

**PREVALENCE, PREDISPOSING FACTORS AND  
AWARENESS OF BURNOUT AMONG KENYAN  
RADIOLOGISTS AND RADIOLOGY TRAINEES**

**PRINCIPAL INVESTIGATOR:  
DR. MAXWELL CHIERA GACHIE  
H58/10837/2018  
DEPARTMENT OF RADIOLOGY**

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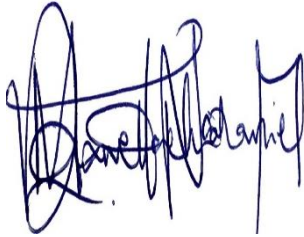
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## STUDENT'S DECLARATION

I, **Dr. Maxwell Chiera Gachie**, do declare that this dissertation is my original work and has not been presented for a degree in any other university.

**Dr. Maxwell Chiera Gachie**

**Signature:**

A handwritten signature in blue ink, appearing to read 'Maxwell Chiera Gachie', written in a cursive style.

**Date:**

24/05/2022

## SUPERVISORS' APPROVAL

This dissertation is submitted with our approval as the university supervisors:


**Dr. Ian Mathenge Muriithi**, MBChB (Nbi) MMed (Nbi)

Consultant Radiologist and Lecturer, Department of Diagnostic Imaging and Radiation Medicine, Faculty of Health Sciences, University of Nairobi.

Signature:  Date: 26<sup>th</sup> June 2022

**Dr. Gladys Nthambi Mwangi**, MBChB (Nbi) MMed (Nbi) BSc. Anatomy (hons Nbi)

Consultant Radiologist, Senior Lecturer, Department of Diagnostic Imaging and Radiation Medicine, Faculty of Health Sciences, University of Nairobi.

Signature:  Date: 13<sup>th</sup> May 2022

**Dr. Wangari Maina**, MBChB (Nbi) MMed (Nbi)

Consultant Radiologist, Kenyatta National Hospital

Signature:  Date: 15<sup>th</sup> June 2022


## DECLARATION OF ORIGINALITY

**Name of the Student** Dr. Maxwell Chiera Gachie  
**Registration Number** H58/10837/2018  
**College** Health Sciences  
**School** Medicine  
**Department** Diagnostic Imaging & Radiology Medicine  
**Course name** Master of medicine in Diagnostic Imaging & Radiology  
Medicine  
**Title** Prevalence, Predisposing Factors and Awareness of  
Burnout Among Kenyan Radiologists and  
Radiology Trainees

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I understand what plagiarism is and I am aware of the University's policy in this regard. I declare that this dissertation is my original work and has not been submitted elsewhere for examination, award of a degree or application. Where other people's work or my own work has been used, this has properly been acknowledged and referenced in accordance with University of Nairobi's requirements. I have not sought or used the services of any professional agencies to produce this work. I have not allowed, and shall not allow anyone to copy my work with the intention of passing it as his/her own work. I understand that any false claim in respect of this work shall result in disciplinary action, in accordance with university plagiarism policy.

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## **DEDICATION**

I dedicate this project to my family: my spouse **Jacqueline** and our children; **Favour Wanjiru** and **Liam George Chiera** for their love, understanding, and support throughout this research work. I would also like to dedicate this project to my colleagues in the departments of Radiology at KNH and UON for their dedication in improving the radiology practice locally and improving the patient experience despite the challenging work environments.

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## ABBREVIATIONS AND ACRONYMS

<b>AKUH</b>	Aga Khan University Hospital
<b>ANOVA</b>	Analysis of Variance
<b>CI</b>	Confidence Interval
<b>DOI</b>	Digital Object Identifier
<b>DP</b>	Depersonalization
<b>EE</b>	Emotional Exhaustion
<b>EI</b>	Emotional Intelligence
<b>EMR</b>	Electronic Medical Record
<b>ICD</b>	International Classification of Diseases
<b>KAR</b>	Kenya Association of Radiologists
<b>KNH</b>	Kenyatta National Hospital
<b>LPA</b>	Low Personal Achievement
<b>MBI</b>	Maslach Burnout Inventory
<b>M.Med</b>	Master of Medicine
<b>MoU</b>	Memorandum of Understanding
<b>OR</b>	Odds Ratio
<b>PACS</b>	Picture Archiving and Communications Systems
<b>PWE</b>	Physical Work Environment
<b>SI</b>	Suicidal Ideation

## ABSTRACT

**Background:** Burnout refers to an occupation syndrome characterized by overwhelming exhaustion, feelings of cynicism or depersonalization, and a sense of ineffectiveness and lower efficacy. High rates of burnout varying from 30% to 75% are seen across all medical specialties globally. Studies on professional burnout are lacking amongst Kenyan radiologists and trainees.

**Objective:** To determine the prevalence, associated factors and awareness of burnout among Kenyan radiologists and radiology trainees

**Materials and Methods:** This cross-sectional study was conducted between 22nd March and 22nd April 2021. Eligible radiologists (200) under the Kenya Association of Radiologists (KAR) and trainees (95) in the three training schools in the country were invited to complete an anonymized 45-item survey that included the abbreviated 9-item licensed Maslach Burnout Inventory-Health Sciences Survey. The association between mean emotional exhaustion (EE), depersonalization (DP), and personal achievement (PA) scores with items in the survey was performed. Data analysis was done using R-4.0.3 software.

**Results:** From the 295 surveys sent out, a total of 132 were completed and returned giving an overall survey response rate of 44.7% (132/295). There were fewer responses from radiologists at 36% (72/200) compared to 63.2% (60/95) from trainees,  $p < 0.001$ . Mean age of radiologist respondents was 41.6 years (8.3 SD) and for trainees 33.2 (3.2 SD). More females completed the survey with male to female ratios of 1:1.5 and 1:1.3 for radiologists and trainees respectively. The overall burnout prevalence among study respondents was 51.5%. The prevalence of burnout was significantly higher in trainees (65%) compared to 40.3% among radiologists,  $p = 0.005$ . Depersonalization was also higher among trainees (Mean = 7) compared to radiologists (Mean = 4.2),  $p = 0.007$ . Significant predisposing factors to burnout among radiologists were; unstable income ( $p = 0.016$ ), dissatisfaction with the physical work environment ( $p = 0.044$ ), un-involvement in academia ( $p = 0.035$ ), unavailability of resting rooms ( $p = 0.021$ ). Working exclusively in the public sector was protective against burnout ( $p = 0.022$ ). Significant predisposing factors to burnout among radiology trainees were; self-sponsorship ( $p = 0.026$ ), younger age  $< 32$  years ( $p = 0.040$ ), having adequate equipment ( $p = 0.040$ ). Protective factors among trainees included access to passive income ( $p = 0.003$ ) and availability of PACS ( $p = 0.007$ ). Majority of the participants (79%) were aware of signs and symptoms of burnout. Control strategies suggested include employing more staff, providing resting rooms and better pay.

**Conclusion:** In this baseline study to assess burnout amongst Kenyan radiologists and trainees, it can be seen that there was significant burnout with an overall prevalence of 51.5%. The major contributory factors were unstable income, unsatisfactory physical work environments and unavailability of resting rooms for radiologists. Contributing factors among trainees included self-sponsorship, PACS availability, having passive income and aged below 32 years. The level of burnout awareness was high.

# 1.0 CHAPTER ONE: INTRODUCTION

## 1.1 Background of the Study

Burnout is increasingly being recognized as a serious problem among physicians working in all fields worldwide. Burnout, first raised in 1974 by Freudenberger (1), was subsequently described by Maslach et al. (2) as a syndrome that affects the emotional part of a human being, presenting a response to stress-causing factors that are work-related, often occurring in individuals with no prior history of psychological or mental disorders. According to WHO (2019), burnout, although not considered as an illness that can be diagnosed in the Diagnostic and Statistical Manual of Mental Disorders-V (DSM-5), received inclusion in the International Classification of Diseases-11 (ICD-11) as a state that results from one's occupation.

As stated in the ICD-11, burn-out is a syndrome conceptualized which results from recurrent stress and difficulties from the workplace. This is portrayed when individuals experience decreased energy, weakened emotional status, increased withdrawal from one's job, or cynicism; and reduced professional efficacy that has not been successfully managed. Physicians' performance and how they think about clinical work is affected by stresses which reverberate through organizational matrix (3). As such, high levels of burnout have detrimental effects on individual physicians, health-care organizations as well as patient outcomes. Burnout can result to physicians being less productive, showing minimum effort and concentration at work, high physician turnover and also withdrawing or retiring early from their profession (4). This can contribute to a drop in the number of physicians and a rise in the cost of health-care management. Burnout may as well contribute to an escalation of physicians' chances of experiencing depression, thus engaging themselves in unhealthy practices like excessive use of drugs and contemplating suicide (5,6). The ramifications of physician burnout further extend to quality and safety in patient care (7,8). Consequently, there is a growing interest in ascertaining the prevalence and drivers of burnout in order to design and implement appropriate interventions to mitigate burnout.

Burnout is conventionally measured using the MBI, a well-established tool for determining burnout in medical studies and constitutes of three properties: emotional exhaustion (EE), depersonalization (DP), and low personal accomplishment (PA) (9). For individuals experiencing burnout, challenges in their workplace are seen through signs like feeling drained, tired, overworked and unable to complete designated work which in most instances are initial signs, and are thought to be due to depletion of energy (10).

The other sign involves individuals becoming emotionally distant and feeling numb about their work (10). They are also noted to have a sense of reduced competency levels at work, which is thought to be a defense mechanism against burnout (2). High rates of energy depletion and emotional distance from work among physicians therefore imply extreme burnout symptoms. However, owing to a complex interplay of both personal factors and work systems that impact levels of stress linked to work, previous research has revealed variances in burnout rates among physicians from different departments and specializations ranging from 30% to 75%.

Accordingly, radiologists have been documented to experience burnout frequently and trends have been observed to be rising over the years (11,12). Burnout rates for various types of radiologists have been reported; 72% of radiologists who specialize in offering therapeutic services (13), 66% of paediatric radiologists (14), and 80% of radiologists dealing with the skeleton and body muscles (15). According to the 2018 Medscape Radiology Lifestyle report, there was an increase in burnout prevalence among practicing radiologists; from 36% in 2013 to 49% in 2017. Radiology trainees have also been observed to be part of those experiencing burnout symptoms at a higher rate (16–18). A survey done on members of the University Radiologists Association by Mcneeley et al. in 2013 revealed more than 50% of radiology trainees among the 266 who took part in the survey to be experiencing burnout symptoms (18). Another survey in New England found corresponding results where burnout rates among radiologists who were receiving training were high (19). A survey among academic radiologists in the United States showed that 79% of respondents had one or more symptoms of burnout (20). In a survey among Saudi Arabian radiology residents, a burnout prevalence rate of 50% has been reported (21).

Increased workload has been reported in numerous studies as a major source of stress, difficulties and a breaking point in regards to work (22–24). Over the last 20 years, there has been a significant increase in workload in the radiology department with the arrival of PACS (a system for collecting, filing, storing pictures and communication), increased advancement in imaging, large number of imaging studies to be read, and large imaging datasets for analysis (25). Work overload has been contributed by other factors, which include long hours of work with many after work hours responsibilities, overly demanding job expectations like short report turnaround time and a deficiency of staff (26). Studies show that the number of night shifts a radiologist works also contributes to burnout, whereby there is a greater risk for those who have been assigned work for longer hours and many shifts as compared to those with lesser shifts (27).

Isolation has also been identified as a potential risk factor for burnout in radiology (23). Advanced technology has reduced face-to-face consultation with others, both within radiology and with other clinical colleagues, resulting to isolation of radiologists. Picture archiving communication systems (PACS) is one of the technological advances. The ease in accessing the electronic medical record (EMR) has also reduced the need for face-to-face communication with others (28,29). The outcome, though not planned nor desirable, may be a gradual decrease in interaction between a physician and patients which in turn creates negative thoughts in physicians' minds as their direct services to patients seem valueless (20). When contact between the physician and patient becomes insufficient, the physician may feel demeaned, thus resulting to individuals lacking a sense of accomplishment in their profession (24,28,30). Adjusting systems to create a favourable environment for interaction between radiologists and patients may reinforce connection with patients receiving services, thus inspiring the radiologists to go on with their career and to never give up (20).

Working environments and practices in some medical centres may also result to high burnout rates. This includes practicing radiology in institutions owned by specific persons or groups, which has been identified as a major contributor of burnout among radiologists. A study among radiologists specialised in imaging of the skeleton and muscles found higher burnout rates among radiologists working in private organisations unlike those in academic practice. The same study revealed that female radiologists had burnout prevalence in ratios of 9.1 to 7.14 for those in private institutions to those in academic settings (15). Academic practice setting for radiologists contributes to burnout in a unique way. Academic radiologists are committed to other duties such as tutoring, conducting research, ensuring there is growth in quality of work and services, and being engaged in management acts (31). Being involved in all these kinds of practices and having numerous roles requires one to set aside more time for work at the expense of their resting time, which may make them look at the job in a negative manner as they may feel overworked (17,29,32).

Poor communication greatly contributes to discontentment of physicians in a workplace. When a radiologists' work is not recognized or appreciated, they lack motivation. Lack of support and being left out in the decision making process may lead to discontentment thus increasing burnout symptoms (23). Denying physicians the liberty to make their own decisions pertaining to work can lead to burnout (20). When physicians lack the power to determine and plan their activities; to manage administration of services while not at work; to control their approach to work; and to determine when to take a holiday, they may feel less contented with the quality of life thus piling up stress linked to their work (12,24).

Occurrence of burnout at high rates among trainees, can be accounted for using different aspects which include: financial and debt stress (18), failure of systems to include trainees in giving opinions in regard to work practice, performance and job market (22), excessive work load and work-life imbalance (20). Increased residency years among radiology trainees has also been shown to significantly correlate with the high occurrence of burnout symptoms (17). Researching and being able to recognize demographic factors that amount to high burnout incidences among radiologists may be of great help when coming up with ways of eradicating burnout. There is insufficient evidence on burnout prediction among professionals for medical imaging based on socio-demographic and occupational predictors. Burnout symptoms have been observed to occur among physicians from all over the world, including high, low and medium income countries (33). With the weight of dangers posed by both infectious diseases and those that are not contagious in Sub-Saharan Africa; resource scarcity, inadequate support; and the negative health impact on patients and providers, there is need for more attention on the well-being of radiologists and other physicians in the less fortunate parts of Africa (34).

## **1.2 Statement of the Problem**

Previous studies have found that radiologists and radiology trainees from all over the world are vulnerable to burnout syndrome which has adverse effects on health care services. A research done in 2014 through a survey on United States physicians found that of the 261 radiologists involved in the survey, 61% reported symptoms of burnout (35). A study conducted by the same authors in 2011 had revealed that 48% of radiologists in the entire United States had burnout syndrome which shows that the trend is worsening (36). In the 2019 Medscape Radiology Lifestyle Report, almost half of the radiologists reported burnout. A study done in Kenya at Kenyatta National Hospital (KNH) among all physicians identified worker's environment as the leading burnout contributing factor with 55% burnout intensity scores among all medical specialties (37). Similar findings were found in a study among registered nurses in the United States (38). This calls for researchers' efforts in the investigation of prevalence and the underlying risk factors of burnout among the qualified and training radiologists in Kenya. This will then aid in development of a comfortable working environment and consequently improve the quality of services and care accorded to patients.



## 2.0 CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

A key aspect of burnout syndrome is being in a state of physical, emotional and mental exhaustion generated by exorbitant and prolonged stress. It's regarded as a constant tendency of evaluating oneself negatively and being unhappy and dissatisfied (39). Clinical manifestation of this syndrome exists along a continuum, which range from mild to severe symptoms. The symptoms proceed gradually but in a subtle way which makes it hard to recognize.

Burnout prevalence in the developed countries among total population is estimated to be in the range of 13% to 27%. However, healthcare workers have been listed in the frontline as high risk of experiencing burnout (40). Furthermore, it has become a pervading problem among physicians that seems to worsen over time (12); emerging as a concern, particularly to the radiologists' burnout rates as compared to other specialties (16). Physicians continue to be at increased risk of burnout relative to the general population (16).

In Kenyatta National Hospital (KNH), the prevalence rate of burnout syndrome was 95.4% (37). This was significantly higher than those found in other parts of the world such as British Columbia (55%), Austria (58%), and Northern England (66%) (41–43). According to American College of Radiology (ACR), 50% of radiologists reported having burnout in 2011. The incidence of burnout significantly increased by 10% over three years accounting for over half of the total radiologists reporting burnout (23).

Burnout includes a constellation of symptoms, which are: negativity or cynicism related to one's job, suicide, changes of appetite and sleep pattern, depersonalization, etc. (44). A cross-sectional study done in Nigeria assessing correlation of burnout between doctors and medical residents found out that emotional distress and a heavy workload were highly linked with all dimensions of burnout among doctors (45).

Ignored and unaddressed job burnout has significant implications. High levels of professional burnout among healthcare providers have proven to cause adverse effects on healthcare quality and safety. A systematic research review, which identified 46 empirical and quantitative studies that addressed burnout and patient safety between the year 1806 to July 2015 in the UK, concluded that medical errors and poor patients outcomes are associated with high levels of burnout (46). According to the Harvard Gazette, burnout among health care practitioners' costs the U.S health care system an approximated 4.6 billion dollars annually. Additionally, a study of physicians found out that burnout is significantly associated with increased substance abuse,

mainly due to ease of access and emotional distancing (47). Health practitioners become detached from their patients and tend to regard them more as objects than human beings.

## **2.2 Clinical Presentation of Burnout**

Burnout has many presentations including the inability to concentrate, anxiety, fatigue, depression, irritability, and the increased use of drugs. There have been many conceptual models that have quantified the evolution of burnout. The Maslach Burnout Inventory is a well-designed tool for measuring burnout based on three dimensions (48).

- i. Emotional exhaustion - where a person feels drained, tired, overworked and unable to complete designated work
- ii. Depersonalization - individuals become emotionally distant and feeling numb about their work. They start exhibiting negative reactions towards clients and workmates.
- iii. Reduced personal accomplishment - a sense of the reduced level of competency at work

According to research on burnout inventory, physicians who were reported to be self-isolating themselves had a high score on emotional exhaustion (2). Subsequently, previous theorizing (49) would relate burnout as a yearning to leave one's job or retire early.

A cohort study done in January 2018 in Canada assessing burnout among radiologists and radiology residents found low burnout rates in personal accomplishment, especially among the males, and extreme burnout symptoms in the terrains of depersonalization and emotional exhaustion (16)

## **2.3 Prevalence of Burnout among Healthcare Workers**

Globally, burnout rates have been on the rise across all medical specialties and the radiologists haven't been spared (35). In 2019 a United States National report on Physician burnout, suicide, and depression reported that 44% of the physicians experienced burnout. A study on United States physicians evaluating the prevalence of burnout and satisfaction with work-life balance, radiologists included, carried out in 2015 relative to 2012, noted that 54.4% of the physicians reported at least 1 symptom in 2015 compared to 45.5 % in 2012 (36). Of the 6880 survey respondents, 3.8 % were radiologists and 61 % of the radiologists reported burnout which was an increase from 2011 where 48% of radiologists recorded burnout (35)

The worsening trend of burnout was also notable in Medical Radiology lifestyle report, where burnout prevalence among radiologists saw an increase from 36% in 2013 to 49% in 2017 (50).

Another study addressing burnout in 216 radiologists amongst the United States physicians reported significant differences in burnout observed across different specialties. After adjusting for socio-demographic factors (which had no statistically significant differences) Radiologists, Family medicine practitioners, and Neurologists remained at a higher risk of burnout (35). The same authors did another study integrating changes in burnout with work-life balance between the physicians and the entire population. A multivariate analysis concluded that physicians are at 39% increased odds of burnout and subsequently 23% reduced odds of being satisfied with work-life integration in comparison to other working adults.

Demographic characteristics also influence burnout. In 2014, a descriptive cross-sectional survey on burnout syndrome was conducted among medical practitioners at Kenyatta National Hospital (KNH). A total sample of 345 medical practitioners was selected. The prevalence rate of burnout was 94.5%. Participants' ages ranged from 25-53 years. The highest level of burnout (97.0%) was found in the age group below 30 years whilst the lowest level of burnout (95.0%) was found in the age group of 31-35 years. Although the difference in age was not statistically significant, the study confirmed that the young and inexperienced workers were more vulnerable to burnout as compared to the old and experienced (37). This was similar to a study done among 582 surgeons in America, where the young were more susceptible to burnout syndrome (51). Further, in the same survey, Derby et al. found that both males and females experienced high burnout syndrome, though the difference in burnout by gender was not statistically significant, which was in contrast to another study of 2300 practicing physicians that showed women are at 60% greater odds of reporting burnout than men ( $p < 0.5$ ). The relationship between education and burnout is difficult to quantify given that, education and job status are strongly confounded (39).

A cross-sectional study on burnout among nurses constituted a total sample of 1556 nurses. It revealed that prevalence of burnout in the nursing profession was thirty one percent for emotional exhaustion, thirty six percent for depersonalization, and twenty nine percent for personal achievements (52). Another recent systematic review on burnout among nurses noted that the prevalence of burnout was 28%, 15%, and 31% for high exhaustion, depersonalization and low of sense personal achievement respectively (53).

A study in 2012 which evaluated burnout symptoms among selected samples of nurses in Nigeria (54). This revealed slightly higher levels of emotional exhaustion (39.1%) and depersonalization (29.2%) and personal achievements (40.0%).

## **2.4 Trainee Burnout**

Radiology trainees continue to experience substantially high burn out rates. The unique nature of radiology training which is often under-appreciated, could be a significant contributor to the trainee's burnout. Studies have shown resident radiologists have lower rates of emotional exhaustion as compared to depersonalization (16). Guenette et al. compared the degree of burnout and associated factors in New England residents relative to other medical providers (19). A substantial degree of burnout was recorded in more than one-third of radiology residents. Interestingly, the high scores were lesser, relative to residents across other specialties. Trainees had high DP 48% and EE 37% that was significantly predictive from their relationship status and residency year. The low levels of PA 19% were not predictive of all the demographic factors included in the study. McNeeley et al. (18) recorded a high DP and EE of 49% and 53%. The rate of high DP corresponds well to Guenette et al. study.

A study of University of Carolina residents in 2015 recorded a relatively high burnout with high rates of EE 60% which was concordant with McNeeley's study which had 53% of EE (55).

Postgraduate trainees who are continuing their medical training following medical schools (interns, residents, specialty trainees) are particularly susceptible compared to other health workers (56). This may be due to differences in workload making it difficult to manage professional, education, and personal life simultaneously. In another systematic review and meta-analysis comparison of burnout levels between medical residents, with data from normative medicine, it proved that trainees experienced higher EE and DP levels than medical peers and comparatively lower PA (57). This also aligned with previous findings that demonstrated the magnitude of burnout in residents.

A longitudinal study in the US investigating burnout and suicidal ideation among the medical students found that approximately half of the residents' experience burnout and nearly 10% have suicidal ideation (6).

## **2.5 Factors Associated with Burnout**

### **2.5.1 Increasing Workload**

Several studies have pointed out that workload contributes towards the prediction of employee burnout. Authors assert that mismatch in workload may aggravate exhaustion (58), thus indicating incompatibility with Karasek and Theorell's interaction hypothesis which outlined that the relationship between the two is considered one of the most controversial aspects.

Radiologists' workload continues to be on the rise in recent years. According to a study on the trends of radiology workload in the United States, radiologists' workload had increased by 7% since the year 2002 and by 34% since 1994. This accounted for a full-time radiologist performing 14,900 procedures in a year. Subsequently, Relative value units per full-time radiologist had dramatically increased by 70.35 since 1991 (25).

Work overload is the main significant contributor to physician burnout (59). In Egypt, researchers conducted a multivariate analysis of variables influencing burnout which revealed work burden was a significant predictor of burnout syndrome; with 92 out of 239 (38.4%) physicians experiencing burnout reporting dissatisfaction with their workload (60). Four prospective studies that measured burnout rates before and after duty-hour reduction, found out that restricted working hours which in turn reduces workload, led to an improvement in the quality of life metrics, including reduced burnout (61).

A study in Pakistan found out that gynaecology residents working 50-60 hours a week had higher levels of burnout compared to those working more than 80 hours (62). Interestingly, another study among general surgery interns in the United States found no correlation between burnout and duration of working hours (63).

### **2.5.2 Practice Environment**

Academic radiology faculty are very happy with work and derive fulfilment from work (31). Career satisfaction is consistently related to low burnout rates (64). Radiologists with high burnout had an increased odd of 126% of being dissatisfied with their career and less likely to identify medicine as a calling. Furthermore, there was 5% and 7.5% decreased odds of a radiologist with higher years experiencing and a radiologist professor experiencing burnout respectively. Also, radiologists taking up at least 50% of non-patient care task was linked with a lesser risk of burnout (65).

Working in private practice has severe burnout prevalence as compared to academic practice. They are likely to work twice as hard to be equal (15). Chew et al. further reported that practice setting was the greatest predictor of burnout compared to other factors which are associated with burnout. The study however did not cover all types of radiologists but was limited to only a subspecialty of radiologists (musculoskeletal). In contrast, Au J et al. argues out that there is insignificant difference between private urologist and academic urologists (66). Poor interactions and working conditions are associated with more burnout (67). Supervisor support, relationship at work, and professional valorisation are perceived to be critical in mitigating occurrences of burnout (67,68). Employees having an ill perception concerning the treatment

they receive in retribution to the effort in their work might be at an increased risk of burnout (68).

### **2.5.3 Communication and Autonomy**

Although changes in work conditions over time have led to a gradual increase in opportunities for communication, employee's physical interaction remains a necessity. Burnout has become a major hindrance in professional life due to advances in technology which in turn heighten pressure and demand on employees in the provision of quality services (69). Chati et al. reported that the ideation of excessive responsibility is significantly linked to burnout (70), though it was argued that being challenged at work could lead to higher rates of burn out (71). Autonomy and decision authority is associated with lower burnout. Lack of appreciation in one's work, little or no involvement in decision making in matters that involve them, have led to consequences of high burnout (23).

### **2.5.4 Socio-demographic Factors**

Burnout was once referred to as an old age syndrome. However, recent studies have differed, reporting younger physicians to be twice at risk compared to the older physicians (72). Younger surgeons are likely to be associated with higher rates of burnout (58). Similarly, Woodside and colleagues reported an increased burnout incidences among the medical residents and that being of a younger age group was associated with a low sense of personal accomplishment (49)

Higher personal accomplishment scores are recorded in males than in women (73), this comported with Chew and colleagues who found that women have high emotional exhaustion and depersonalizing, and an increased 60% odds of reporting burnout (74). However, another longitudinal study that went on for a year found that male burnout scores were higher compared to females, though the study was based at an intern level with a low cohort of n=21 (75). The study was concordant with that of KNH that found high burnout levels in both genders though slightly higher in males (37). The odds are increased by 23% if a physician has a partner in a non-medical profession (59). Younger age, being a female, residency training and being single is associated with a higher risk of burnout (76); whilst having children, emotional intelligence, mentorship is associated with a lower risk of burnout (58).

### **2.5.5 PACS Environment**

The usage of PACS is always considered a success story (77). While introducing PACS to the hospital, management and implementers should create a conducive environment where it's

firmly supported. Before PACS, radiologists engaged in more regular face to face communication and consultations with physicians from other specialties which helped them develop more clarity of the clinical problem at hand and consequently come up with more meaningful and impactful reports (44).

Unfortunately, the introduction of PACS substantially reduced engagements between physicians causing self-isolation that inadvertently contributed to increased DP and a low feeling of PA (44).

## **2.6 Effects of Burnout**

Within the medical profession, burnout has been widely reported and consistently associated with poor mental outcomes of physicians. It is a salient condition that has adverse effects on the professional, personal, and social life of a health professional. Implications of burnout are pervasive, emotional exhaustion being the core of physician burnout. Ironically, burnout serves to reduce the health of professionals who are charged in maintaining the life of others. For example, the repercussions for burnout among physicians is increased substance and alcohol abuse/dependence especially in surgeons (78), accounting for 25% increased odd of alcohol abuse/dependence.

A burned out physician is likely to be at a double risk of suicidal ideation; SI was 1.5 to 3.0 more common in surgeons than the average population (79). 60% of the suicidal surgeons were reluctant to seek medical help in fear that it will affect their license. Additionally, the suicidal rate in males was 40% higher than the general population and that of females was 130% higher as compared to the population.

Dyrbye and colleagues linked physician burnout to doubled medical errors (80), with an increased odds of 17% of being involved in a malpractice suit (81). Burnout adversely affects a patient's quality of care. Recent research suggests that when physicians are distressed and emotionally detached or disengaged, their patients take longer to recover and reduce their adherence to treatment recommendation. At least 9% of physicians who experience burnout are prone to have low patient satisfaction scores and a major medical error (82).

Cross-sectional studies have reported physician burnout with low job satisfaction, reduced productivity, lower patient satisfaction scores, and the will to quit the job or go into an early retirement (59). Physicians with symptoms of burnout are most likely to leave an organization. This impacts negatively in an organization, somewhat increasing the economic burden as the quality and amount of work output is jeopardized. Subsequently, it results in losses as employers spend more recruiting and training new physicians (83). In Canada, the losses of

inpatient services related to reduced clinical hours is fairly close to \$28 million; and that due to early retirement \$185 million, an aggregate of \$213 million annually (84).

Burnout also increases organizational expenditure indirectly by the doubled medical errors malpractice suits. Also, absenteeism and low job productivity put a strain on the health care system which struggles to meet the demands of the population they serve. A study on how burnout affects productivity examined efficiency at workplace using the number of sick leave days, workability, and intent to either stay at the current work or change jobs. Burnout was negatively associated with productivity indicating that the higher the burnout the lower the productivity (85).

Burnout mechanism that demeans work relationships is likely to have the same impact at home. An individualistic perspective on stress overlooks the likelihood of how burnout experienced by one person is likely to cross over to another (86). Furthermore, they also suggested that females are more unguarded to their partner stress because of their empathic nature.

## **2.7 Burnout Prevention and Management**

Over the years, the demand has always exceeded the supply (patients are more than the healthcare workers) therefore, access to health services has been limited to individuals. This has caused the available practitioners to work under a stretched schedule. Consequently, there have been evident scenarios where the job demand has exponentially increased which in turn increased incidences of burnout. It has, therefore, become a necessity to address and mitigate burnout syndrome.

Awa and colleagues surveyed to evaluate the effectiveness of intervention programs at the workplace (87). They sampled a total of 25 intervention studies of which 17 were person-directed, 2 were organization-directed and 6 was a combination of the two. The interventions were aimed to reduce stressors by redesigning job tasks, decreasing workload, and increasing physician involvement in decision making. 8% of the combination led to reduced burnout. Person-directed reduced burnout but in the short-term. Concordant to this result was a study on oncology nurses that demonstrated; shared responsibility, teamwork, and social support relatively relieved them from burnout (88).

Dunn and colleagues conducted an interventional study among physicians to determine if a data-guided program and systematic improvement process enhances physician well-being in an organization. Emotional and work-related exhaustion significantly reduced. This portrayed that, decreasing physician workload is an effective approach in preventing burnout (88). Additionally, a one-year cohort study for Norwegian doctors investigating predictors of change



in burnout after intervention (89); which was counselling of doctors, noted the mean level for EE reduced from 3 to 2.53. The reduction in mean was a result of reduced working hours by almost 2 hours a week. Reduction in exhaustion was independently predicted by reduced working hours.

While organization interventions are related to providing long-term effects on burnout, a person-directed intervention can be adapted for persons who already are in the process of burnout. Finding balance within all aspects of life is a vital strategy to combat burnout. Several pieces of research have shown emotional intelligence to be an independent contributor to burnout (90,91). Controversially, in another study, it was noted that teams with a high level of EI are likely to experience task conflict compared to those with average EI during a problem-solving task because those with high EI are more of goal-oriented and not in control of their emotions (92).

Open communication which can be done through a suggestion box, weekly review meetings, face to face conversation is vital for a person and the organization (12). A study among the Japanese nurses assessing the correlation between burnout and communication skills found out that low sense of personal accomplishment improved significantly after communication skills training such as accepting valid criticism and negotiating (93). In another setting, physicians that participated in a Mindfulness and Self-awareness program experienced positive changes in empathy and psychosocial beliefs. Furthermore, these behavioural changes were associated with improved quality of care and lower healthcare costs (94).

Having effective leadership promotes the well-being of physicians in the organization (73). Shanafelt and colleagues conducted a study on the impact of organizational leadership on burnout among physicians in 2013. A composite leadership score was used to rate qualities of leadership of physicians' immediate supervisors. The study concluded that leadership styles and new insights into the organization with the physicians' knowledge affected the wellness of the physicians (95).

## **2.8 Justification of the Study**

High rates of burnout among radiologists worldwide prompted this study. In the 2019 Medscape Radiology Lifestyle Report, almost half of radiologists reported burnout. Previous research in Kenya gives scanty information about burnout among radiologists (37). There is no scientific information published regarding the same thus causing limitations in the ability to diagnose the problem. The need for well-being of radiologists is of great value to the nation as they will grow professionally and be in a position to deliver quality health care to all patients.

As a result, many health problems will be reduced since the patients will be attended to with much care. Burnout among physicians does not only impact their health and that of patients, but also the society and the nation at large. This is seen when physicians contemplate suicide and other harmful practices including substance abuse which may in turn lead to early retirement and withdrawal from responsibilities. This poses a financial problem to the government as replacing a registered physician is costly (38). There is thus need to ensure mental well-being of all health care workers. An equally important aim of this study is to stimulate engaging discussion among radiologists in the hope that solutions can be jointly identified, implemented, and shared.

## **2.9 Research Questions**

- i. What is the level of burnout syndrome among radiologists and radiology trainees in Kenya?
- ii. What are the major factors contributing to burnout among radiologists and radiology trainees?
- iii. What is the level of awareness of burnout signs and symptoms among Kenyan radiologists and radiology trainees?

## **2.10 Objectives**

### **2.10.1 The General Objective**

To determine the prevalence, associated factors and awareness of burnout among Kenyan radiologists and radiology trainees

### **2.10.2 Specific Objectives**

- i. To determine the prevalence of burnout among Kenyan radiologists and radiology trainees.
- ii. To determine factors associated with burnout among Kenyan radiologists and radiology trainees.
- iii. To determine the level of awareness of burnout signs and symptoms among Kenyan radiologists and radiology trainees.

## **3.0 CHAPTER THREE: METHODOLOGY**

### **3.1 Study Design**

This was an analytic cross-sectional study using the Maslach Burnout Inventory (MBI) questionnaire.

### **3.2 Study Setting**

An online based cross-sectional survey was administered to members of the Kenya Association of Radiologists (KAR), which is a society for medical doctors who specialize in radiology. The KAR society is non-partisan and not for commercial activities. The KAR has full members and associate members. The associate membership of KAR includes radiology trainees in three academic institutions currently offering radiology training in Kenya; which are; University of Nairobi (UoN), Aga Khan University Hospital (AKUH) and Moi University. The study used an online anonymized platform for data collection.

### **3.3 Study Population**

The study targeted 200 radiologists in KAR registered under the Kenya Medical Practitioners and Dentists Council and 95 radiology trainees in the three training institutions in Kenya.

#### **3.3.1 Inclusion Criteria**

- All eligible full and associate members of the KAR who were available in the period of data collection and readily agreed to take part in the online survey

#### **3.3.2 Exclusion Criteria**

- Registered radiologists who were not members of the Kenya Association of Radiologists (KAR) society in Kenya and eligible members that declined to give consent.

### **3.4 Sample Size and Sampling**

This study applied a census method with complete enumeration and survey of all members of Kenya Association of Radiologists society. It therefore did not involve sampling.

### **3.5 Subjects Recruitment**

A standardized questionnaire was packaged in an electronic form. The KAR chairperson was e-mailed a link that would be used in the survey and also requested to share the link with members of KAR who were found eligible. The email message had a brief description outlining

the purpose and rationale for the survey. All members willing to participate in the survey were invited to fill up the survey without including their names through the link shared to them. The participants were reached out through electronic means to give consent before taking up the survey. Access to the survey was made available for a period of one month (between 22<sup>nd</sup> March 2021 to 22<sup>nd</sup> April 2021), with participants being reminded on a weekly basis to improve response rate.

### **3.6 Study Variables**

#### **3.6.1 Exposure Variables**

Demographic variables—age, gender, marital status, religion, level of education, type of sponsorship for residency, sources and level of income, number of dependents, years of practice, distance travelled to work, location and type of workplace.

Occupational variables

- Extra responsibilities
- Imaging modalities
- Availability of PACS
- Case load per day or week
- Number of hours worked per week
- Night and weekend duty
- Physical environment e.g. space, lighting, ablution facilities.
- Availability of staff room

#### **3.6.2 Outcome Variables**

Burnout syndrome—EE, DP, PA

Behavioral variables

- Social interaction activities/hobbies/physical activities
- Recreational drug use/abuse.
- Work related psychosocial issues.

### **3.7 Survey Tool**

The Maslach burnout inventory (MBI) is a standard survey tool with 22 items for determination of burnout occurrence (2). The full MBI assesses burnout in three dimensions that are clearly defined, and out of the 22 items, nine are for evaluating emotional exhaustion (EE) rates, five for depersonalization (DP) and eight for personal accomplishment (PA) (2). The length of the tool brings about restriction in application of the full MBI; thus prompting creation and validation of the abbreviated versions (14). Previous work has proven three questions valid for abbreviation of EE, three questions on DP and three questions on PA (29). These questions are scored using an ordered sequence of symptoms, whereby the sequence has seven points ranging from “never” to “everyday”. The points are then classified as having low, moderate or high level of burnout (2). The scores accorded for the abbreviated MBI contains 2.7 times, three times and 1.7 times emphasis on scores of PA, EE and DP respectively, whereby sum of scores is considered for each dimension (2). In the PA subscale, scores of  $\leq 12$  are regarded as being low,  $\geq 15$  high, while those between 13 and 14 are taken as moderate. For the EE subscale, scores of  $\leq 6$  are viewed as low,  $\geq 11$  high, and those between 7 and 10 are regarded as moderate. Finally, for the DP, scores of  $\leq 3$  are considered low,  $\geq 7$  high, and those between 4 and 6 are viewed as moderate (2,14). Burnout syndrome is thus conclusively determined when the levels of PA are low, with levels of EE and DP are high (2). However, it is known that physicians may experience burnout, despite having a sense of high personal accomplishment; several studies have reported burnout in physicians manifesting as high emotional exhaustion and/or high depersonalization (13,35). In this study, the abbreviated 9-item MBI was adapted in order to encourage participation.

### **3.8 Data Collection**

A 45-item survey was administered, which included the abbreviated 9-item licenced MBI to evaluate burnout levels. The MBI questions were slightly altered to fit this study (Appendix 8). The 36 extra questions included demographics questions, questions related to stress causing factors in radiology residency and profession, as well as questions on social activities they may be engaged in. These additional questions were devised with an aim to key out factors yielding burnout. These variables may have been used in other studies by previous researchers regarding the same topic. The last component had an open-ended free response question regarding recommendations on possible interventions to address burnout as well as questions on awareness and availability of psychosocial support.

Study data was collected and managed by Survey Monkey (SurveyMonkey.com, Mateo, California, USA; [www.surveymonkey.com](http://www.surveymonkey.com)) and was accessible for a period of one month. Individuals who agreed to participate were reminded in two weeks in case they had not clicked the link for survey. To minimize bias, every computer IP address was only allowed to give one response. Considering the nature of this survey to cause participants to become susceptible to disturbing feelings and emotions, a link <https://www.cma.ca/physician-health-and-wellness> and <https://www.acr.org/Member-Resources/Benefits/Well-Being> was incorporated to assist any participant who felt the need of assessing their mental health by knowing more about their about symptoms.

### **3.9 Ethical Considerations**

Ethical approval was obtained from UON/KNH research ethics board before commencing the study. Informed consent was requested prior to opening the survey and inferred as given when a participant chose to participate in the Survey Monkey platform and submitted the filled anonymized survey. Respondents' confidentiality and privacy was ensured by using numerical identifiers and safe and restricted data storage was maintained throughout the study. The data collection soft copy feedback is kept safe from landing to wrong hands by being placed in a secure cabinet that can only be accessed by the primary researcher.

### **3.10. Data Management**

The raw survey data hosted in Survey Monkey was exported into Excel and counterchecked for completeness and inconsistencies. The responses to the abbreviated 9-item MBI were re-coded for the quantification of the burnout levels to allow meaningful comparisons of the findings with other previous studies in literature. Cleaned raw data was kept and availed in a comma-delimited file (\*.csv), which also served as a supplement to back up. All the information was coded and stored securely by the investigator in a password-protected computer in order to maintain participant confidentiality. The principle investigator kept the codes.

### **3.11. Data Analysis**

The study used R Software version 4.0.3 for data analysis. Categorical variables were expressed in terms of frequencies and percentages. Continuous or numerical variables were analyzed using measures of central tendency (mean and standard deviation) and dispersion (median and interquartile range), depending on whether the variable is normally distributed or not, respectively. The prevalence of severe burnout and burnout sub-domains among

radiologists and radiologist trainees was computed as the proportion of respondents who clearly exhibited EE and DP in a high degree and low PA, using the cut-offs outlined in section 3.7. Similarly, the prevalence of overall burnout was computed as the proportion of respondents who exhibited a high degree of EE and/or DP.

The factors associated with burnout among Kenyan radiologists and radiology trainees were determined using two-sample t-tests and analysis of variance (ANOVA). Two sample t-tests were used to investigate the relationship between EE, DP, and PA burnout scores and binary explanatory variables. ANOVA was used to examine the relationship between EE, DP, and PA burnout scores and categorical explanatory variables with three or more levels.

Comparison of two categorical variables was determined by performing either Chi-square tests or Fisher's exact test depending on the sample size. The level of significance was set at  $\alpha=0.05$  with confidence intervals (CI) of 95%, which implies that p-values found to be below 0.05 were statistically significant.

### **3.12 Expected Findings**

This study was expected to identify information on the prevalence of burnout among radiologists and radiology trainees in Kenya. The information on the factors linked to burnout and level of awareness of burnout signs and symptoms among radiologists and radiology trainees in Kenya was also to be determined. This information was to be disseminated through a thesis report, manuscripts and conference presentation to relevant stakeholders to optimize the mental wellbeing of health care workers.

### **3.13 Study Results Dissemination Plan**

After completion of the study, we will disseminate results via these avenues:

- Printing and dissemination of a final report to the University of Nairobi, Department of Diagnostic Imaging and Radiation Medicine.
- Printing and dissemination of a final report to the Radiology Department, Kenyatta National Hospital.
- Publishing papers in general and specialist peer reviewed journals.
- Presentation of our results in international and local conferences.

### **3.14 Study Limitations and How to Minimize Them**

A main limitation of online surveys is the limited ability to reach challenging populations like the elderly and people in remote areas who may have poor internet access. The questionnaire was shared through established communication channels by KAR and remained open for one month. Use of a census methodology and sending weekly reminders was to improve response rate and increase the representativeness of the target population.

### **3.15 Study Time Frame**

The study was undertaken over 10 months, from August 2020 to May 2021.



## 4.0 CHAPTER FOUR: ANALYSIS AND INTERPRETATION OF RESULTS

### 4.1 Descriptive Results

#### 4.1.1 Introduction

The study population was 295 from which a total of 132 respondents completed the survey tool. The overall survey response rate was 44.7% (132/295) which was further specified to be a survey response rate of 36% for radiologists (72/200) and 63.2% trainees (60/95). The difference in response rate between radiologists and trainees was significant ( $p < 0.001$ ).

#### 4.1.2 Demographic Characteristics Based on Respondent Occupation

Overall median age was 36 (IQR 32, 40) years and the age range of 28-75 years. The median age for the radiologists was 38 (IQR 36, 44) years and median age for trainees was 32 (IQR, 31, 34) years. The difference in age was statistically significant ( $p < 0.001$ ). Majority of the respondents were female at 58% giving a male to female ratio of 1:1.5. Other general characteristics are as shown in Table 1.

**Table 1: General demographic characteristics ( $n = 132$ )**

Characteristic	Overall,	Radiologist,	Resident,	p-value
	N = 132	N = 72	N = 60	
<b>Age</b>	36 (32, 40)	38 (36, 44)	32 (31, 34)	<b>&lt;0.001<sup>1</sup></b>
<b>Sex of respondent</b>				
Female	77 (58%)	43 (60%)	34 (57%)	<b>0.7<sup>2</sup></b>
Male	55 (42%)	29 (40%)	26 (43%)	
<b>Marital Status</b>				
Married	99 (76%)	56 (78%)	43 (73%)	<b>0.5<sup>2</sup></b>
Single	32 (24%)	16 (22%)	16 (27%)	
(Missing)	1	0	1	
<b>Religion</b>				
Christian	110 (83%)	64 (89%)	46 (77%)	<b>0.061<sup>2</sup></b>
Non-Christian	22 (17%)	8 (11%)	14 (23%)	
<b>Income</b>				
< 99,999	17 (13%)	1 (1.4%)	16 (27%)	
100,000 - 199,999	45 (34%)	8 (11%)	37 (62%)	<b>&lt;0.001<sup>2</sup></b>
200,000 - 299,999	34 (26%)	27 (38%)	7 (12%)	
> 300,000	36 (27%)	36 (50%)	0 (0%)	
<b>No. of dependents</b>				
< 5	93 (70%)	47 (65%)	46 (77%)	<b>0.2<sup>2</sup></b>
5+	39 (30%)	25 (35%)	14 (23%)	
<b>Passive Income</b>				
No	75 (57%)	33 (46%)	42 (70%)	<b>0.005<sup>2</sup></b>
Yes	57 (43%)	39 (54%)	18 (30%)	

<sup>1</sup>Independent sample t-test, <sup>2</sup>Chi-square test

### 4.1.3 Work Environment Characteristics and Burnout Awareness Based on Respondent Occupation

The results showed that, 21% (15) of the radiologists compared to 13% (8) were working extra hours. The difference was no significant. Further, the findings revealed that there was significant difference between radiologists and trainees based on deployment area ( $p=0.029$ ), equipment rating ( $p=0.009$ ), case load ( $p<0.001$ ), stable income ( $p =0.023$ ), having passive income ( $p=0.005$ ), leave days ( $p<0.001$ ) and satisfaction with work environment ( $p=0.017$ ) as shown in Table 2.

**Table 2: Work environment characteristics and burnout awareness based on respondent occupation**

Characteristic	Overall,	Radiologist,	Resident,	p-value
	N = 132	N = 72	N = 60	
<b>Extra hours</b>				
No	23 (17%)	15 (21%)	8 (13%)	<b>0.3</b>
Yes	109 (83%)	57 (79%)	52 (87%)	
<b>Deployment Area</b>				
City i.e. Nairobi/Kisumu/Mombasa	96 (73%)	59 (82%)	37 (62%)	
Large towns i.e. County/Subcounty headquarters	30 (23%)	11 (15%)	19 (32%)	<b>0.029</b>
Small town/rural	6 (4.5%)	2 (2.8%)	4 (6.7%)	
<b>Equipment rating</b>				
Adequate	30 (23%)	21 (29%)	9 (15%)	
Inadequate	46 (35%)	29 (40%)	17 (28%)	<b>0.009</b>
Somehow adequate	56 (42%)	22 (31%)	34 (57%)	
<b>Case load</b>				
< 10	17 (13%)	7 (9.7%)	10 (17%)	
10-20	39 (30%)	10 (14%)	29 (48%)	<b>&lt;0.001</b>
20-30	37 (28%)	25 (35%)	12 (20%)	
> 30	39 (30%)	30 (42%)	9 (15%)	
<b>PACS Available</b>				
No	43 (33%)	22 (31%)	21 (35%)	<b>0.6</b>
Yes	89 (67%)	50 (69%)	39 (65%)	
<b>Stable Income</b>				
No	52 (39%)	22 (31%)	30 (50%)	<b>0.023</b>
Yes	80 (61%)	50 (69%)	30 (50%)	
<b>Passive Income</b>				
No	75 (57%)	33 (46%)	42 (70%)	<b>0.005</b>
Yes	57 (43%)	39 (54%)	18 (30%)	
<b>Leave days</b>				

No	75 (57%)	24 (33%)	51 (85%)	<b>&lt;0.001</b>
Yes	57 (43%)	48 (67%)	9 (15%)	
<b>Satisfaction with work environment</b>				
No	87 (66%)	41 (57%)	46 (77%)	<b>0.017</b>
Yes	45 (34%)	31 (43%)	14 (23%)	
<b>Resting Room available</b>				
No	102 (77%)	59 (82%)	43 (72%)	<b>0.2</b>
Yes	30 (23%)	13 (18%)	17 (28%)	
<b>Burnout knowledge</b>				
No	28 (21%)	10 (14%)	18 (30%)	<b>0.024</b>
Yes	104 (79%)	62 (86%)	42 (70%)	
<b>Distance of work from home</b>				
< 5 Km	36 (27%)	15 (21%)	21 (35%)	
5-20 Km	78 (59%)	44 (61%)	34 (57%)	<b>0.091</b>
> 20 km	18 (14%)	13 (18%)	5 (8.3%)	
<b>Work hours</b>				
0-40 Hours	80 (61%)	37 (51%)	43 (72%)	<b>0.018</b>
> 40 Hours	52 (39%)	35 (49%)	17 (28%)	
<b>No. of imaging modalities</b>				
0-4	64 (48%)	39 (54%)	25 (42%)	<b>0.2</b>
05-08	68 (52%)	33 (46%)	35 (58%)	

*Chi-square test for association*

#### **4.1.4 Behavioral Characteristics Based on Respondent Occupation**

Recreational characteristics among the study respondents were also compared between radiologists and trainees as shown in Table 3. The findings revealed that there was significant difference between radiologists and trainees based on burnout knowledge ( $p = 0.024$ ), psychosocial support availability ( $p = 0.026$ ), work hours ( $p = 0.018$ ) and income ( $p < 0.001$ ).

**Table 3: Behavioural characteristics based on respondent occupation**

Characteristic	Overall, N = 132	Radiologist, N = 72	Resident, N = 60	p-value
<b>Involvement in recreational activities</b>				
No	28 (21%)	11 (15%)	17 (28%)	<b>0.068</b>
Yes	104 (79%)	61 (85%)	43 (72%)	
<b>Alcohol Use</b>				
No	75 (57%)	42 (58%)	33 (55%)	<b>0.7</b>
Yes	57 (43%)	30 (42%)	27 (45%)	
<b>Cigarette use</b>				
No	129 (98%)	71 (99%)	58 (97%)	<b>0.6</b>
Yes	3 (2.3%)	1 (1.4%)	2 (3.3%)	
<b>Marijuana use</b>				
No	124 (94%)	69 (96%)	55 (92%)	<b>0.5</b>
Yes	8 (6.1%)	3 (4.2%)	5 (8.3%)	
<b>Use injectable recreational drugs</b>				
No	131 (100%)	71 (100%)	60 (100%)	
Yes	0 (0%)	0 (0%)	0 (0%)	
<b>Psychosocial support availability</b>				
No	108 (82%)	54 (75%)	54 (90%)	<b>0.026</b>
Yes	24 (18%)	18 (25%)	6 (10%)	
<b>Sought psychosocial support</b>				
No	100 (76%)	58 (81%)	42 (70%)	<b>0.2</b>
Yes	32 (24%)	14 (19%)	18 (30%)	

*Chi-square test for association*

#### 4.1.5 Resident Specific Characteristics

The findings established that 60% (36) of the trainees were government sponsored while 30% (18) of the respondents were year 4 in their studies as shown in Table 4.

**Table 4: Resident specific characteristics**

Characteristic	Resident, N = 60
<b>Resident Sponsor</b>	
Government/institution sponsored	36 (60%)
Self-sponsored	24 (40%)
<b>Resident Level of Study</b>	
Year 1	11 (18%)
2	16 (27%)
3	15 (25%)
4	18 (30%)

#### 4.1.6 Radiologist specific characteristics

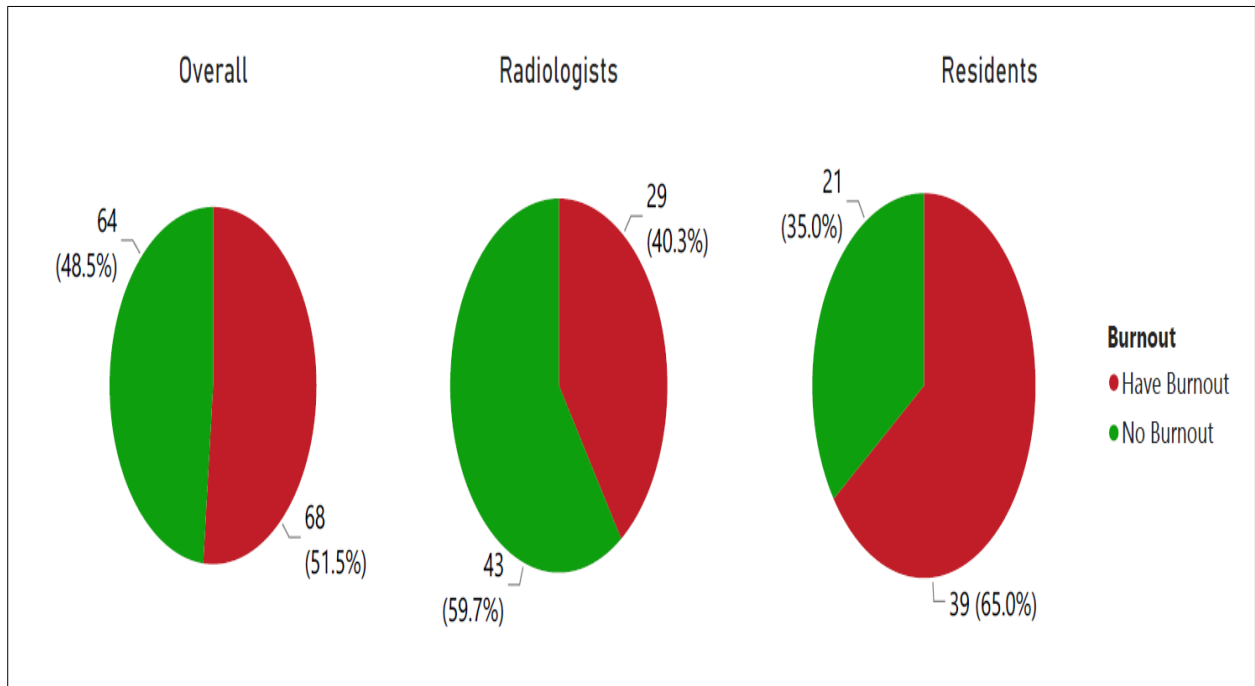
The results revealed that 46% (33) of the respondents were working in both public and private practice, 49% (26) of them were working in level 6 facility, 66% (46) were involved in administrative and managerial duties (66%). Majority were not sub-specialized (84%) Only 33% were involved in academia. 88% had income levels of above Kshs 200,000 as shown in Table 5.

**Table 5: Specific demographic characteristics (Radiologists)**

<b>Characteristic</b>	<b>Radiologist, N = 72<sup>1</sup></b>
<b>Radiologist Employer</b>	
Both public and private practice	33 (46%)
Exclusively in public service	17 (24%)
Exclusively private practice	16 (22%)
Not Employed	1 (1.4%)
Self-Employed	5 (6.9%)
<b>Level of facility</b>	
Level 4	7 (13%)
Level 5	13 (25%)
Level 6	26 (49%)
Other	7 (13%)
(Missing)	19
<b>Academia</b>	
No	48 (69%)
Yes	22 (31%)
(Missing)	2
<b>Sub-specialized</b>	
No	59 (84%)
Yes	11 (16%)
(Missing)	2
<b>Administrative duties</b>	
No	24 (34%)
Yes	46 (66%)
(Missing)	2
<b>Number of years of practice</b>	
< 10	50 (70%)
10+	21 (30%)
(Missing)	1

## 4.2 The Prevalence of Burnout Among Kenyan Radiologists and Radiology Trainees

The prevalence of burnout among radiologists and trainees was investigated as shown in Figure 1. The prevalence of overall burnout was found to be 51.5%, while severe burnout was 15.2%. The prevalence of burnout among trainees was significantly higher, 65% (39) compared to radiologists, 40.3% (29),  $p = 0.005$ .



**Figure 1:Prevalence of burnout (overall, among radiologists & residents)**

### 4.2.1 Comparison of Burnout Characteristics Between Radiologists and Trainees

The study also sought to compare burnout components based on occupation as shown in Table 6. There was no significant difference between radiologists and trainees based on personal accomplishment ( $p=0.6$ ) and emotional exhaustion ( $p = 0.11$ ). More than half of the trainees, 52% (31) had high level of depersonalization compared to 25% (18) among radiologists,  $p=0.007$ . More than half, (56%) of respondents had high levels of PA.

**Table 6: Comparison of burnout characteristics between radiologists and residents**

Characteristic	Overall	Radiologist	Resident,	p-value
	N = 132	N = 72	N = 60	
	n (%)	n (%)	n (%)	
<b>Personal Accomplishment (PA) Mean ±SD</b>		14.71±3.048	13.62±3.25	
Low	38 (29%)	19 (26%)	19 (32%)	0.6
High	74 (56%)	43 (60%)	31 (52%)	
Moderate	20 (15%)	10 (14%)	10 (17%)	
<b>Emotional Exhaustion (EE) Mean ±SD</b>		8.8±4.5	11.0±5.0	
High	62 (47%)	28 (39%)	34 (57%)	0.11
Low	32 (24%)	19 (26%)	13 (22%)	
Moderate	38 (29%)	25 (35%)	13 (22%)	
<b>Depersonalization (DP) Mean ±SD</b>		4.2±3.7	7.0±5.2	
High	49 (37%)	18 (25%)	31 (52%)	<b>0.007*</b>
Low	55 (42%)	36 (50%)	19 (32%)	
Moderate	28 (21%)	18 (25%)	10 (17%)	
<b>High EE and/or High DP = Overall burnout (OB)</b>				
Yes	68 (51.5%)	29 (40%)	39 (65%)	<b>0.005*</b>
No	64 (48.5%)	43 (60%)	21 (35%)	
<b>High EE and High DP and Low = Severe burnout (OB)</b>				
Yes	20 (15.2%)	7 (9.7%)	13 (22%)	0.0487
No	112 (84.8%)	65 (90%)	47 (78%)	

*Chi-square test for association*

### **4.3 Factors Associated with Burnout Among Kenyan Radiologists and Radiology Trainees.**

#### **4.3.1 Radiologist Factors**

The findings show that involvement in academia, stability of income, satisfaction with the physical working environment (PWE), availability of resting rooms, psychosocial support use, distance to work and type of employer had significant relationships with burnout among the radiologists. However, being not involved in academia was significantly related to DP (p=0.035), while lack of stable income had a significant relationship with mean EE (p=0.016). Similarly, the t-test results showed a significant association between lack of resting rooms and mean EE (p=0.021) as well as mean DP (p=0.023). The ANOVA results showed an existing relationship between longer distances from work with mean EE (p=0.048). radiologists who

were exclusively working for public had higher personal accomplishment (p=0.022). Psychosocial support use was significantly associated with both mean EE (p=0.048) and DP (p=0.013). The findings are as shown in Table 7.

**Table 7:Radiologist factors associated with burnout**

Variable	EE	P-value	DP	P-value	PA	P-value
	(Mean ±SD)		(Mean ±SD)		(Mean ±SD)	
<b>Involved in academics</b>						
No	9.396	0.121	4.813	0.035*	14.25	0.128 <sup>1</sup>
Yes	7.591		3.045		15.455	
<b>Have stable income</b>				0.119		
No	10.682	0.016*	5.318		14.364	0.548 <sup>1</sup>
Yes	7.96		3.78		14.86	
<b>Physical Work Environment Satisfaction</b>						
No	9.732	0.044*	4.732	0.212	14.805	0.76 <sup>1</sup>
Yes	7.548		3.613		14.581	
<b>Presence of a resting room</b>						
No	9.458	0.021*	4.712	0.023*	14.593	0.511 <sup>1</sup>
Yes	5.769		2.154		15.231	
<b>Psychosocial support use</b>						
No	8.31	0.0480*	3.638	0.013*	14.845	0.45 <sup>1</sup>
Yes	10.786		6.786		14.143	
<b>Distance of home from work</b>						
< 5 Km	8.667		4.8		15.133	
5-20 Km	8.045	0.0480*	3.545	0.093	14.659	0.803 <sup>2</sup>
> 20 km	11.462		6		14.385	
<b>Employer</b>						
Both public and private practice	9.97		5.182		14.121	
Exclusively in public service	8.294	0.202	3.118	0.358	16.471	0.022 <sup>2</sup>
Exclusively private practice	8		4		13.688	
Not Employed	3		2		12	

<sup>1</sup>Independent samples t-test, <sup>2</sup>One-way analysis of variance, \* significance (p<0.048)



### 4.3.2 Trainees Factors

The results show that age, residency sponsorship, PACS availability, having passive income, psychosocial support use, and equipment rating had significant relationships with burnout among the trainees. Being self-sponsored was significantly related to mean EE ( $p=0.026$ ), while passive income had a significant relationship with mean PA ( $p=0.03$ ). Similarly, the t-test results showed a significant association between psychosocial support use and mean EE ( $p=0.021$ ) and mean DP ( $p=0.033$ ). The ANOVA results showed an existing relationship between adequacy of equipment rating with mean DP ( $p=0.048$ ). The trainees age had a significant relationship with DP, with a p-value of 0.002 from the t-test results. Psychosocial support use was significantly associated with both mean EE ( $p=0.021$ ) and DP ( $p=0.033$ ) The findings are as shown in Table 8.

**Table 8: Residents factors associated with burnout**

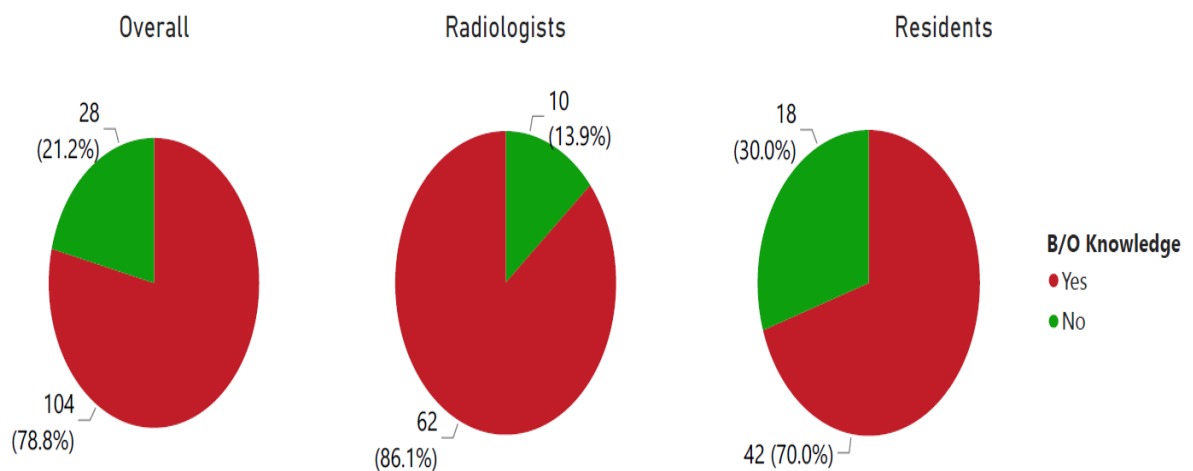
Variable	EE (Mean $\pm$ SD)	p- value	DP (Mean $\pm$ SD)	p- value	PA (Mean $\pm$ SD)	p-value
<b>Resident sponsor</b>						
Government/institution sponsored	9.861	0.026*	6	0.0482	13.806	0.602 <sup>1</sup>
Self-sponsored	12.75		8.625		13.333	
<b>PACS available</b>						
No	11.333	0.716	6.238	0.384	11.905	0.007* <sup>1</sup>
Yes	10.846		7.487		14.538	
<b>Passive income</b>						
No	10.952	0.884	6.548	0.267	12.952	0.003* <sup>1</sup>
Yes	11.167		8.222		15.167	
<b>Psychosocial support use</b>						
No	10	0.021*	6.167	0.033*	13.476	0.592 <sup>1</sup>
Yes	13.389		9.111		13.944	
<b>Age</b>						
Below 32	11.556	0.58	9.167	0.040*	14.444	0.154 <sup>1</sup>
32+	10.786		6.143		13.262	
<b>Equipment rating</b>						
Adequate	14		10.444		15.333	
Somehow adequate	10.118	0.118	5.794	0.045*	13.559	0.171 <sup>2</sup>
Inadequate	11.235		7.765		12.824	

<sup>1</sup>Independent samples t-test, <sup>2</sup>One-way analysis of variance, \* significance ( $p<0.048$ )

## 4.4 Level of Awareness of Burnout Signs and Symptoms Among Kenyan Radiologists and Radiology Trainees

### 4.4.1 Awareness on Burnout

The overall results indicate that approximately 79% of the respondents were aware of burnout signs and symptoms. However, the level of awareness was significantly higher among the radiologists (86.1%) compared to the trainees (70%); ( $p=0.024$  using chi-square test). Results are as displayed in Figure 2.



**Figure 2: Burnout awareness**

### 4.4.2 Burnout Signs and Symptoms

Table 9 below shows the frequently mentioned signs and symptoms of burnout among the Kenyan radiologists and trainees. Fatigue was the most mentioned symptom followed by headache and then depression and insomnia. Others included irritability, reduced work output, poor concentration and apathy.

**Table 9: Common burnout symptoms**

Symptom	Frequency
Fatigue	68
Headache	23
Depression	11
Insomnia	11

## 4.5 Burnout Prevention (Recommendations by Radiologists and Residents)

### 4.5.1 Recommendations by Radiologists

To reduce burnout, majority of the radiologists (27) suggested employing more staff, providing resting rooms (12), PACS (11), better facilities (8) and new equipment (8). Other recommendations put across by the radiologists included better pay, flexibility working from home, better working environment, increasing leave days, facilitating career progression, availing consumables in time, regular servicing of equipment, on site gym and cafeteria services, less interference by administrators and providing refreshments.

Recommendations by Radiologists

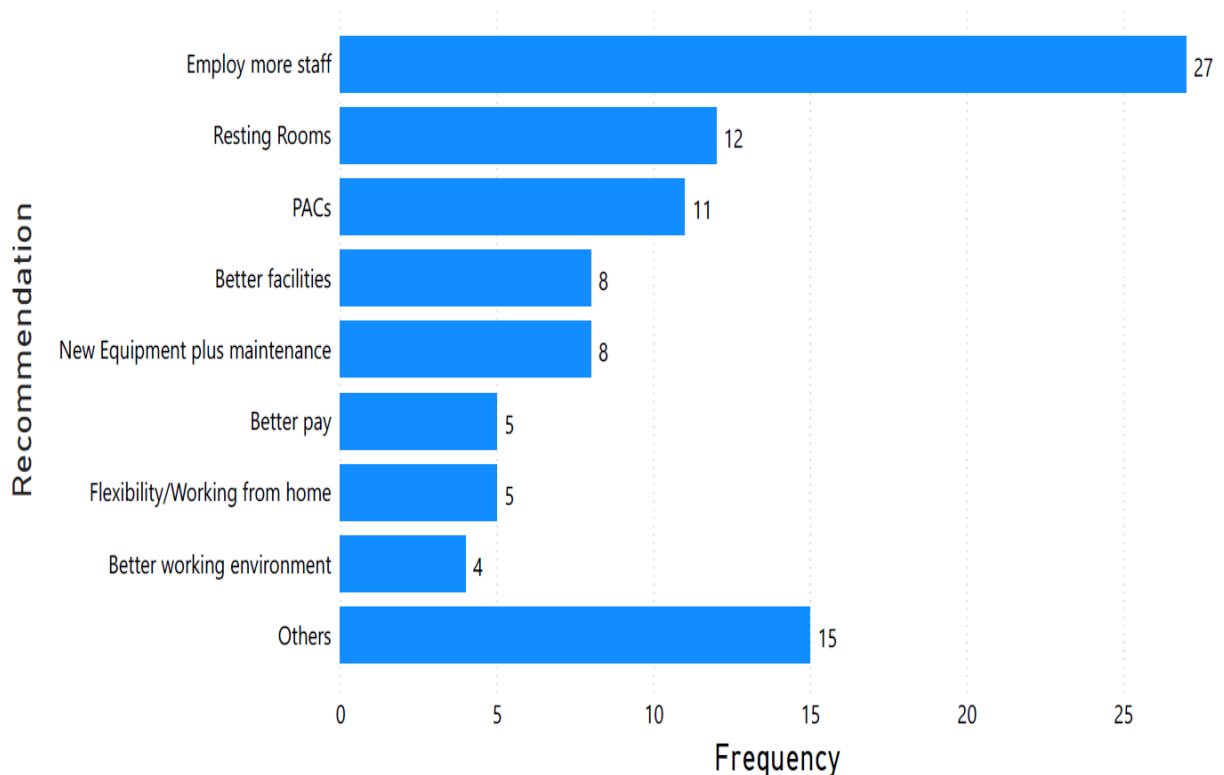
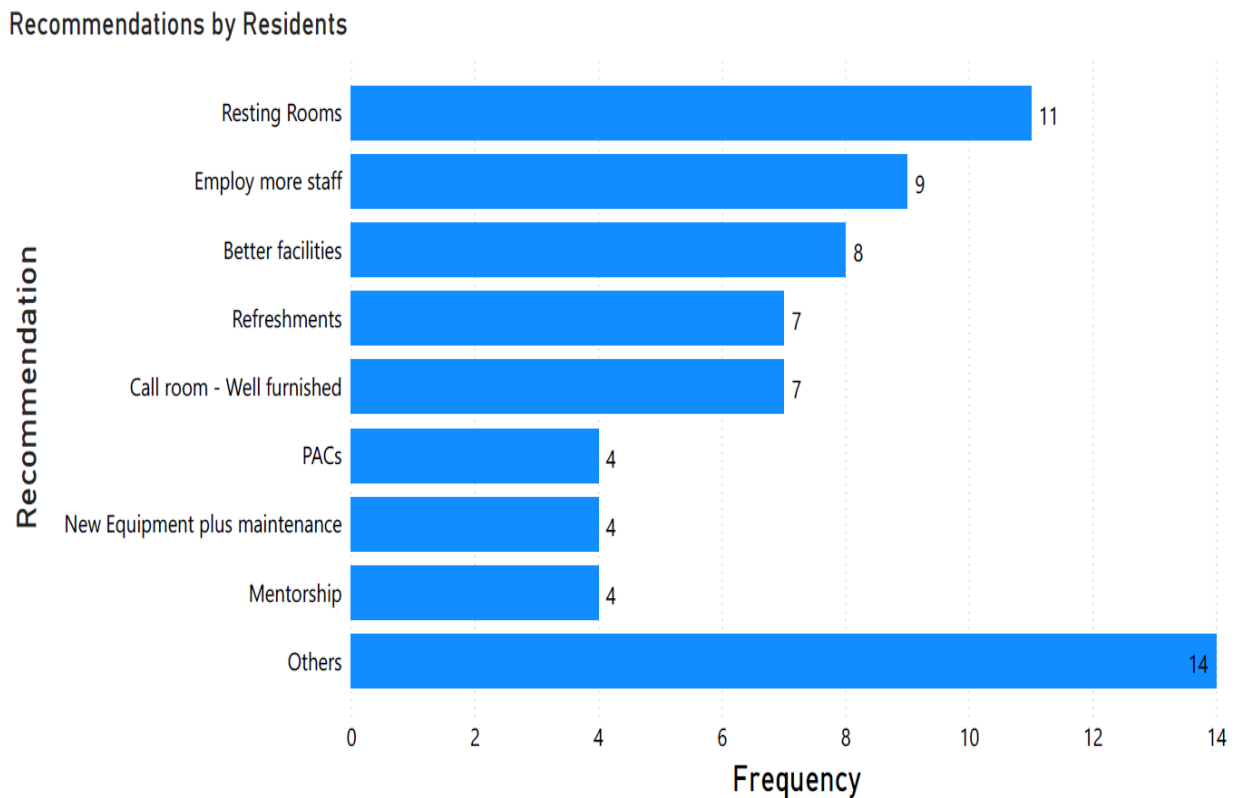


Figure 3: Radiologist's recommendations

#### 4.5.2 Recommendations by Residents

The key recommendations proposed by the respondents included resting rooms, employment of more teaching staff, better work facilities, refreshments, PACS and provision of mentorship. Other recommendations included a stipend to self-sponsored students, reduced work load to allow for self-directed studies, acquire relevant on-site modalities to reduce external rotations, allow remote reporting for majority of cases, more supervision and guidance during rotations and increasing numbers of trainees covering calls. The key recommendations are as shown in Figure 3.



**Figure 4: Resident's recommendations**

## **5.0 CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Discussion**

#### **5.1.1 Demographic Characteristics**

The study sought to investigate the prevalence, associated factors and awareness of burnout among Kenyan radiologists and radiology trainees. The overall survey response rate at 44.7% was comparatively better than the 18.7% seen in a study done in Canada with similar objectives, target population and used the same online survey platform(16). Radiologists participation at 36 % was however significantly less than the 63.2% by trainees ( $p < 0.001$ ). The radiologist participation compares well to response rates of 32% and 36% in studies on burnout among pediatric and musculoskeletal radiologists respectively (14,15) Surveys of physicians tend to have lower response rates than those of the general population citing busy schedules, perceived lack of importance, concerns about confidentiality and bias of the survey, and survey fatigue from the large number of requests they receive(96).

The median age of the study respondents in the present study was 36 (IQR: 32-40). The findings also revealed that there was significant difference in age between radiologists and trainees,  $p < 0.01$ . Radiologists were older 38 (IQR: 36 -44) compared to trainees 32(IQR: 31-34),  $p < 0.01$ . Radiologists have attained professional qualifications while the trainees are still in training hence explaining the difference in age between the two groups. These findings are comparable to a study conducted in New England by Guenette and Smith assessing burnout among resident radiologists which revealed that 90% of trainees were aged below 35 years (97).

More than half of the respondents, 58% were female showing a ratio of male to female, 1: 1.5. More females completed the survey with male to female ratios 1:1.5 and 1:1.3 for radiologists and trainees respectively. However, the findings revealed that there was no difference in gender between radiologists and trainees. These findings are inconsistent with findings from Chew et al. in a study conducted assessing burnout among society of skeletal radiology members which found that, 79.2% of respondents were male compared to 20.8% who were female (98). This difference could be attributed to the specific focus on skeletal radiologists rather than all radiologists.

The present study established that 76% of the respondents were married while 24% were single, 78% of the radiologists were married compared to 73% among trainees, the difference however

was not significant. Zha et al. also found that significant number of respondents in both radiologists and trainees were married although the difference between the groups was not statistically significant (16).

### **5.1.2 Prevalence of Burnout Among Kenyan Radiologists and Trainees**

The findings from the present study established that the prevalence of burnout among radiologists and trainees. Further, the prevalence of burnout among trainees was significantly higher, 65% compared to 40.3% among radiologists, ( $p=0.005$ ). The difference could be attributed to the timing of the study and the demands of residency training. It is of note that the timing of our study coincided with the highest peak of the Covid-19 pandemic in the country with the larger radiology institutions reorganizing work flow to allow for remote reporting, flexible shifts and excusing the high-at-risk from physical attendance at the work stations.. The findings are consistent with a study conducted in United States by Shanafelt et al which revealed that the prevalence of burnout among radiologists was 45% (36). However, Huang et al in a study conducted during the pandemic in 2021 found contrasting results where the level of stress and burnout was higher among other hospital staff 23.9% compared to 17.8% among radiologists (99).

In the overall prevalence as well as the specific burnout dimensions related to burnout, our radiologists recorded lower prevalence in high EE, high DP and low PA in comparison to previous studies done among musculoskeletal, pediatric and interventional radiologists (13–15). This could be due to the difference in practice environments and demographic characteristics of the study populations with the latter being sub- specialized radiologists who spend longer years in training, likely to be fewer in practice and handle more complex cases. In our case, only 16 % of radiologists reported to be sub-specialized.

The present study established a high prevalence of burnout amongst trainees which compares well with the results of a meta-analysis on burnout rates among various medical specialty residencies (100) This study showed that radiology residents had the highest prevalence at 77.16% followed by neurology and general surgery while psychiatry, oncology and family medicine had the lowest rates. The aggregate prevalence in this study was 51.0% (100). We postulate that since radiology is highly reliant on rapidly evolving technology with limited patient interactions, the training curriculum keeps expanding to integrate new modalities or advancements in previously available diagnostics and there could be worries on artificial intelligence impact on future work prospects for trainees.

Personal accomplishment is a self-protective response against burnout (2). We found high levels of PA in both Kenyan radiologists and trainees congruent to a study by Shanafelt et al. in USA that found radiology to be among the medical specialties with high job satisfaction and good work-life balance (36).

### **5.1.3 Factors Associated with Burnout**

The findings from the present study revealed that age was significantly associated with burnout for trainees where we found out that those less than 32 years were more likely to have high DP ( $p=0.040$ ). These results are comparable to Shanafelt et al. who found that younger physicians were two times more likely to have burnout compared to older physicians (72). We attributed this to the developmental cycle of medical careers where older physicians tend to gain better confidence in their abilities and have control over their lives and ability to control negative outcomes. However, the findings from the present study established no statistical significance among radiologist's age and burnout components. This could be due to underrepresentation of older radiologists as only 30% of radiologists had been in the career for more than 10 years. Mid-level career (11-20 years) physicians have been found to have highest rates of burnout attributed to long working hours' day, frequent night calls, frustration with the administrative burden, dissatisfaction with the chosen specialty, and pay issues(101).

Our study established that emotional exhaustion was significantly higher in radiologists who did not have a stable income ( $M = 10.68$ ) compared to those who reported having stable income ( $M = 7.96$ ),  $p = 0.016$ . In addition, the findings also revealed that self-sponsored trainees had higher emotional exhaustion scores ( $M = 12.75$ ) compared to those who were government sponsored ( $M = 9.86$ ). This could be due to reduced financial needs among government sponsored trainees as well as radiologists with stable income. McNeeley et al. found that financial wellbeing is a significant factor in influencing burnout among physicians (18).

The present study found that, longer distance travelled to work by radiologists had a borderline association with higher EE ( $p=0.048$ ) similar to findings in a Ghanaian study that found commuting stress to be directly and indirectly related to burnout (102). This may have been influenced by the high concentration of our respondents in cities and large towns with longer hours spent on traffic causing stress. We however did not find any direct association of physical location (city, large town or rural area) with burnout.

No statistically significant association was seen between burnout and sex, marital status, religion, number of dependents, years of practice for radiologists and different residency years.

Our findings revealed that burnout was significantly higher among trainees with severity of 7 compared to 4.2 among radiologists. This affirmed results of multiple studies that have demonstrated significant increase in burnout during medical training compared to staff due to its unique nature and demands(13,19,56,103).

In the present study, dissatisfaction with the physical work environment such as work space, lighting, ablution facilities among radiologists was significantly associated with emotional exhaustion ( $p=0.044$ ). Further, the present study also revealed that unavailability of resting rooms was a strongly correlated with high EE ( $p=0.021$ ) and DP ( $p=0.023$ ). Trainees were more likely to be dissatisfied with the work environment than radiologists ( $p=0.017$ ) though this was not associated with any burnout dimension. More than three quarters of respondents (77%) did not have access to resting rooms. Diagnostic radiology work involves relative isolation, spending long hours interpreting images in reporting rooms and as such is sedentary(12). Prolonged stationary positioning has been associated with chronic musculoskeletal pain and resistive strain injuries amongst radiologists, including tenosynovitis and low back pain thus there is need for compliance of work environments to proper ergonomic practices (104).

The findings from the present study revealed that radiologists working exclusively in public institutions (24%) had higher levels of PA ( $p=0.022$ ), a protective factor against burnout compared to the majority working in both public and private sectors (46%) or exclusively private practice (22%). No other burnout dimension was significant. Contrary to our findings, a study done on New Zealand radiologists found high burnout rates in all three dimensions among public hospital radiologists despite a similar distribution at the various facilities(105).Notably, the healthcare systems of Kenya and New Zealand are largely publicly funded with similar challenges, a high proportion of complex and seriously ill public hospital patients while the private radiology practice dealt mainly with elective or clinic patients (105).It is possible that radiologists who work exclusively in the public sector may be driven by altruism thus deriving satisfaction from serving the vulnerable and under-privileged.

Our current study also established that, there was also significantly higher depersonalization ( $p=0.035$ ) among non- academic radiologists compared to those in academia. This is a novel finding as older studies demonstrated increased burnout in academic radiologists due to commitment to other duties such as tutoring, conducting research, ensuring there is growth in quality of work and services, and being engaged in management acts(20,31,32). Nonetheless, we believe the constant interaction with students and patients when demonstrating techniques such as ultrasound in academic practice may be protective from cynicism.



The present study revealed that there was significant association of depersonalization with adequate equipment ( $p=0.045$ ) among trainees. This was further compounded by only 15% of trainees reporting to have access to adequate equipment. Since burnout is a complex syndrome and multi-factorial, this may have been influenced by the differences in the various teaching hospitals. Among the three training schools in the country, two are based in public hospitals and one in a private hospital with differing human and physical resources. Private facilities are more equipped and notably by the time we conducted the study, the private university hospital had the only PET-CT in the country and other nuclear medicine equipment (106). These may have led to variances in responsibilities and workloads of the trainees.

Our present study also established no significant association between burnout and sub-specialization despite comparatively higher prevalence of burnout in previous studies on sub-specialized radiologists suggesting higher risk (13,15,20) This may be explained by the lower number of subspecialists in our study  $n=11$ , 16% collaborating previous authors findings on the shortage of radiology sub-specialization in Kenya and the few available still do a lot of general radiology (107).

According to our findings, we established caseload as an occupational variable had no relationship with EE, DP, and PA. Similarly, our study also looked at the extra responsibility of having managerial or administrative duties, number of modalities served in a day, working extra hours or weekends, number of hours worked in a week and none were significantly associated with burnout. These findings were on both radiologists and trainees. This is contrary to previous findings on work overload being the main significant contributor to physician burnout (22,59,60)

We established that radiologists worked significantly more hours per week ( $p=0.018$ ) and handled more cases per day ( $p<0.001$ ) compared to trainees. This is in spite of a similar number of imaging modalities per day and the extra-hours (night and weekends) worked. Significantly more trainees (85%) compared to radiologists (33%) had not taken leave in the past twelve months ( $p<0.001$ ). Further studies at institutional level on workload versus taken leave days are needed as poor work-life balance has been found to be a significant burnout contributor in radiology trainees and young/early career radiologists (17,21,23,101)

Our study found no significant relationship between burnout and Picture Archiving and Communication Systems (PACS) among radiologists but a significant relation between burnout and high personal achievement among the trainees ( $p=0.007$ ). The effect of PACS on radiology burnout has been described as a 'double-edged sword' as it leads to improved efficiency but can increase burnout by increased isolation, work overload, increased demands

by healthcare business owners on output and remote access during off hours leading to poor work-life balance (44,77). This effect on trainees may be due to the convenience offered by the system in accessing data for research, off site reporting, accessing other clinical information necessary for generating reports.

More than half of both radiologists and trainees (67% and 65% respectively) reported to have access to a PACS. However, we do note that the systems differ widely in features e.g software capabilities, user friendliness, modalities covered, integration into other hospital information systems and remote access (77). There was no available local data on distribution and characteristics of PACS though findings on radiological equipment demonstrate majority are in the private sector (106). As such a proper audit is necessary for better understanding of its impact on the profession.

Our study findings reported that recreational drug use of which alcohol use was most common for both radiologists (42% n=30) and trainees (45% n= 27) had no significant relationship with burnout. Cigarette and marijuana use were much more infrequent and none of the respondents identified as using intravenous drugs of abuse. Previous findings on repercussions for burnout among physicians were increased substance and alcohol abuse/dependence, accounting for 25% increased odd of alcohol abuse/dependence(78). This study was however done among surgeons whose work environments may differ from radiologists. We however found a significant relationship between those with burnout and seeking psychosocial support from colleagues, professionals or any other person. For radiologists, those with high EE ( $p=0.048$ ) and high DP ( $p=0.013$ ) were more likely to seek support. Similarly, trainees with high EE ( $p=0.021$ ) and high DP ( $p=0.033$ ) sought psychosocial support.

The findings on drug use and seeking of psychosocial support imply good coping mechanisms and health seeking behaviors among the Kenyan radiologists and radiology trainees which should be nurtured. The availability of free psychosocial support at the workplace had no significant relation to any burnout dimension among the trainees and radiologists. Our scope was limited and thus did not investigate on the reasons for seeking psychosocial support and neither on burnout association with depression, suicidality, work absenteeism and quality of relationships at home or with colleagues. This can be included in future research.

## **5.1.4 Burnout Awareness and Prevention**

### ***5.1.4.1 Awareness of Burnout Signs and Symptoms***

The overall findings on awareness of burnout signs and symptoms among Kenyan radiologists and radiology trainees established that 104 (79%) of the study population were aware of the

symptoms and signs, whereas 28(21%) did not have information. Radiologists had significantly more knowledge than trainees ( $p = 0.024$ ). 62 (62%) of the radiologists were aware of the symptoms, and 10 (14%) lacked awareness. Similarly, a large percentage of the trainees were aware of the signs and symptoms, 42(70%), whereas 18(30%) were unaware. Fatigue was the most reported symptom by most respondents ( $n= 68$ ) followed by headaches, depression, insomnia, poor concentration, irritability, stress, anger, apathy and reduced work output. These corresponded to those mentioned in literature (9,48).

While no other comparative studies assessing the level of awareness of signs and symptoms of burnout syndrome could be found on PUBMED, a cross-sectional survey carried among nurses practicing in high-intensity settings to determine burnout and resilience reported that the nurses' awareness of burnout symptoms and resilience prevents stress(108). Additionally, a systematic review on the prevalence of compassion fatigue and burnout in Intensive Care Unit professionals established that the prevalence of burnout among health care workers is a result of lack of awareness (109). We postulate that increased awareness of burnout signs and symptoms allows for its earlier detection by the individual/co-workers/supervisors with subsequent earlier mitigation of effects.

#### ***5.1.4.2 Prevention and Management***

Our current study found that there was no correlation between burnout and involvement in social interaction activities, hobbies and exercise. Majority of respondents: 85% radiologists ( $n= 65$ ) and 72% trainees ( $n=43$ ) were involved in hobbies, social interaction and physical activities such as knitting, traveling, ministry, volunteering, swimming and jogging. However, we did not assess on how often they participated and this may have made a difference. Others have shown that physicians who participated in routine exercise were 44% less likely to report burnout (110).

Radiologists from our present study identified that prevention of burnout would involve increase staffing levels, provision of resting rooms, better work facilities and equipment, provision of PACS and improved pay. Additionally, for trainees was provision of mentorship and increased leave days. This implies the common deficiencies in our radiology institutions and the perceived weight they carry on physician wellness. These recommendations mirror majority of those of the American College of Radiology Commission on Human Resources who additionally suggest restoring a sense of control and life style balance, invoking action by the radiology community and seeking professional help(23). As previously mentioned, radiologists and trainees with burnout significantly sought more psychosocial help ( $p < 0.048$

for high DP and EE). However, we established that more than three quarters of the respondents did not have the support freely available in the workplace, significantly more in trainees at 90% than radiologists 75% ( $p=0.026$ ). This is concerning considering the higher prevalence of burnout in residency. Therefore, the recommendations by respondents are relevant and have been put forward by other radiology societies as strategies to alleviate burnout syndrome in combination with other interventions(23,111).

## **5.2 Limitations**

Our study had several limitations. First, this was a cross-sectional study. It could not allow us to study the variation of burnout among the respondents throughout the entire work period and especially for trainees, throughout the entire study period in medical school. Second, the low response rate seen among radiologists might have led to a type 2 error. However, the survey respondents reflect the heterogeneity of radiology practice settings, and whereas the study proportions may not mirror the proportion of actual practice settings, the survey results provide insights for further areas of investigation. A wider reaching census survey preferably with printed questionnaires during a members' annual conference may have better representation. As with all voluntary surveys, the study was impacted by selection bias. Radiologists who are not members of the KAR open forum or active on social media would not have had the opportunity to participate in the survey. Respondents with manifestations of burnout may have been more inclined to participate in the survey. Conversely, physicians experiencing burnout may have been less likely to participate owing to generalized disengagement. Recall bias may also have occurred amongst trainees since, by the time the study was conducted, some students were off-campus due to the cessation of educational activities due to the COVID-19 pandemic. Many radiology departments had also restructured working arrangements during the height of the pandemic by: encouraging off-site reporting, spreading out shifts to reduce physical congestion as well as excusing the elderly and those with co-morbidities from work that involved close client interaction such as performing ultrasounds. This, in itself, may have also contributed.

## **5.3 Recommendations by The Researcher**

Some of the recommendations that have emerged from the study findings are having committees in professional associations and healthcare institutions dedicated to physician wellness. These are key to acknowledging and addressing physician burnout and are gaining increasing popularity among health care organizations. These committees may be referred to

by various names, such as a physician wellness committee or burnout prevention committee. However, the common goal is to actively survey and optimize physician wellness and satisfaction through targeted interventions. To ensure success, these committees should have the unwavering support of the organization's leadership. The committee should be made up of providers from varying specialties at different stages of professional careers and administrators. After analyzing the prevalence of burnout data, the committee should develop targeted interventions based on the unique issues and suggestions received. Improvement of problems identified by radiologists, and all physicians alike, will improve physician satisfaction and provide the sense that the organization values their opinions. The committee should then report back to the physicians and present the action items created to address specific issues and the results of those interventions.

Special focus should be on trainees who displayed significantly higher burn out as compared to radiologists, with interventions targeting the known risk factors as well as providing mentorship and coping mechanisms to reduce depersonalization.

Further research on burnout can be carried out on specific radiology practices and medical schools as the impact of differences in organizational leadership and cultures maybe masked in such a large survey.

Similar nationwide surveys should also be carried out to assess the burnout trends over time and the effects of interventions that may have been initiated.

## **5.4 Conclusion**

Burnout is pervasive among radiologists and often goes under-diagnosed and underreported. The incidence of burnout in health care professionals, including radiologists, is increasing at record levels. Urgent measures are needed to address this global disorder. In addition to organization-directed interventions, several individual measures have been discussed to help prevent burnout in radiologists and promote well-being. Preventing burnout in radiologists is vital for ensuring overall better health, high physician satisfaction, optimal health care delivery, and positive patient outcomes.

## REFERENCES

1. Freudenberger HJ. Staff Burn-Out. *J Soc Issues* [Internet]. 1974 [cited 2021 Nov 26];30(1):159–65. Available from: doi:10.1111/j.1540-4560.1974.tb00706.x
2. Maslach C, Jackson SE, Leiter MP. *Maslach burnout inventory*. Scarecrow Education; 1997.
3. Tomo A, De Simone S. Exploring factors that affect the well-being of healthcare workers. *Int J Bus Manag* [Internet]. 2017;12(6):49–61. Available from: doi:10.5539/ijbm.v12n6p49
4. Hamidi MS, Bohman B, Sandborg C, Smith-Coggins R, de Vries P, Albert MS, et al. The economic cost of physician turnover attributable to burnout. In: 2017 American Conference on Physician Health (ACPH) Abstract Book San Francisco: Efficiency of Practice [Internet]. 2017. p. 35. Available from: doi: 10.1186/s12913-018-3663-z
5. Davis M, Detre T, Ford DE, Hansbrough W, Hendin H, Laszlo J, et al. Confronting depression and suicide in physicians: a consensus statement. *Jama* [Internet]. 2003;289(23):3161–6. Available from: doi: 10.1001/jama.289.23.3161
6. Dyrbye LN, Thomas MR, Massie FS, Power D V, Eacker A, Harper W, et al. Burnout and {Suicidal} {Ideation} among {U}. {S}. {Medical} {Students}. *Ann Intern Med* [Internet]. 2008 Sep [cited 2020 Oct 3];149(5):334–41. Available from: doi: 10.7326/0003-4819-149-5-200809020-00008
7. Dewa CS, Loong D, Bonato S, Trojanowski L. The relationship between physician burnout and quality of healthcare in terms of safety and acceptability: a systematic review. *BMJ Open* [Internet]. 2017 Jun;7(6):e015141. Available from: doi: 10.1136/bmjopen-2016-015141
8. Zis P, Anagnostopoulos F, Sykioti P. Burnout in {Medical} {Residents}: {A} {Study} {Based} on the {Job} {Demands}-{Resources} {Model}. *Sci World J* [Internet]. 2014 Oct;2014. Available from: doi: 10.1155/2014/673279
9. MASLACH C, Wilmar B. S., Michael P., L.(2001);“Job Burnout.” *Annu Rev Psychol* [Internet]. 52:397–422. Available from: doi: 10.1146/annurev.psych.52.1.397
10. Leiter MP, Maslach C. Burnout and engagement: {Contributions} to a new vision. *Burn Res* [Internet]. 2017;5:55–7. Available from: doi: 10.1016/j.burn.2017.04.003
11. Ayyala RS, Baird GL, Sze RW, Brown BP, Taylor GA. The growing issue of burnout in radiology — a survey-based evaluation of driving factors and potential impacts in pediatric radiologists. *Pediatr Radiol* [Internet]. 2020 Jul;50(8):1071–7. Available from:

- <https://doi.org/10.1007/s00247-020-04693-2>
12. Chetlen AL, Chan TL, Ballard DH, Frigini LA, Hildebrand A, Kim S, et al. Addressing {Burnout} in {Radiologists}. *Acad Radiol* [Internet]. 2019 Apr [cited 2020 Oct 3];26(4):526–33. Available from: <https://doi.org/10.1016/j.acra.2018.07.001>
  13. Bundy JJ, Hage AN, Srinivasa RN, Gemmete JJ, Lee E, Gross JS, et al. Burnout among {Interventional} {Radiologists}. *J Vasc Interv Radiol* [Internet]. 2020 Apr;31(4):607--613.e1. Available from: doi: 10.1016/j.jvir.2019.06.002
  14. Ayyala RS, Ahmed FS, Ruzal-Shapiro C, Taylor GA. Prevalence of {Burnout} {Among} {Pediatric} {Radiologists}. *J Am Coll Radiol* [Internet]. 2019 Apr [cited 2020 Oct 3];16(4):518–22. Available from: <https://doi.org/10.1016/j.jacr.2018.08.016>
  15. Chew FS, Mulcahy MJ, Porrino JA, Mulcahy H, Relyea-Chew A. Prevalence of burnout among musculoskeletal radiologists. *Skeletal Radiol* [Internet]. 2017 Apr;46(4):497–506. Available from: <https://doi.org/10.1007/s00256-017-2578-9>
  16. Zha N, Patlas MN, Neuheimer N, Duszak R. Prevalence of {Burnout} among {Canadian} {Radiologists} and {Radiology} {Trainees}. *Can Assoc Radiol J* [Internet]. 2018 Nov [cited 2020 Oct 3];69(4):367–72. Available from: <https://doi.org/10.1016/j.carj.2018.05.005>
  17. IsHak WW, Lederer S, Mandili C, Nikraves R, Seligman L, Vasa M, et al. Burnout during residency training: a literature review. *J Grad Med Educ* [Internet]. 2009;1(2):236–42. Available from: doi: 10.4300/JGME-D-09-00054.1.
  18. McNeeley MF, Perez FA, Chew FS. The {Emotional} {Wellness} of {Radiology} {Trainees}: {Prevalence} and {Predictors} of {Burnout}. *Acad Radiol* [Internet]. 2013 May [cited 2020 Oct 3];20(5):647–55. Available from: <https://doi.org/10.1016/j.acra.2012.12.018>
  19. Guenette JP, Smith SE. Burnout: {Prevalence} and {Associated} {Factors} {Among} {Radiology} {Residents} in {New} {England} {With} {Comparison} {Against} {United} {States} {Resident} {Physicians} in {Other} {Specialties}. *Am J Roentgenol* [Internet]. 2017 Jun [cited 2020 Oct 3];209(1):136–41. Available from: <https://doi.org/10.2214/AJR.16.17541>
  20. Ganeshan D, Rosenkrantz AB, Bassett Jr RL, Williams L, Lenchik L, Yang W. Burnout in {Academic} {Radiologists} in the {United} {States}. *Acad Radiol* [Internet]. 2020 Sep [cited 2020 Oct 3];27(9):1274–81. Available from: <https://doi.org/10.1016/j.acra.2019.12.029>

21. Bin Dahmash A, Alorfi FK, Alharbi A, Aldayel A, Kamel AM, Almoaiqel M. Burnout {Phenomenon} and {Its} {Predictors} in {Radiology} {Residents}. Acad Radiol [Internet]. 2020 Jul [cited 2020 Oct 3];27(7):1033–9. Available from: <https://doi.org/10.1016/j.acra.2019.09.024>
22. Heavy physician workloads: impact on physician attitudes and outcomes. Heal Serv Manag Res [Internet]. 2007 Nov [cited 2020 Oct 4];20(4):261–9. Available from: <https://doi.org/10.1258/095148407782219067>
23. Harolds JA, Parikh JR, Bluth EI, Dutton SC, Recht MP. Burnout of {Radiologists}: {Frequency}, {Risk} {Factors}, and {Remedies}: {A} {Report} of the {ACR} {Commission} on {Human} {Resources}. J Am Coll Radiol [Internet]. 2016 Apr [cited 2020 Oct 3];13(4):411–6. Available from: <https://doi.org/10.1016/j.jacr.2015.11.003>
24. Restauri N, Flug JA, Mcarthur TA. A {Picture} of {Burnout}: {Case} {Studies} and {Solutions} {Toward} {Improving} {Radiologists}' {Well}-being. Curr Probl Diagn Radiol [Internet]. 2017 Sep;46(5):365–8. Available from: [doi:10.1067/j.cpradiol.2016.12.006](https://doi.org/10.1067/j.cpradiol.2016.12.006)
25. Bhargavan M, Kaye AH, Forman HP, Sunshine JH. Workload of {Radiologists} in {United} {States} in 2006–2007 and {Trends} {Since} 1991–1992. Radiology [Internet]. 2009 Aug [cited 2020 Oct 3];252(2):458–67. Available from: <https://doi.org/10.1148/radiol.2522081895>
26. Nicola Dawson. Towards a dynamic understanding of burnout. 2015.
27. McCormack HM, MacIntyre TE, O'Shea D, Herring MP, Campbell MJ. The {Prevalence} and {Cause}(s) of {Burnout} {Among} {Applied} {Psychologists}: {A} {Systematic} {Review}. Front Psychol [Internet]. 2018 Oct;9:1897. Available from: [doi:10.3389/fpsyg.2018.01897](https://doi.org/10.3389/fpsyg.2018.01897)
28. Ayyala RS. The importance of fostering workplace wellness in pediatric radiology. Pediatr Radiol [Internet]. 2020 Apr;50(4):465–6. Available from: <https://doi.org/10.1007/s00247-019-04570-7>
29. Riley M, Mohr D, Waddimba A. The reliability and validity of three-item screening measures for burnout: {Evidence} from group-employed health care practitioners in upstate {New} {York}. Stress Heal [Internet]. 2018 Feb;34:187–93. Available from: [doi:10.1002/smi.2762](https://doi.org/10.1002/smi.2762)



30. Magnavita N. Workplace {Violence} and {Occupational} {Stress} in {Healthcare} {Workers}: {A} {Chicken}-and-{Egg} {Situation}—{Results} of a 6-{Year} {Follow}-up {Study}. *J Nurs Scholarsh* [Internet]. 2014 Sep [cited 2020 Oct 3];46(5):366–76. Available from: <https://doi.org/10.1111/jnu.12088>
31. Kelly AM, Cronin P, Dunnick NR. Junior {Faculty} {Satisfaction} in a {Large} {Academic} {Radiology} {Department}. *Acad Radiol* [Internet]. 2007 Apr [cited 2020 Oct 3];14(4):445–54. Available from: <https://doi.org/10.1016/j.acra.2007.01.017>
32. Raja S, Stein SL. Work-life balance: history, costs, and budgeting for balance. *Clin Colon Rectal Surg* [Internet]. 2014 Jun;27(2):71–4. Available from: [doi:10.1055/s-0034-1376172](https://doi.org/10.1055/s-0034-1376172)
33. Rotenstein LS, Torre M, Ramos MA, Rosales RC, Guille C, Sen S, et al. Prevalence of {Burnout} {Among} {Physicians}: {A} {Systematic} {Review}. *JAMA* [Internet]. 2018 Sep [cited 2020 Oct 2];320(11):1131–50. Available from: <https://doi.org/10.1001/jama.2018.12777>
34. Dubale BW, Friedman LE, Chemali Z, Denninger JW, Mehta DH, Alem A, et al. Systematic review of burnout among healthcare providers in sub-{Saharan} {Africa}. *BMC Public Health* [Internet]. 2019 Sep;19(1):1247. Available from: [doi:10.1186/s12889-019-7566-7](https://doi.org/10.1186/s12889-019-7566-7)
35. Shanafelt TD, Hasan O, Dyrbye LN, Sinsky C, Satele D, Sloan J, et al. Changes in {Burnout} and {Satisfaction} {With} {Work}-{Life} {Balance} in {Physicians} and the {General} {US} {Working} {Population} {Between} 2011 and 2014. *Mayo Clin Proc* [Internet]. 2015 Dec [cited 2020 Oct 2];90(12):1600–13. Available from: <https://doi.org/10.1016/j.mayocp.2015.08.023>
36. Shanafelt TD, Boone S, Tan L, Dyrbye LN, Sotile W, Satele D, et al. Burnout and {Satisfaction} {With} {Work}-{Life} {Balance} {Among} {US} {Physicians} {Relative} to the {General} {US} {Population}. *Arch Intern Med* [Internet]. 2012 Oct [cited 2020 Oct 2];172(18):1377–85. Available from: <https://doi.org/10.1001/archinternmed.2012.3199>
37. Kokonya D. Burnout {Syndrome} among {Medical} {Workers} at {Kenyatta} {National} {Hospital} ({KNH}), {Nairobi}, {Kenya}. *Afr J Psychiatry* [Internet]. 2014 Jan;17. Available from: [doi:10.4172/1994-8220.1000142](https://doi.org/10.4172/1994-8220.1000142)

38. Bakhamis L, Paul DP, Smith H, Coustasse A. Still an {Epidemic}: {The} {Burnout} {Syndrome} in {Hospital} {Registered} {Nurses}. *Health Care Manag (Frederick)* [Internet]. 2019 Mar;38(1):3–10. Available from: doi:10.1097/hcm.0000000000000243
39. Maslach C, Jackson SE. The measurement of experienced burnout. *J Organ Behav* [Internet]. 1981 Apr [cited 2020 Oct 2];2(2):99–113. Available from: <https://doi.org/10.1002/job.4030020205>
40. Lindblom KM, Linton SJ, Fedeli C, Bryngelsson I-L. Burnout in the working population: relations to psychosocial work factors. *Int J Behav Med* [Internet]. 2006 Mar;13(1):51–9. Available from: [https://doi.org/10.1207/s15327558ijbm1301\\_7](https://doi.org/10.1207/s15327558ijbm1301_7)
41. Thommasen H V, Lavanchy M, Connelly I, Berkowitz J, Grzybowski S. Mental health, job satisfaction, and intention to relocate. Opinions of physicians in rural British Columbia. *Can Fam Physician*. 2001;47(4):737–44.
42. Maunz S, Steyrer J. Schlafmedizin-Ubersichten-Das Burnout-Syndrom in der Krankenpflege: Ursachen-Folgen-Pravention. *Wien Klin Wochenschr*. 2001;113(7–8):296.
43. Hayter M. Burnout and AIDS care-related factors in HIV community Clinical Nurse Specialists in the North of England. *J Adv Nurs* [Internet]. 1999;29(4):984–93. Available from: doi: 10.1046/j.1365-2648.1999.00973.x.
44. Radiologists health promoting taskforce U. Dealing with radiologists burnout. [cited 2021 Nov 26]; Available from: <https://healthmanagement.org/c/imaging/news/dealing-with-radiologists-burnout>
45. Ogundipe OA, Olagunju A, Lasebikan V, Coker A. Burnout among doctors in residency training in a tertiary hospital. *Asian J Psychiatr* [Internet]. 2014 Aug;10. Available from: doi:10.1016/j.ajp.2014.02.010
46. Hall LH, Johnson J, Watt I, Tsipa A, O'Connor DB. Healthcare {Staff} {Wellbeing}, {Burnout}, and {Patient} {Safety}: {A} {Systematic} {Review}. *PLoS One* [Internet]. 2016 Jul;11(7):e0159015. Available from: <https://doi.org/10.1371/journal.pone.0159015>
47. Stanciu C, Gnanasegaram S, III N, Ahmed S, Kohrman S, Teja N. Physician {Wellness} and {Substance} {Use} - {A} {Brief} {Review}. *J Alcohol \& Drug Depend* [Internet]. 2018 Aug;6. Available from: doi:10.4172/2329-6488.1000e142.

48. Maslach C, Leiter MP. Understanding the burnout experience: recent research and its implications for psychiatry. *World Psychiatry* [Internet]. 2016 Jun [cited 2020 Oct 3];15(2):103–11. Available from: <https://doi.org/10.1002/wps.20311>
49. Schaufeli Wilmar B., Leiter Michael P., Maslach Christina. Burnout: 35 years of research and practice. *Career Dev Int* [Internet]. 2009 Jan [cited 2020 Oct 4];14(3):204–20. Available from: <https://doi.org/10.1108/13620430910966406>
50. Peckham C, Grisham S. Medscape lifestyle report 2017 [Internet]. race and ethnicity, bias and burnout. 2017 [cited 2017 Feb 26]. Available from: [medscape.com/features/slideshow/lifestyle/2017/overview](https://www.medscape.com/features/slideshow/lifestyle/2017/overview)
51. Shanafelt TD, Balch CM, Bechamps GJ, Russell T, Dyrbye L, Satele D, et al. Burnout and career satisfaction among {American} surgeons. *Ann Surg* [Internet]. 2009 Sep;250(3):463–71. Available from: [doi:10.1097/sla.0b013e3181ac4dfd](https://doi.org/10.1097/sla.0b013e3181ac4dfd)
52. Gómez-Urquiza JL, la Fuente-Solana EI, Albendín-García L, Vargas-Pecino C, Ortega-Campos EM, la Fuente GA. Prevalence of {Burnout} {Syndrome} in {Emergency} {Nurses}: {A} {Meta}-{Analysis}. *Crit Care Nurse* [Internet]. 2017 Oct [cited 2020 Oct 4];37(5):e1--e9. Available from: <https://doi.org/10.4037/ccn2017508>
53. la Fuente GA, Gómez-Urquiza JL, Ortega-Campos EM, Cañadas GR, Albendín-García L, la Fuente-Solana EI. Prevalence of burnout syndrome in oncology nursing: {A} meta-analytic study. *Psychooncology* [Internet]. 2018 May [cited 2020 Oct 4];27(5):1426–33. Available from: <https://doi.org/10.1002/pon.4632>
54. Lasebikan VO, Oyetunde MO. Burnout among {Nurses} in a {Nigerian} {General} {Hospital}: {Prevalence} and {Associated} {Factors}. Estryn-Behar M, editor. *ISRN Nurs* [Internet]. 2012 Apr;2012:402157. Available from: <https://doi.org/10.5402/2012/402157>
55. Connolly A, Holmes E, Clark L, Denniston C, Meltzer-Brody S. Resident {Physician} {Burnout}: {Creating} an {Institutional} {System} to {Detect}, {Identify}, and {Mitigate} {Symptoms}. *Obstet & Gynecol*. 2015;126:51S.
56. Wu F, Ireland M, Hafekost K, Lawrence D. National mental health survey of doctors and medical students. 2013;
57. Prentice S, Dorstyn D, Benson J, Elliott T. Burnout {Levels} and {Patterns} in {Postgraduate} {Medical} {Trainees}: {A} {Systematic} {Review} and {Meta}-{Analysis}. *Acad Med* [Internet]. 2020 Mar;95:1444–54. Available from: [doi:10.1097/ACM.00000000000003379](https://doi.org/10.1097/ACM.00000000000003379)

58. Shanafelt TD, West CP, Sinsky C, Trockel M, Tutty M, Satele D V, et al. Changes in {Burnout} and {Satisfaction} {With} {Work}-{Life} {Integration} in {Physicians} and the {General} {US} {Working} {Population} {Between} 2011 and 2017. *Mayo Clin Proc* [Internet]. 2019 Sep [cited 2020 Oct 4];94(9):1681–94. Available from: <https://doi.org/10.1016/j.mayocp.2018.10.023>
59. West CP, Dyrbye LN, Shanafelt TD. Physician burnout: contributors, consequences and solutions. *J Intern Med* [Internet]. 2018 Jun [cited 2020 Oct 4];283(6):516–29. Available from: <https://doi.org/10.1111/joim.12752>
60. Abdo SA, El-Sallamy RM, El-Sherbiny AA, Kabbash IA. Burnout among physicians and nursing staff working in the emergency hospital of Tanta University, Egypt. *East Mediterr Heal J* [Internet]. 2016;21(12):906–15. Available from: doi:10.26719/2015.21.12.906.
61. Hutter M, Kellogg K, Ferguson C, Abbott W, Warshaw A. Hutter {MM}, {Kellogg} {KC}, {Ferguson} {CM}, {Abbott} {WM}, {Warshaw} {AL}. {The} impact of the 80-hour resident workweek on surgical residents and attending surgeons. *Ann Surg* [Internet]. 2006 Jul;243:864--71; discussion 871. Available from: doi:10.1097/01.sla.0000220042.48310.66.
62. Waheed K, Liaqat N, Ejaz S, Khanum A, Ijaz S, Butt A, et al. Burnout among gynaecological residents in {Lahore}, {Pakistan}: {A} cross-sectional survey. *J Pak Med Assoc*. 2017 Sep;67:1318–22.
63. Antiel RM, Reed DA, Van Arendonk KJ, Wightman SC, Hall DE, Porterfield JR, et al. Effects of duty hour restrictions on core competencies, education, quality of life, and burnout among general surgery interns. *JAMA Surg* [Internet]. 2013 May;148(5):448–55. Available from: doi:10.1001/jamasurg.2013.1368.
64. Contag SP, Golub JS, Teknos TN, Nussenbaum B, Stack BC, Arnold DJ, et al. Professional burnout among microvascular and reconstructive free-flap head and neck surgeons in the United States. *Arch Otolaryngol neck Surg* [Internet]. 2010;136(10):950–6. Available from: doi:10.1001/archoto.2010.154
65. Ganeshan D, Wei W, Yang W. Burnout in chairs of academic radiology departments in the United States. *Acad Radiol* [Internet]. 2019;26(10):1378–84. Available from: doi:10.1016/j.acra.2018.12.006.
66. Au Jason, Elizondo Rodolfo A., Roth David R. Surgeon {Burnout} among {American} {Pediatric} {Urologists}. *Urol Pract* [Internet]. 2017 May [cited 2020 Oct 4];4(3):264–8. Available from: <https://doi.org/10.1016/j.urpr.2016.06.003>

67. Begat I, Ellefsen B, Severinsson E. Nurses' satisfaction with their work environment and the outcomes of clinical nursing supervision on nurses' experiences of well-being—a Norwegian study. *J Nurs Manag* [Internet]. 2005;13(3):221–30. Available from: doi: 10.1111/j.1365-2834.2004.00527.
68. Costa ÉSM da, Hyeda A, Maluf E. Working {Environment} and {Burnout} {Syndrome}. In 2016. Available from: doi: 10.21767/2471-299X.1000039
69. Cascio W, Montealegre R. How {Technology} {Is} {Changing} {Work} and {Organizations}. *Annu Rev Organ Psychol Organ Behav* [Internet]. 2016 Mar;3:349–75. Available from: doi:10.1146/annurev-orgpsych-041015-062352.
70. Chati R, Huet E, Grimberg L, Schwarz L, Tuech J-J, Bridoux V. Factors associated {With} burnout among {French} digestive surgeons in training: results of a national survey on 328 residents and fellows. *Am J Surg* [Internet]. 2017 Apr [cited 2020 Oct 4];213(4):754–62. Available from: <https://doi.org/10.1016/j.amjsurg.2016.08.003>
71. Joseph H. McAbee, Brian T. Ragel, Shirley McCartney, G. Morgan Jones, L. Madison Michael, Michael DeCuypere, et al. Factors associated with career satisfaction and burnout among {US} neurosurgeons: results of a nationwide survey. *J Neurosurg JNS* [Internet]. 2015;123(1):161–73. Available from: <https://thejns.org/view/journals/j-neurosurg/123/1/article-p161.xml>
72. Shanafelt TD, Boone SL, Dyrbye LN, Oreskovich MR, Tan L, West CP, et al. The medical marriage: a national survey of the spouses/partners of US physicians. In: *Mayo Clinic Proceedings* [Internet]. Elsevier; 2013. p. 216–25. Available from: doi: 10.1016/j.mayocp.2012.11.021.
73. Zeijlemaker C, Moosa S. The prevalence of burnout among registrars in the {School} of {Clinical} {Medicine} at the {University} of the {Witwatersrand}, {Johannesburg}, {South} {Africa}. *South African Med Journal*; Vol 109, No 9 [Internet]. 2019; Available from: doi:10.7196/SAMJ.2019.v109i9.13667
74. McMurray JE, Linzer M, Konrad TR, Douglas J, Shugerman R, Nelson K, et al. The {Work} {Lives} of {Women} {Physicians}. *J Gen Intern Med* [Internet]. 2000 Jun [cited 2020 Oct 4];15(6):372–80. Available from: <https://doi.org/10.1111/j.1525-1497.2000.im9908009.x>
75. Lebares CC, Guvva E V, Ascher NL, O'Sullivan PS, Harris HW, Epel ES. Burnout and {Stress} {Among} {US} {Surgery} {Residents}: {Psychological} {Distress} and {Resilience}. *J Am Coll Surg* [Internet]. 2018 Jan [cited 2020 Oct 4];226(1):80–90. Available from: <https://doi.org/10.1016/j.jamcollsurg.2017.10.010>

76. Fernando BMS, Samaranayake DL. Burnout among postgraduate doctors in {Colombo}: prevalence, associated factors and association with self-reported patient care. *BMC Med Educ* [Internet]. 2019 Oct;19(1):373. Available from: <https://doi.org/10.1186/s12909-019-1810-9>
77. Pynoo B, Devolder P, Duyck W, van Braak J, Sijnave B, Duyck P. Do hospital physicians' attitudes change during PACS implementation? A cross-sectional acceptance study. *Int J Med Inform* [Internet]. 2012;81(2):88–97. Available from: doi:10.106/j.ijmedinf.2011.10.007
78. Oreskovich MR, Kaups KL, Balch CM, Hanks JB, Satele D, Sloan J, et al. Prevalence of alcohol use disorders among American surgeons. *Arch Surg* [Internet]. 2012;147(2):168–74. Available from: doi: 10.1001/archsurg.2011.1481.
79. Shanafelt TD, Balch CM, Dyrbye L, Bechamps G, Russell T, Satele D, et al. Special report: suicidal ideation among American surgeons. *Arch Surg* [Internet]. 2011;146(1):54–62. Available from: doi: 10.1001/archsurg.2010.292.
80. Shanafelt TD, Balch CM, Bechamps G, Russell T, Dyrbye L, Satele D, et al. Burnout and {Medical} {Errors} {Among} {American} {Surgeons}. *Ann Surg* [Internet]. 2010;251(6). Available from: doi: 10.1097/SLA.0b013e3181bfdab3.
81. Balch CM, Oreskovich MR, Dyrbye LN, Colaiano JM, Satele D V, Sloan JA, et al. Personal consequences of malpractice lawsuits on American surgeons. *J Am Coll Surg* [Internet]. 2011;213(5):657–67. Available from: doi: 10.1016/j.jamcollsurg.2011.08.005.
82. Casalino L, Crosson F. Physician {Satisfaction} and {Physician} {Well}-{Being}: {Should} {Anyone} {Care}? *Prof Prof* [Internet]. 2015 May;5. Available from: doi:10.7577/pp.954.
83. Patel RS, Bachu R, Adikey A, Malik M, Shah M. Factors related to physician burnout and its consequences: a review. *Behav Sci (Basel)* [Internet]. 2018;8(11):98. Available from: doi: 10.3390/bs8110098.
84. Dewa CS, Jacobs P, Thanh NX, Loong D. An estimate of the cost of burnout on early retirement and reduction in clinical hours of practicing physicians in Canada. *BMC Health Serv Res* [Internet]. 2014;14(1):1–9. Available from: doi: 10.1186/1472-6963-14-254.
85. Dewa CS, Loong D, Bonato S, Thanh NX, Jacobs P. How does burnout affect physician productivity? {A} systematic literature review. *BMC Health Serv Res* [Internet]. 2014 Jul;14(1):325. Available from: <https://doi.org/10.1186/1472-6963-14-325>

86. Neff L, Karney B. Stress {Crossover} in {Newlywed} {Marriage}: {A} {Longitudinal} and {Dyadic} {Perspective}. *J Marriage Fam - J MARRIAGE FAM* [Internet]. 2007 Aug;69:594–607. Available from: doi:10.1111/j.1741-3737.2007.00394
87. Awa WL, Plaumann M, Walter U. Burnout prevention: A review of intervention programs. *Patient Educ Couns* [Internet]. 2010;78(2):184–90. Available from: doi: 10.1016/j.pec.2009.04.008.
88. Dunn PM, Arnetz BB, Christensen JF, Homer L. Meeting the imperative to improve physician well-being: assessment of an innovative program. *J Gen Intern Med* [Internet]. 2007;22(11):1544–52. Available from: doi: 10.1007/s11606-007-0363-5
89. Rø KEI, Gude T, Tyssen R, Aasland OG. Counselling for burnout in Norwegian doctors: one year cohort study. *Bmj* [Internet]. 2008;337. Available from: doi: 10.1136/bmj.a2004.
90. Chan DW. Emotional intelligence and components of burnout among {Chinese} secondary school teachers in {Hong} {Kong}. *Teach Teach Educ* [Internet]. 2006 Nov;22(8):1042–54. Available from: doi: 10.1016/j.tate.2006.04.005.
91. Mayer JD, Salovey P, Caruso DR, Sitarenios G. Emotional intelligence as a standard intelligence. *Emotion* [Internet]. 2001;1(3):232–42. Available from: doi:10.1037/1528-3542.1.3.232.
92. Jordan P, Troth A. Managing {Emotions} {During} {Team} {Problem} {Solving}: {Emotional} {Intelligence} and {Conflict} {Resolution}. *Hum Perform* [Internet]. 2004 Apr;17. Available from: doi:10.1207/s15327043hup1702\_4.
93. Shimizu T, Mizoue T, Kubota S, Mishima N, Nagata S. Relationship between burnout and communication skill training among Japanese hospital nurses: a pilot study. *J Occup Health* [Internet]. 2003;45(3):185–90. Available from: doi: 10.1539/joh.45.185.
94. Ms K, Epstein RM, Beckman h, et al. Association of an educational program in mindful communication with burnout, empathy and attitudes among primary care physicians. *JAMA*. 2009;302:1284–93.
95. Shanafelt TD, Gorringer G, Menaker R, Storz KA, Reeves D, Buskirk SJ, et al. Impact of organizational leadership on physician burnout and satisfaction. In: *Mayo Clinic Proceedings* [Internet]. Elsevier; 2015. p. 432–40. Available from: doi: 10.1016/j.mayocp.2015.01.012.

96. Taylor T, Scott A. Do Physicians Prefer to Complete Online or Mail Surveys? Findings From a National Longitudinal Survey. *Eval Health Prof* [Internet]. 2019 Mar 1 [cited 2022 Jan 29];42(1):41–70. Available from: <https://pubmed.ncbi.nlm.nih.gov/30384770/>
97. Guenette JP, Smith SE. Burnout: Prevalence and associated factors among radiology residents in New England with comparison against United States resident physicians in other specialties. *Am J Roentgenol*. 2017;
98. Chew FS, Mulcahy MJ, Porrino JA, Mulcahy H, Relyea-Chew A. Prevalence of burnout among musculoskeletal radiologists. *Skeletal Radiol* [Internet]. 2017 Apr;46(4):497–506. Available from: doi:10.1007/s00256-017-2578-9
99. Huang HL, Chen RC, Teo I, Chaudhry I, Heng AL, Zhuang K Da, et al. A survey of anxiety and burnout in the radiology workforce of a tertiary hospital during the COVID-19 pandemic. *J Med Imaging Radiat Oncol* [Internet]. 2021 Apr 1 [cited 2022 Feb 2];65(2):139–45. Available from: <https://pubmed.ncbi.nlm.nih.gov/33591604/>
100. Low ZX, Yeo KA, Sharma VK, Leung GK, McIntyre RS, Guerrero A, et al. Prevalence of Burnout in Medical and Surgical Residents: A Meta-Analysis. Vol. 16, *International Journal of Environmental Research and Public Health* . 2019.
101. Dyrbye LN, Varkey P, Boone SL, Satele D V., Sloan JA, Shanafelt TD. Physician satisfaction and burnout at different career stages. *Mayo Clin Proc* [Internet]. 2013 [cited 2022 Feb 2];88(12):1358–67. Available from: <https://pubmed.ncbi.nlm.nih.gov/24290109/>
102. Amponsah-Tawiah K, Annor F, Arthur BG. Linking commuting stress to job satisfaction and turnover intention: The mediating role of burnout. *J Workplace Behav Health* [Internet]. 2016 Apr 2;31(2):104–23. Available from: <https://doi.org/10.1080/15555240.2016.1159518>
103. Ferguson C, Low G, Shiau G. Burnout in Canadian Radiology Residency: A National Assessment of Prevalence and Underlying Contributory Factors. *Can Assoc Radiol J*. 2020;71(1):40–7.
104. Rodrigues JCL, Morgan S, Augustine K, Clague G, Pearce T, Pollentine A, et al. Musculoskeletal symptoms amongst clinical radiologists and the implications of reporting environment ergonomics--a multicentre questionnaire study. *J Digit Imaging* [Internet]. 2014 Apr;27(2):255–61. Available from: <https://pubmed.ncbi.nlm.nih.gov/24113846>



105. Lim R, Pinto C. Work stress, satisfaction and burnout in New Zealand radiologists: comparison of public hospital and private practice in New Zealand. *J Med Imaging Radiat Oncol* [Internet]. 2009 Apr [cited 2022 Jan 23];53(2):194–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/19527366/>
106. Lynne Gathuru M, Gabriel Onditi, Elias D, Richard Pitcher D. Analysis of registered radiological equipment in Kenya. *PAMJ* [Internet]. 2021;40(205). Available from: <https://www.panafrican-med-journal.com/content/article/40/205/full>
107. Brown B, Culp M, Olabu B, Mwangi G, Magabe P, Baigorri B, et al. Meeting the Need for IR Training in Kenya. *J Vasc Interv Radiol*. 2020 Nov 1;31:1929-1932.e1.
108. Van Mol MMC, Kompanje EJO, Benoit DD, Bakker J, Nijkamp MD. The prevalence of compassion fatigue and burnout among healthcare professionals in intensive care units: a systematic review. *PLoS One*. 2015;10(8):e0136955.
109. Rushton CH, Batcheller J, Schroeder K, Donohue P. Burnout and resilience among nurses practicing in high-intensity settings. *Am J Crit Care*. 2015;24(5):412–20.
110. Shenoi AN, Kalyanaraman M, Pillai A, Raghava PS, Day S. Burnout and Psychological Distress Among Pediatric Critical Care Physicians in the United States\*. *Crit Care Med* [Internet]. 2018;46(1). Available from: [https://journals.lww.com/ccmjournal/Fulltext/2018/01000/Burnout\\_and\\_Psychological\\_Distress\\_Among\\_Pediatric.15.aspx](https://journals.lww.com/ccmjournal/Fulltext/2018/01000/Burnout_and_Psychological_Distress_Among_Pediatric.15.aspx)
111. Fishman MDC, Mehta TS, Siewert B, Bender CE, Kruskal JB. The {Road} to {Wellness}: {Engagement} {Strategies} to {Help} {Radiologists} {Achieve} {Joy} at {Work}. *RadioGraphics* [Internet]. 2018 Oct [cited 2020 Oct 4];38(6):1651–64. Available from: <https://doi.org/10.1148/rg.2018180030>

## APPENDICES

### Appendix I: Consent Form

Informed consent will be requested prior to opening the survey and inferred as given when a participant chooses to participate on Survey Monkey and submits the filled anonymized survey.

#### **PARTICIPANT INFORMATION AND CONSENT FORM**

**Title of Study: PREVALENCE, PREDISPOSING FACTORS AND AWARENESS OF BURNOUT AMONG KENYAN RADIOLOGISTS AND RADIOLOGY TRAINEES**

**Principal Investigator\and institutional affiliation:DR. MAXWELL CHIERA GACHIECo-  
Investigators and institutional affiliation:** The University of Nairobi, Kenyatta National Hospital and Kenya Association of Radiologists

#### **Introduction:**

I would like to introduce you to a study being conducted by Dr Maxwell Gachie as the principal investigator with affiliation to the University of Nairobi, Kenyatta National Hospital and Kenya Association of Radiologists. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. You are to make this voluntarily after understanding the purpose of this study. By principle, your decision to participate is entirely voluntary, you may withdraw from the study at any time without necessarily giving a reason for your withdrawal and you may refuse to participate in the research without any undue consequences. You will have access to a copy of this form for your records.

Do you wish to continue?

Yes

No

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No. \_\_\_\_\_

#### **What Is This Study About?**

This study is titled, “**PREVALENCE, PREDISPOSING FACTORS AND AWARENESS OF BURNOUT AMONG KENYAN RADIOLOGISTS AND RADIOLOGY TRAINEES**” The study aims to determine the prevalence of burnout among Kenyan radiologists and radiology trainees. It also aims to assess the knowledge of symptoms

associated and the underlying risk factors and collect some possible interventions to address the syndrome.

The study will be a cross-sectional study design. The study targets all the members of the Kenya Association of Radiologists. Once you agree to participate in the study, you will be expected to fill online data collection tools and send them back to the principal investigator to complete the research process. It would take you about 30 minutes to complete the online survey.

**Are There Any Risks, Harms Discomforts Associated with This Study?**

There are no potential overt physical risks that you will be exposed to when you chose to participate in this study. The study does not include physical contacts or access to private medical records. To maintain privacy, the data collection process does not require participants to provide any identifying data or links. Code numbers will be used to identify you in a password-protected computer database and will keep all of our paper records in a locked file cabinet.

If there are any questions you do not want to answer, you can skip them. You have the right to refuse filling in the questionnaire in total or any questions without being any repercussions whatsoever.

**Are There Any Benefits Being in This Study?**

There are no outright benefits designated for the participants in this study. However, your participation will provide information that can inform policy makers and employers on how to mitigate burnout among radiologists and radiology trainees in Kenya and beyond.

**What If You Have Questions in Future?**

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh\_erc@uonbi.ac.ke. The principal investigator will pay you back for your charges to these numbers if the call is for study-related communication.

## **Appendix II: Statement of Consent**

### **Participant's statement**

I have read and fully understand this consent form. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study. I understand that all efforts will be made to keep information regarding my personal identity confidential. By clicking YES, I have not given up any of the legal rights that I have as a participant in a research study.

**I agree to participate in this research study:** Yes No

### **Researcher's statement**

I, the undersigned, have shared full details of this study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

**Researcher's Name:** \_\_\_\_\_

**Date:**

\_\_\_\_\_

**Signature**

\_\_\_\_\_

For more information, you can contact:

### **Principal Investigator**

Dr. Maxwell Chiera Gachie

Department of Diagnostic Imaging and Radiology, University of Nairobi.

Phone: +254721583158      Email: maxgachie@gmail.com

### **Lead Supervisor**

Dr. Ian Mathenge Muriithi

MBChB (Nbi) MMed (Nbi)

Consultant Radiologist and Lecturer, Department of Diagnostic Imaging and Radiation Medicine, University of Nairobi

Phone: +254733752947      Email: matibabu2@yahoo.com

### **The Secretary/Chairperson,**

KNH-UoN Ethics and Research Committee

Telephone No. 2726300 Ext 44102      Email: uonknh\_erc@uonbi.ac.ke

## Appendix III: Data Collection Tool (Questionnaire)

### **PART 1: Bio-data**

Tick as appropriate

1. AGE (years):

\_\_\_\_\_

2. GENDER:

Female

Male

3. MARITAL STATUS:

Single

Married

Separated

Divorced

Widowed

Other (specify).....

4. RELIGION:

Christian

Muslim

Buddhist

Hindu

Other (specify).....

5. How many people can be classified as your dependents?

\_\_\_\_\_

**PART 2:**

**A. WORK RELATED INFORMATION**

1. You are a:
  - Resident
  - Radiologist
2. If you are a resident, who is your sponsor?
  - Self-sponsored
  - Government/institution sponsored
  - Not applicable
3. If you are a resident, kindly indicate your current level of study (years)
  - 1
  - 2
  - 3
  - 4
4. If you are a radiologist, how many years have you practiced?  
.....
5. If you are a radiologist, who is your employer?
  - Exclusively private practice
  - Self-employed
  - Not Employed
  - Exclusively in public service
  - Both public and private practice
6. If in public service above, what is the level of the facility
  - Level 6
  - Level 5
  - Level 4
  - other
7. Are you in academia
  - Yes
  - No

8. Are you subspecialized
- Yes
  - No
9. Do you have any administrative/managerial duties?
- Yes
  - No
10. How many hours do you work in a typical week?
- \_\_\_\_\_
11. Do you work extra hours i.e nights and weekends?
- Yes
  - No
12. Where is your primary place of employment (deployment area)?
- City i.e Nairobi/Kisumu/Mombasa
  - Large town i.e county/sub county headquarters
  - Small town/rural
13. How far is your place of work from your residence (in KMs)?
- \_\_\_\_\_
14. How would you rate the radiology resources (human/equipment) available to you?
- Inadequate
  - Somehow adequate
  - Adequate
  - Highly adequate
15. How many imaging modalities do you serve on a typical day? Tick appropriately
- General radiography
  - CT
  - MRI
  - Ultrasound
  - Nuclear studies
  - Mammography

Fluoroscopic studies

Interventional radiology

others, specify

.....

16. What is your average case load per day?

<10

10-20

20-30

>30

17. Do you have a PACS available to you?

Yes

No

18. Do you consider your source of your income as stable?

Yes

No

19. What is your monthly net income (in KShs)?

≤99,999

100,000-199,999

200,000-299,999

≥300,000

20. Apart from your employment, are you involved in any other income generating activity?

Yes

No

21. In the last one year, have you taken any leave days?

Yes.

How many Days?.....

No



22. Are you satisfied with your physical work environment like lighting, space, ablution facilities and ventilation etc.?

Yes

No

23. Does have a resting room provided for you at work?

Yes

No

24. What can your employer/institution do to make your work feel less stressful/improve the work situation?

---

---

---

**B. SOCIAL ACTIVITIES**

25. Are you involved in any social interaction activities /hobbies/ physical activities?

Yes

- Specify (e.g. gym, ball games, golf, charity, singing) .....

- How often?

Daily

Occasionally

Rarely

No

26. Do you drink alcohol?

Yes,

If yes, how often?

Daily

Occasionally

Rarely

No

27. Do you smoke cigarettes

Yes,

If yes, how often?

Daily

Occasionally

Rarely

No

28. Do you smoke marijuana?

Yes,

If yes, how often?

Daily

Occasionally

Rarely

No

29. Do you use injectable recreational drugs?

Yes,

If yes, how often?

Daily

Occasionally

Rarely

No

**C. AWARENESS**

30. Have you heard of burn out syndrome?

Yes

No

31. If yes in #30 above, what signs and symptoms of burn out do you know of?

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---

32. Is psychosocial support freely available for staff at your place of work?

Yes

No

33. In the last one year, have you sought psychosocial support from a colleague, professional or any other person for work related issues?

Yes

No

### PART 3

For each statement, mark the box that most accurately reflects your response:

	<i>Every day</i>	<i>A few times a week</i>	<i>Once a week</i>	<i>A few times a month</i>	<i>Once a month or less</i>	<i>A few times a year</i>	<i>Never</i>
I deal very effectively with the problems of my patients							
I feel I treat some patients as if they were impersonal objects							
I feel emotionally drained from my work							
I feel fatigued when I get up in the morning and have to face another day on the job							
I've become more callous towards people since I took this job							
I feel I'm positively influencing other people's lives through my work							
Working with people all day is really a strain for me							
I don't really care what happens to some patients							
I feel exhilarated after working closely with my patients							

Thank you for your responses

## Appendix IV: KNH/UoN-ERC Letter of Approval



UNIVERSITY OF NAIROBI  
COLLEGE OF HEALTH SCIENCES  
P O BOX 19676 Code 00202  
Telegrams: varsity  
Tel: (254-020) 2726300 Ext 44355

KNH-UON ERC  
Email: [uonknh\\_erc@uonbi.ac.ke](mailto:uonknh_erc@uonbi.ac.ke)  
Website: <http://www.erc.uonbi.ac.ke>  
Facebook: <https://www.facebook.com/uonknh.erc>  
Twitter: @UONKNH\_ERC [https://twitter.com/UONKNH\\_ERC](https://twitter.com/UONKNH_ERC)



KENYATTA NATIONAL HOSPITAL  
P O BOX 20723 Code 00202  
Tel: 726300-9  
Fax: 725272  
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/463

22<sup>nd</sup> December 2020

Dr. Maxwell Chiera Gachie  
Reg.No.H58/10837/2018  
Dept.of Diagnostic Imaging and Radiation Medicine  
School of Medicine  
College of Health Sciences  
University of Nairobi



Dear Dr. Gachie

**RESEARCH PROPOSAL – PREVALENCE, PREDISPOSING FACTORS AND AWARENESS OF BURNOUT AMONG  
KENYAN RADIOLOGISTS AND RADIOLOGY TRAINEES (P554/010/2020)**

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 22<sup>nd</sup> December 2020 – 21<sup>st</sup> December 2021.

This approval is subject to compliance with the following requirements:

- Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
- Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
- Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
- Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
- Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

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For more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>

Yours sincerely,



**PROF. M. L. CHINDIA**  
**SECRETARY, KNH-UoN ERC**

- c.c. The Principal, College of Health Sciences, UoN  
The Senior Director, CS, KNH  
The Chairperson, KNH- UoN ERC  
The Assistant Director, Health Information Dept, KNH  
The Dean, School of Medicine, UoN  
The Chair, Dept. of Diagnostic Imaging and Radiation Medicine, UoN  
Supervisors: Dr. Ian Mathenge Muriithi, Dept. of Diagnostic Imaging and Rad. Medicine, UoN  
Dr. Gladys Nthambi Mwangi, Dept. of Diagnostic Imaging and Rad. Medicine, UoN  
Dr. Wangari Maina, Dept. of Radiology, K.N.H

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## Appendix V: Certificate of Plagiarism

### Prevalence, Predisposing Factors And Awareness Of Burnout Among Kenyan Radiologists And Radiology Trainees

#### ORIGINALITY REPORT

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STUDENT PAPERS

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