| | 71-80 | 8 |
| | 81-90 | 9 |
| | 91-100 | 10 |

| Total burn score | Threat to life | Probability of survival (%) |
|---|---|---|
| 2-3 | Very low | >99 |
| 4-5 | Moderate | 98 |
| 6-7 | Moderately severe | 80-90 |
| 8-9 | Serious | 50-70 |
| 10-11 | Severe | 20-40 |
| 12-13 | Maximum | <10 |

**Annex4: REVISED BAUX SCORE NOMOGRAM**



## Annex5: LUND BROWDER CHART

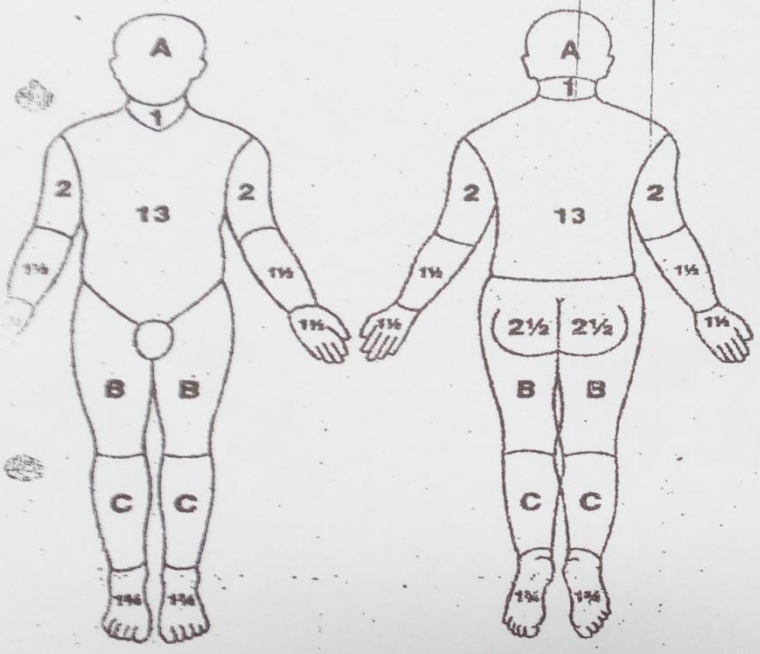
BURN RECORD

NAME
ADDRESS
AGE M/F
ADMISSION WEIGHT WARD

| BURN | DATE | TIME OF ADMISSION | TYPE OF BURN | |
|---|---|---|---|---|
| | | | INHALATION INJURY | YES/NO |
| REGISTERED | | | PLACE AND TIME OF BURN | |
| | | | INFORMANT | |

LUND AND BROWDER CHARTS

IGNORE
SIMPLE ERYTHEMA




☐ Superficial
☐ Deep

| REGION | % |
|---|---|
| HEAD | |
| NECK | |
| ANT. TRUNK | |
| POST. TRUNK | |
| RIGHT ARM | |
| LEFT ARM | |
| BUTTOCKS | |
| GENITALIA | |
| RIGHT LEG | |
| LEFT LEG | |
| TOTAL BURN | |

RELATIVE PERCENTAGE OF BODY SURFACE AREA AFFECTED BY GROWTH

| AREA | AGE 0 | 1 | 5 | 10 | 15 | ADULT |
|---|---|---|---|---|---|---|
| A = ½ OF HEAD | 9½ | 8½ | 6½ | 5½ | 4½ | 3½ |
| B = ½ OF ONE THIGH | 2¾ | 3¼ | 4 | 4½ | 4½ | 4¾ |
| C = ½ OF ONE LEG | 2½ | 2½ | 2¾ | 3 | 3¼ | 3½ |