

**THE ASSOCIATION BETWEEN PERCEIVED STRESS LEVELS AND THE COPING
STRATEGIES EMPLOYED BY MEDICAL RESIDENTS AT THE UNIVERSITY OF
NAIROBI**

YVONNE NJERI KIANDUMA

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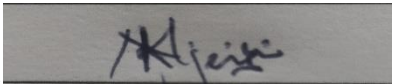
**A dissertation submitted in partial fulfillment of the requirements for the award of a degree
of Master of Medicine in Psychiatry**

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2021

DECLARATION

I, Dr. Yvonne Njeri Kianduma hereby declare that this dissertation is my original work and that it has not been submitted for an academic award or qualification in any institution of higher learning. Appropriate referencing has been made when citation of other people’s work has been done.

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APPROVAL

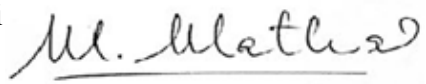
This dissertation has been submitted for evaluation with our approval as University of Nairobi supervisors.

Prof. Muthoni Mathai

MBChB (Nairobi); Mmed (Nairobi); PhD (Germany)

Department of Psychiatry

University of Nairobi



Sign.....

Date 02.08.21.....

David M. Ndeti

MBChB (Nairobi); DPM (London); MRCPsych; FRCPsych (UK); MD (Nairobi); DSc

(Nairobi); DIFAPA (USA); Certificate in Psychotherapy (London)

Professor of Psychiatry

Department of Psychiatry

University of Nairobi



Sign.....

Date.....30/07/2021.....

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DEDICATION

To my mother, Margaret Kianduma, who has always been my greatest cheerleader and constant source of encouragement in all that I do. I am who I am because of you.

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LIST OF ABBREVIATIONS AND ACRONYMS

COPE: Coping Orientation of Problems Experienced

DASS: Depression Anxiety and Stress Scale

ERC: Ethics and Research Committee

KNH: Kenyatta National Hospital

KMPDC: Kenya Medical Practitioners and Dentists Council

MBChB: Bachelor of Medicine and Bachelor of Surgery

MNTRH: Mathari National Teaching and Referral Hospital.

PSS: Perceived Stress Scale

STATA: Statistics and data

UON: University of Nairobi

OPERATIONAL DEFINITIONS

Medical resident: A medical doctor who holds MBChB from an accredited medical school, is registered by the KMPDC and is currently pursuing postgraduate medical training in a specific specialty.

Chief Resident: A medical resident usually in their final year of training who is elected by fellow residents to act as a liaison between faculty members and residents. Each department has their own chief resident.

Medical specialty: an area of health expertise that focuses on specific group of patients, diseases and skills. For example pediatrics deals with children

Perceived stress: Thoughts and feelings a person has about how much stress he or she is under at a specific point in time or over a certain time period

Burnout: a state of physical, mental and emotional fatigue as a result of chronic stress

ABSTRACT

Background: Medical residency training is known to be a stressful period of career development with prevalence rates of perceived stress among medical residents documented to be higher than in the general population. Exposure to stress without utilizing appropriate coping strategies negatively impacts medical residents' well-being and consequently patient care.

Objective: This study aimed to determine the levels of perceived stress among medical residents at the University of Nairobi and the coping strategies they employed to deal with stress.

Method: It was an online survey utilizing the Survey Monkey software where data was collected from 260 medical residents recruited via consecutive sampling. Stress levels were assessed using the ten item Perceived Stress Scale (PSS) while coping strategies were determined using the Brief Coping Orientation of Problems Experienced (COPE) inventory. Data pertaining to medical residents demographic and residency characteristics was collected using a researcher-designed questionnaire.

Data analysis: Data was exported as a Microsoft excel file for cleaning and coding and then verified and analyzed using STATA 13.0. Continuous variables were presented as means and standard deviation while categorical variables were presented as tables of frequencies and percentages. Binary logistic regression odds ratio (95%CI) was used to determine the association between the dependent and independent variables with significant associations defined by a p value < 0.05. Spearman's correlation was used to analyze the correlation between perceived stress and coping strategies employed. Significant correlations were defined by a p value < 0.05.

Results: Of the 260 medical residents, 43 (16.5%, 95%CI: 11.7-20.5%) had mild stress, 165 (63.5%, 95%CI: 57.4-68.9%) had moderate stress and 52 (20%, 95%CI: 15.8-25.5%) had severe stress. The mean score for perceived stress was 20 (SD=6.8). The most commonly used adaptive strategies were planning (72.5%), acceptance (68.9%) and active coping (68.5%) with humor (50.9%) as the least. The most commonly used maladaptive coping strategies were self-distraction (63.8%), self-blame (56.1%) and venting (55.6%) with substance use (36.5%) as the least.

Conclusion: Majority of the medical residents in this study were stressed. There was a significant association between perceived stress and sex, availability of training sponsorship and presence of a psychiatric illness. Medical residents employed adaptive coping strategies more frequently than maladaptive strategies. Higher perceived stress levels were reported among medical residents utilizing maladaptive coping strategies compared to those who employed adaptive coping strategies.

Recommendation: Incorporation of programs that strengthen and encourage peer support, mentorship, social support and the appropriate utilization of adaptive stress-coping strategies as part of medical residency training may help to mitigate stress.

CHAPTER ONE

INTRODUCTION AND BACKGROUND INFORMATION

1.1 Introduction

Prevalence of stress is documented to be around 18% among the general population and 28% among medical doctors, which is among the highest of all professions (Govender et al., 2012). The medical work environment entails a number of stressors for medical doctors (Sirsawy et al., 2016). These include the continuous need to learn new skills, gain knowledge and expertise as well as working long and often erratic hours, making decisions while meeting patient needs, and establishing a work-life balance (Sirsawy et al., 2016). Medical residency training includes additional stress from meeting the numerous academic criteria and clinical responsibilities (Alosaimi, Kazim, et al., 2015; O.L. et al., 2017; O.O. et al., 2010; Saiful & Yusoff, 2010). Therefore, understanding stress and coping is important in order to create effective programs and services that enhance both the psychological and physical well-being of medical residents which in turn also enhances patient care quality. Data are scarce locally on the coping strategies employed by medical residents. This study is designed to bridge this gap by generating information on the levels of perceived stress and the coping strategies medical residents utilize.

1.2 Background Information

Stress refers to how our bodies respond to demands placed on them (Seyle, 1983). Circumstances in an individual's life or in their environment that cause stress are known as stressors (Yusoff et al., 2010).

According to Ndetei et al. (2006), when the demands imposed on an individual result in an increase in performance to satisfy those expectations, then normal to minimal stress is experienced by the individual. However, if the demand pressure does not lead to an increase in efficiency or it further decreases the individual's output, then the person experiences tremendous stress (Ndetei DM, Othieno CJ, Tarek O, Mburu J et al., 2006). This stress and output curve is also described by Mumtaz et al. (2010) who note that if stress is maintained at optimal levels then it can facilitate the acquisition of information and skills but if allowed to exceed this level, it becomes detrimental to both the physical and mental health of the individual. Lazarus and Folkman (1984) also noted that when a person considers a particular situation to be more

challenging than they can handle with a potential to jeopardize their well-being then they experience psychological stress. This may manifest in negative mental and physical changes in a person's body including depression, anxiety, headaches, somatization, raised blood pressure among others (Saini et al., 2010; Shibli Sadiq et al., 2019).

Medical residents experience stress daily owing to their work environment which exposes them to prolonged working hours, sleep deprivation and fatigue whilst exerting themselves emotionally as they deal with patients and their relatives (Alosaimi, Kazim, et al., 2015; Maswadi et al., 2019a; Saini et al., 2010). Furthermore, expectations are placed on them to be competent clinicians, apt students, proficient teachers and researchers all the while ensuring they are managing their family and/or personal situations well (Saini et al., 2010).

People not only have varying stress thresholds but also coping methods while dealing with stress (O.L. et al., 2017). Coping as described by Lazarus and Folkman (1984) refers to constantly changing cognitive and behavioral efforts employed to tackle internal and/ or external demands that an individual considers threatening regardless of their effectiveness. They further note that how an individual appraises situations determines their stress reactions and coping efforts.

Coping strategies of stress can either be adaptive or maladaptive. Frequent exposure to stressful working environments without appropriate coping strategies often negatively impacts the physical and psychological well-being of medical residents with maladaptive strategies such as denial, self-blame and substance use documented to be associated with depression, anxiety, decreased performance at work and poor quality of life (Alosaimi, Almufleh, et al., 2015).

It is important for medical residents to take care of their mental health not only for themselves but for the benefit of all the people they serve because high stress and burnout levels can contribute to suboptimal patient care, medication and clinical errors with consequent patient dissatisfaction (Saini et al., 2010).

There is limited data on postgraduate medical students regarding perceived stress and coping strategies compared with stress during undergraduate medical training period. This study therefore aims to add to the body of knowledge more so in our local context by determining the levels of perceived stress as well as the coping strategies of stress of medical residents at the University of Nairobi teaching hospitals.

1.3 Problem Statement

Medical training is considered very stressful and more so during residency which comes with high expectations and multiple responsibilities (Shibli Sadiq et al., 2019). Medical residents frequently encounter institutional stressors such as heavy workload with consequent sleep deprivation as well as personal stressors that may include family problems, social difficulties and financial constraints (Alosaimi, Kazim, et al., 2015). Alosaimi et al. (2015) further document professional stressors in terms of information overload that relates to the breadth and depth of knowledge covered during medical residency training.

A number of studies have evaluated stress levels among medical residents and established high prevalence rates ranging between 30- 70% compared with 18% for the general population (Abdulghani et al., 2015; Akinsulore et al., 2020; Mumtaz et al., 2010; Saiful & Yusoff, 2010; Saini et al., 2010; Vankar et al., 2011).

In sub-Saharan Africa, 40- 80% of medical doctors, nurses and other healthcare providers have been reported to have stress and burnout (Dubale et al., 2019). Studies in Kenya have found that 96.7% of medical doctors who included medical residents experienced high levels of burnout (Kokonya et al., 2014).

It is imperative to determine the stress-coping strategies employed by medical residents given these high prevalence rates in order to mitigate any emotional, mental and physical fatigue that may arise in the course of their training which not only adversely affects their quality of life but also patient care. One of the aims of this study will be to determine the coping strategies utilized by medical residents at the University of Nairobi in Kenya and further establish any association between their perceived stress levels and the coping strategies employed.

CHAPTER TWO

LITERATURE REVIEW

2.1 Prevalence of perceived stress among medical residents

Globally, there have been reports of higher levels of stress among medical residents relative to the general population. In the United States, family medicine residents were found to have a mean perceived stress score of 16.1 while using the PSS-10 which was higher than the perceived stress score range of 12-14 found in the general population (Zinurova & DeHart, 2018). The PSS-10 assesses the degree to which individuals appraise circumstances in their lives as stressful with scores ranging between 0 and 40. Low stress levels range between 0 and 13, moderate stress levels range between 14 and 26 whilst severe stress levels range between 27 and 40. Medical doctors in the United Kingdom have also reported high stress and burnout levels with one study documenting a prevalence rate of 31.5% (McKinley et al., 2020) while another one focusing on medical residents working in the accident and emergency departments in North London hospitals found that 51% were stressed (McPherson et al., 2003). In Germany, 17.1% of medical residents reported high stress levels and 39.5% were found to be moderately stressed (Bernburg et al., 2016).

A study assessing perceived stress among medical residents working in various teaching hospitals in Jordan using the PSS-10 found the mean perceived stress score was 21.6 (Maswadi et al., 2019a) whilst in Saudi Arabia it was 22, Turkey 19.9 and Argentina 21.7 (Alosaimi, Kazim, et al., 2015). Psychiatry residents in Singapore were found to have a mean perceived stress score of 24 (Chew et al., 2019). A study in India among 930 resident doctors working in different medical colleges found that the overall prevalence of stress was 32.8% while using the DASS-42 (Saini et al., 2010) with a more recent study utilizing the PSS-10, documenting a mean perceived stress score among postgraduate medical students as 17.96 which fell under the moderate stress category (Datar et al., 2017).

In Africa, a survey carried out by Abodunrin et al. (2017) among medical residents in a teaching hospital in Nigeria found that 53.7% were moderately stressed, 23.9% had severe stress while 22.4% experienced mild stress. Ogunsemi et al. (2010) had earlier established that 50% of medical residents in Nigeria regarded their life as being stressful. A current study among medical doctors working in a tertiary hospital in Ile-ife Nigeria who also included medical residents, revealed a stress prevalence rate of 43.2% confirming the presence and gravity of stress during

the medical residency training period (Akinsulore et al., 2020). The prevalence of stress among medical doctors in South Africa was found to be at 51% with 27% experiencing severe stress (Govender et al., 2012) with another study also concluding that medical residents in South Africa experienced high levels of stress and burnout (Sirsawy et al., 2016).

These findings were somewhat similar to a study done in Ethiopia which reported that 42.5% of postgraduate students in the college of Health Sciences at Jimma University were stressed (Zegeye et al., 2018). The prevalence of stress was also found to be high at 57.4% among undergraduate medical, dental and nursing students in Uganda (Amanya et al., 2018). In Kenya, 96.7% of medical doctors who included medical residents were noted to be experiencing high burnout (Kokonya et al., 2014).

2.2 Common sources of stress during medical residency training

A number of studies have identified various issues as causes of stress during medical residency training such as job pressure, time and task conflicts. Doctor-patient relationships have also been noted to involve high interpersonal and emotional demands (Chen et al., 2018). The Philadelphia resident service committee of the Association of Program directors in internal medicine grouped resident stressors into situational, personal and professional stressors (Kasi et al., 2007). Sleep deprivation, financial strain, lack of time for family or personal matters as well as the emotional drain of dealing with sickness and death were the common stressors among medical residents in the United States (Amir et al., 2018). Medical residents in Germany specializing in surgery and internal medicine reported high job demands while those in pediatrics, gynecology and neurology cited high emotional demands (Bernburg et al., 2016). Medical residents in Jordan reported their areas of stress as emanating from work, financial needs, academic requirements and familial obligations (Maswadi et al., 2019a) while those participating in a stress management course in Qatar listed long working hours with high patient volumes, challenges in communicating with other health care workers, sleep deprivation and the pressure to succeed in examinations as their main stressors (Afana et al., 2017).

These findings were similar to medical residents in India who reported duty hours, departmental academic activities and financial issues as their common reasons for stress during residency (Saini et al., 2010) as well as those in Malaysia who listed academic, performance pressures and work-family work- family conflicts as the main stressor domains affecting them (Saiful & Yusoff, 2010). In Nigeria, the requirements of academic, clinical and field work coupled with

harassment at work and familial responsibilities were the main stressors during medical residency training (O.L. et al., 2017). An earlier survey also found that the residents considered their training program to be hectic citing pressure from exams, regular evaluations, clinical workload coupled with insufficient time to rest (O.O. et al., 2010).

In Kenya, factors in the medical workers environment contributed to the leading cause of burnout with regards to work overload especially in busier departments, dealing with emergencies, poor doctor- patient bonding and professional conflicts among others (Kokonya et al., 2014).

2.3 Coping strategies employed by medical residents

Despite being exposed to somewhat similar situations in regards to medical residency training, medical residents will still view stress differently and this variation in stress perception results in adaptation of different strategies to either minimize or solve the issues causing stress (Guido et al., 2012). Persistence of stress with consequent development of burnout may be facilitated through utilization of ineffective coping mechanisms (Guido et al., 2012).

Chen et al. (2018) have pointed out that medical residents may actively choose behavioral or psychological responses which are geared towards altering the nature of stressors or one's opinion towards the stressful event. Such active coping strategies include planning, instrumental support and positive reframing of the situation among others. They further pointed out that others may passively engage in activities which prevent them from directly addressing the stressor such as denial, substance use, self-blame among others (Chen et al., 2018). Medical residents utilizing maladaptive coping strategies are more likely to be stressed (Kasi et al., 2007; Mamidipalli et al., 2018).

A survey among surgical residents across Canada revealed that most of them used exercise, consulting others, engaging in enjoyable activities and maintaining optimism as coping strategies with very few employing unhealthy methods such as smoking, alcohol and drug use (Aminazadeh et al., 2012). Medical doctors in the United Kingdom primarily used maladaptive coping strategies to manage work-related stress with self-distraction and self-blame being the most frequently reported coping mechanisms. Male doctors mostly used denial and humor to cope with stress while their female counterparts relied on emotional support and positive reframing (McKinley et al., 2020). Pharmacy residents in the United States listed spending time

with family and friends, staying optimistic and engaging in enjoyable activities as their main coping methods (Zinurova & DeHart, 2018).

Medical residents in Qatar utilized social support, entertainment, exercise and sleeping as coping mechanisms (Afana et al., 2017). Adaptive coping strategies such as planning and acceptance of the situation were used more frequently by medical residents training in Saudi Arabia relative to the dysfunctional strategies of which self-blame, self-distraction and venting were the most common (Alosaimi, Almuflleh, et al., 2015). Medical residents in India were found to be utilizing maladaptive coping strategies such as denial, distracting oneself and disengagement more frequently than their counterparts in Nepal (Mamidipalli et al., 2018) with female resident doctors in India employing emotional support and venting as coping strategies whilst their male colleagues used planning and humor to deal with stress (Vankar et al., 2011). Another study among 200 medical residents in India revealed that male residents utilized dysfunctional coping strategies such as denial, blaming oneself and substance use more frequently than female residents and that among the various specialties there was no difference in coping strategies utilized (Datar et al., 2017). Junior year psychiatry residents in Singapore primarily engaged in avoidance as a coping mechanism while the senior year residents mostly used denial and religion (Chew et al., 2019). Majority of medical residents in Nigeria preferred talking to others about their stress, sought spiritual help and opted to look on the bright side of life. Some employed dysfunctional coping strategies such as avoidance, blaming oneself, sleeping and eating more than usual with 5.2% resulting to alcohol, 1.7% cigarettes and 8.6% used medications to handle stress (O.O. et al., 2010). This was similar to a more recent study which concluded that adaptive coping strategies were employed more than the maladaptive ones (Akinsulore et al., 2020).

2.4 Association of sociodemographic factors and residency characteristics with perceived stress

Some studies assessing the impact of sex on stress levels have revealed that female medical residents report higher levels of stress compared to males (Alosaimi, Kazim, et al., 2015; Maswadi et al., 2019a; Zinurova & DeHart, 2018) whereas others have found no significant association of sex with stress level (Mumtaz et al., 2010; Vankar et al., 2011). Internal medicine residents in the United States were also found to have no gender differences in terms of stress levels (Braun, 2012).

A study carried out among medical residents in Dubai found that female residents were more stressed than male residents and that stress was more common among those who were married, residents who had children, those specializing in family medicine and residents who were in their second year of training. Medical residents who were in their fifth year or more were found to be the least stressed (Monsef et al., 2015). Female residents in Iran were also more stressed than males though marital status and having children lacked significant relationship with stress. It was also established that those in first and second year were more stressed. Medical residents in obstetrics and gynecology, surgery, orthopedics, pathology, neurosurgery and pediatrics were among the most stressed with those in radiology and dermatology being the least stressed (Ebrahimi & Kargar, 2018). There was no significant correlation between the area of specialization and stress level among postgraduate trainee doctors in Pakistan (Mumtaz et al., 2010) as well as in India (Mamidipalli et al., 2018; Vankar et al., 2011). A study in India among medical residents working in different medical colleges also found that those in first year were more stressed than the other years (Saini et al., 2010) which was similar to another study in Saudi Arabia (Abdulghani et al., 2015). This was also reported among psychiatry residents in Singapore where those in junior years (years 1 and 2) were found to be more stressed (Chew et al., 2019).

There was no difference in stress levels with regards to age, gender and marital status among psychiatry residents in Singapore (Chew et al., 2019) which was similar to international medical residents in Malaysia (Hussein et al., 2012).

In Nigeria, residents in obstetrics and gynecology were found to be the most stressed followed by those in internal medicine while those specializing in family medicine and psychiatry were found to be least stressed (O.L. et al., 2017) with 61.4% of medical residents reporting that they would pursue another career if they had another chance whilst 34.5% would consider changing to a different training program (O.O. et al., 2010). No major variations in stress levels between male and female medical residents were observed in an earlier study although single medical residents were found to be more stressed than those who were married (Issa et al., 2009).

A study done in Kenya among medical workers medical residents included, found no significant association between burnout and sex, age, marital status, experience years or religion (Kokonya et al., 2014). This was similar to a study among medical doctors in Zambia (Simuyemba & Mathole, 2019).

Overall, findings pertaining to the association of sociodemographic variables with stress have yielded mixed results.

2.5 Study Significance and Rationale

Organizations are becoming more concerned about their employees' physical and mental health and how stress and psychosocial factors impact their productivity (Maswadi et al., 2019a). Apart from coping with daily life stressors be they social, emotional, physical or family problems, medical residents have to deal with stresses unique to medical education such as wide academic curriculum, long duration of the course, financial debt and not enough time for relaxation (Oku et al., 2015). Several studies have found that the stress perceived by medical residents has to do more with their lack of adequate coping resources than with the actual occupational stressors thus necessitating the need for a clear understanding on how to balance professional and personal demands (Amir et al., 2018).

Promoting students well-being during medical training is paramount since medical students and resident doctors are known to experience high rates of psychological morbidity when compared to students in other areas of study. This would involve teaching them to recognize personal distress, adopt positive coping strategies and acknowledge any need for further help (Oku et al., 2015).

There is paucity of data locally on the evaluation of the coping strategies employed by medical residents given the high levels of documented stress and burnout and bearing in mind that the healthcare quality offered to patients can be impacted by medical residents' well-being during training. Furthermore the studies done in Africa are also few with majority targeting undergraduate medical students and general practitioners with no additional focus on coping mechanisms. This study therefore aims to not only assess perceived stress levels during medical residency training in Kenya but also determine the various coping strategies employed by medical residents thus adding to the pool of knowledge in our setting and form a basis for future research on this area.

The findings of the study will be useful to the medical residents in terms of enhancing awareness on the appropriateness of the coping strategies they employ. Similarly, the university administration and the dean school of medicine in conjunction with the chairpersons of the various departments could utilize the information gathered to incorporate the learning of stress management techniques and development of adaptive coping skills into the different curriculums

which will in turn benefit medical residents by enhancing and promoting their well-being during training.

2.6 Research Questions

1. What are the levels of perceived stress among medical residents at the University of Nairobi?
2. What are the positive and negative coping strategies employed by medical residents at the University of Nairobi?
3. Is there a significant association between perceived stress and demographic factors of medical residents at the University of Nairobi?
4. Is perceived stress associated with coping strategies among medical residents at the University of Nairobi?

2.7 Objectives

2.7.1 Broad Objective

To evaluate the levels of perceived stress among medical residents at the University of Nairobi and the coping strategies they employ to deal with stress.

2.7.2 Specific Objectives

1. To determine the levels of perceived stress among medical residents at the university of Nairobi.
2. To determine the positive and negative coping strategies employed by medical residents at the university of Nairobi.
3. To determine the association between perceived stress and demographic factors of medical residents at the university of Nairobi.
4. To determine the association between perceived levels of stress and coping strategies employed by medical residents at the university of Nairobi.

2.8 Conceptual Framework

Medical residents experience stress emanating from academic requirements, financial needs, work and familial obligations but despite being exposed to somewhat similar conditions in regards to medical residency training, they will still view stress differently and as a result of this variation in stress perception they employ different strategies to either minimize or solve the issues causing stress.(Guido et al., 2012; Maswadi et al., 2019b). Whether or not a medical resident perceives stress is mediated through the coping strategies they have developed over time.

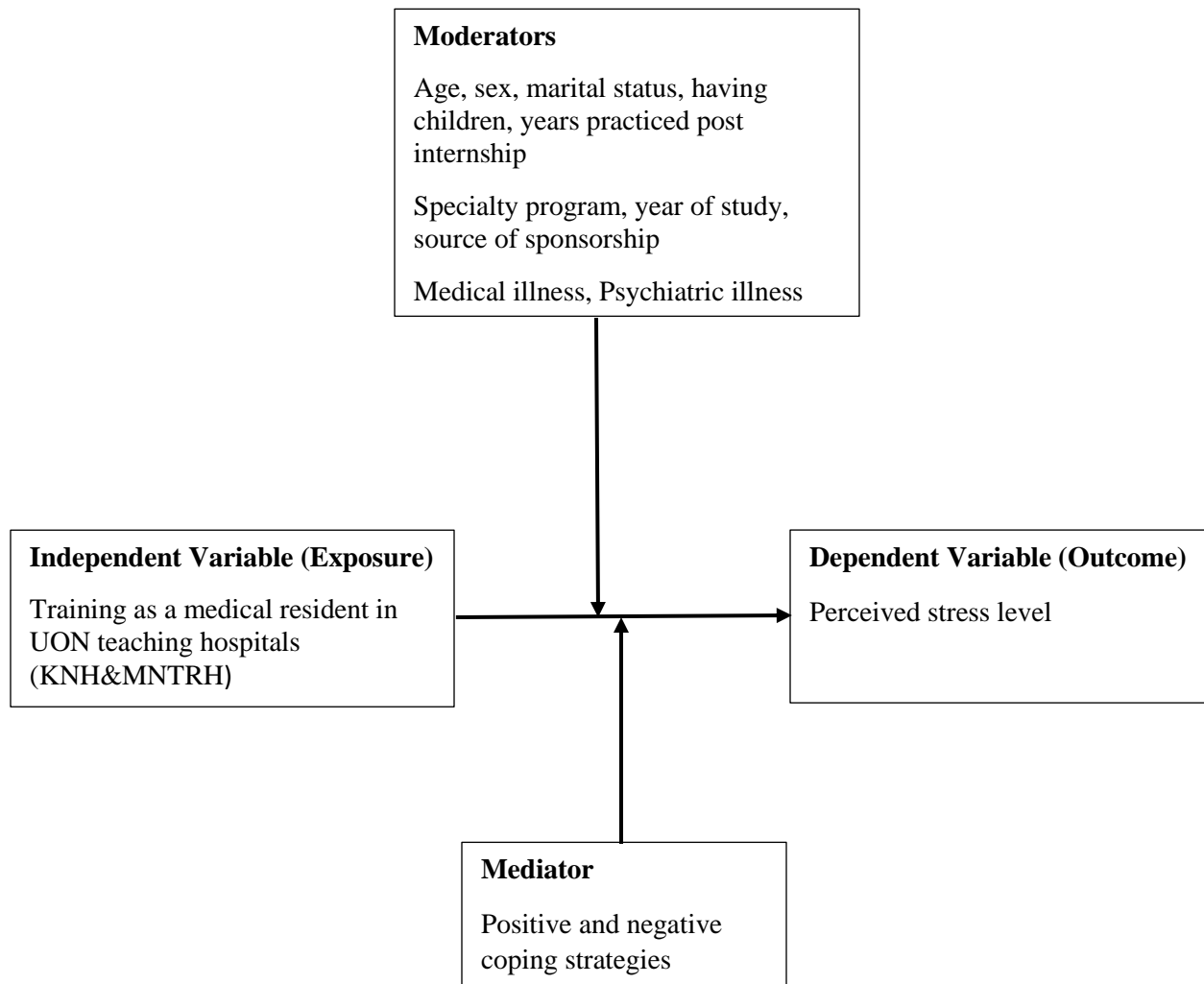


Figure 1: Conceptual model

2.9 Theoretical Framework

Coping is often characterized as cognitive and behavioral attempts to respond to a threat. Lazarus and Folkman in 1984 introduced the transactional model of stress and coping which emphasized that coping choices rely on both evaluating the danger (primary appraisal) and evaluating the resources required to tackle the danger (secondary appraisal).

Medical residents can be said to experience similar stressors in the course of their training with regards to fulfilling academic requirements whilst balancing work-life obligations but the differences in experiences of stress may depend on how a medical resident individually perceives the stressors. If an event or a situation during medical residency training is perceived in a positive manner or slightly threatening then the medical resident experiences less stress and vice versa. This perception of one's ability to face the said situation successfully, leads to effective coping. Persistence of stress may be facilitated by the use of ineffective coping strategies.

Empirical studies have noted that when a stressor is perceived as highly threatening, a person is more likely to utilize coping strategies that shift attention away from the stressor such as denial or cognitive and behavioral avoidance but when the threat severity and possibility of personal harm is appraised as something one can sufficiently handle, then adaptive coping strategies are employed such as seeking information geared towards solving the problem (Glanz et al., 2008). This study will seek to determine the levels of perceived stress among medical residents and the association with the coping strategies they employ to tackle the stressors experienced in the course of training.

CHAPTER THREE

METHODOLOGY

3.1 Study design

The study was an online survey utilizing the Survey Monkey software.

3.2 Study area

University of Nairobi School of medicine which enrolls medical residents to train in both Kenyatta National Hospital and Mathari National Teaching and Referral Hospital. UON began medical training in 1967 and currently has 14 departments handling both undergraduate and postgraduate studies. KNH is a public tertiary referral hospital situated in Nairobi County about three and a half kilometers from the central business center with a bed capacity of 1800. MNTRH is the national psychiatry teaching and referral hospital in Kenya with a 600 bed capacity and is situated in Nairobi county about ten kilometers from the central business center. Medical residents specializing in Psychiatry spend a majority of their training years here.

3.3 Study population

This consisted of medical residents enrolled in the various Master of medicine programs at the University of Nairobi who were training in their respective specialties at UON teaching hospitals (KNH&MNTRH). Their total number was 814 as of April 2021.

3.3.1 Inclusion criteria

1. Medical residents who were enrolled in the various residency programs at the University of Nairobi and were undertaking clinical duties in their respective specialties.
2. Medical residents who consented to take part in the study.

3.3.2 Exclusion criteria

1. Year 1 and Year 2 medical residents who were enrolled in Orthopedic surgery, General surgery, Plastic surgery, Neurosurgery, Cardiovascular and thoracic surgery, Pediatric surgery, Urology and ENT since they are usually based in UON- Chiromo campus for the first year and continue to rotate together in year 2 for principles of surgery before moving to their actual specialty.

3.4 Sample size determination

Using Cochran's (1977) formula with an estimated perceived stress prevalence (p) of 43% (Akinsulore et al., 2020), a confidence interval of 95% and a level of significance of 5% (0.05), the sample size was arrived at as follows:

$$n = \frac{z^2 p (1-p)}{d^2}$$

Where:

n – Estimated sample size

d – The level of precision

p - Proportion of those with the condition of interest

z – Confidence interval

$$n = \frac{1.96^2 \times 0.43 (1 - 0.43)}{0.05^2}$$

$$n = 377$$

Corrected sample size for finite population

$$n' = \frac{n}{1 + \frac{(n-1)}{N}}$$

Where;

n' = adjusted sample size

n = sample size

N = population size

The current population of medical residents training in their actual specialties at UON teaching hospitals (KNH & MNTRH) was **814**.

Thus;

$$N = 814$$

Therefore to get n' ,

$$n' = \frac{377}{1 + \frac{(377-1)}{814}}$$

$$n' = 258$$

3.5 Sampling procedure

Medical residents were grouped into two groups:

1. Medical- Psychiatry, Human pathology, Pediatrics and child health, Diagnostic radiology and Internal medicine. Total number in this group was **369**.
2. Surgical- Ophthalmology, Anesthesiology, Obstetrics & Gynecology, ENT, General surgery, Neurosurgery, Plastic surgery, Cardiovascular & Thoracic surgery, Urology, Pediatric surgery and Orthopedic surgery. Total number in this group was **445**.

Proportional allocation from each group was done by dividing the total number of medical residents in each group by the total population and then multiplying the result with the adjusted sample size. Thus arriving at 117 medical residents for the medical group and 141 for the surgical group. Further, proportional allocation for each department was done by dividing the total number of medical residents in that department over the total number of the group the department falls and multiplying the result by either 117 for the medical group or 141 for the surgical. Participant responses were then consecutively selected until the required number from each department was attained.

3.6 Recruitment and consenting procedure

After clearance from Kenyatta National Hospital- University of Nairobi Ethics and Research Committee (KNH-UON ERC), the principal investigator proceeded to create a Survey Monkey account which was password protected.

An online questionnaire with an introductory part stating the study purpose, procedure, potential risks and benefits was then generated. This introductory part also included confidentiality aspects and emphasized voluntary participation. Medical residents were asked to select at the end of the introductory portion whether they wanted to participate in the study or not and this action served as the participant consent before proceeding to fill in the questionnaire. If a medical resident chose to participate, they proceeded to the other sections of the questionnaire and were thanked for participating once they got to the end of the survey. If a medical resident declined to participate, they were automatically directed to the end of the survey without having access to the other parts of the questionnaire.

The principal investigator then contacted the various Chief Residents of the different Master of medicine programs via phone call and an accompanying text message introducing herself while

giving a brief overview of the study and then requested each chief resident to share the generated survey link with their fellow residents via their official internet-based social media messaging platforms. The generated survey link had an attached brief message that introduced the principal investigator, the study title and a request for participation. The contact information of the various chief residents was obtained from the respective departments.

The principal investigator was in communication with the various chief residents twice a week either via phone call or text message so as to remind them to remind their colleagues to complete the survey. Once the required number of responses from a particular department was attained, the principal investigator directly thanked the chief resident and requested that they convey her gratitude to their fellow medical residents through a short gratitude message that the principal investigator had drafted.

3.7 Study flow

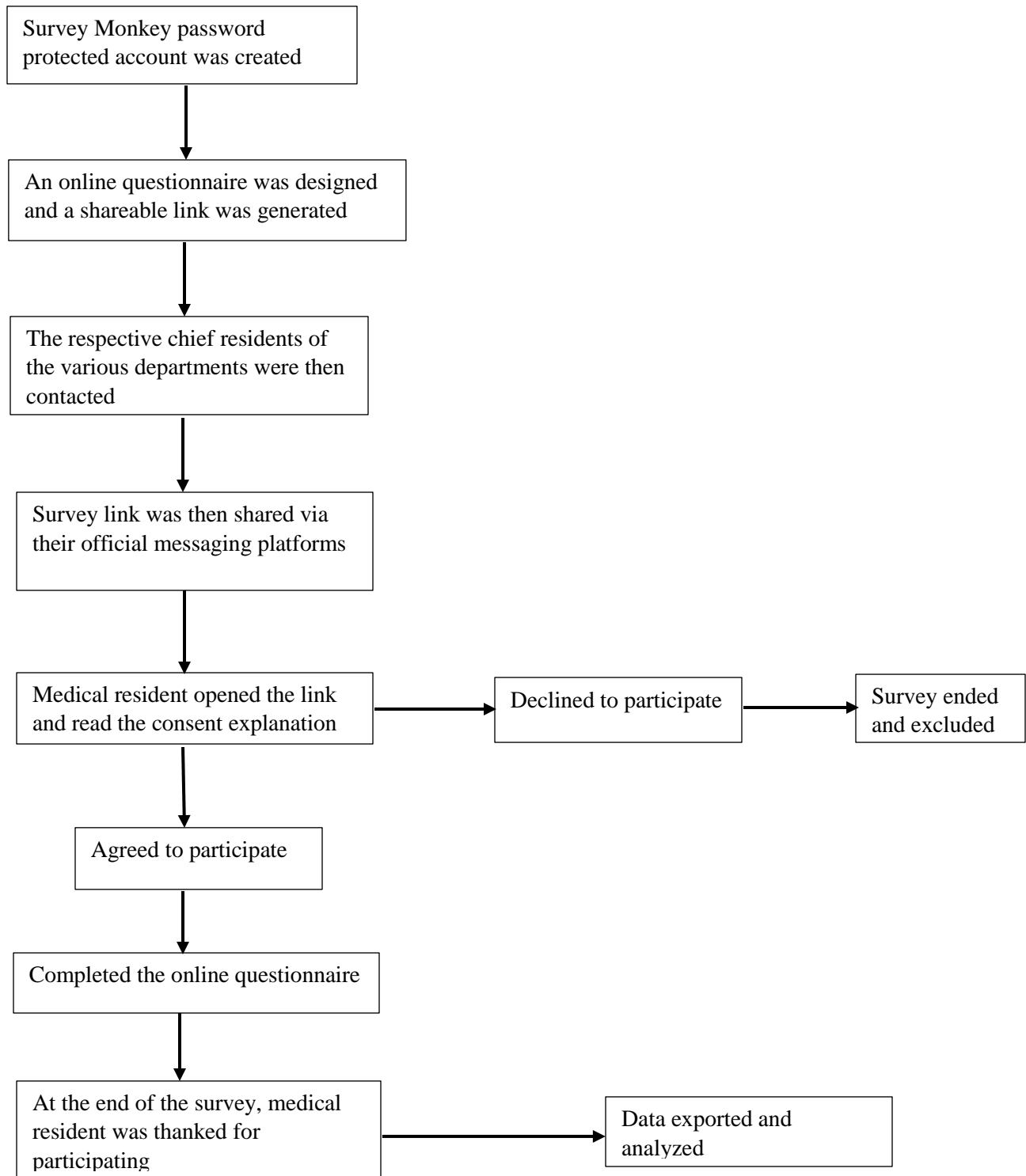


Figure 2: Study participants' recruitment and data collection flow chart

3.8 Data collection instruments

3.8.1 Socio-demographic and residency characteristics questionnaire

This was researcher- designed and included the participant's age, sex, marital status, number of children, general health information and residency characteristics such as year of study, specialty and source of training sponsorship.

3.8.2 Perceived Stress Scale-10

The ten item perceived stress scale (PSS-10) was used to assess levels of perceived stress among the participants. It is a self-reported questionnaire intended to determine the extent to which people evaluate circumstances in their lives as being stressful. The original version of the instrument which has 14 items was developed in 1983 by Cohen et al followed by a 10 item version in 1988. There is also a four-item version which makes data collection from large population samples over the phone feasible. The Perceived Stress Scale has been empirically validated with populations comprising mainly of college students and workers with the psychometric properties of the 10 item scale compared with the 14 item reported to be generally superior thus making it a suitable tool in both practice and research (Cohen, S., Kamarck, T., & Mermelstein, 1983). Systematic literature searches have revealed Cronbach's alpha of PSS-10 to be greater than 0.70 which is regarded as the minimum measure of internal consistency according to Nunnally and Bernstein in 1994 (Lee, 2012).

The PSS-10 consists of 10 items scored on a Likert scale with 0 = Never, 1= Almost never, 2= Sometimes, 3= fairly often and 4= very often. Scores are reversed for items 4, 5, 7 and 8. To get a total, scores for each item are then added up. Total scores range between 0 and 40 with higher scores indicating higher perceived stress. Mild stress scores are between 0 and 13, Moderate stress scores range between 14 and 26 while severe stress scores range between 27 and 40.

3.8.3 Brief COPE Inventory

This is the shortened version of the initial 60 item (15 scales with 4 items per scale) COPE inventory by Carver et al in 1989 which was noted to be quite lengthy with some items reported to be considerably redundant thus leading to participant impatience when completing the questionnaire. This was used to assess the frequency with which medical residents utilized various strategies in response to stress. The Brief COPE inventory consists of 28 items assessed on a 4-point Likert scale with 1= not at all, 2=a little, 3= fairly and 4= a lot. There are 14 coping strategies assessed with each strategy allocated two questions. Scores ranging from 1 to 4 are

assigned for every question. To find the total, scores are summed up for each coping strategy. The Cronbach's alpha values range 0.50 to 0.90 (Carver C.S., 1997).

Coping strategies can be grouped into either Approach coping strategies or Avoidant coping strategies. Approach strategies include active coping, emotional support, instrumental support, positive reframing, planning and acceptance. Avoidant strategies include distracting oneself, self-blame, denial, substance use and behavioral disengagement. Humor and religion may be classified as neither avoidant nor approach.

Some studies have grouped the strategies into either adaptive coping strategies or maladaptive coping strategies with adaptive strategies referring to the approach strategies mentioned above plus humor and religion. Maladaptive strategies included the avoidant strategies previously outlined (Akinsulore et al., 2020; Alosaimi, Almufleh, et al., 2015; Kasi et al., 2007; McKinley et al., 2020). These categorizations are however left at the user's discretion (Carver C.S., 1997).

3.9 Reliability and Validity

The principal investigator conducted a pre-test of the survey using 26(10% of the respondents) medical residents randomly sampled from the group that was to be excluded from the study. This was to determine the average duration it took to complete the survey and rectify any flaws with the survey design that would impact on the validity and reliability.

3.10 Quality assurance procedures

Research ethics were adhered to during the study process. All participants received the same questionnaire to ensure uniformity. Completeness of the questionnaire was ensured by programming the survey in such a way that one was only able to progress to the next question after having filled the previous one. Survey Monkey identified the IP (Internet Protocol) addresses of devices used in filling out the survey thus restricted participants to participating only once. In consultation with a qualified biostatistician the principal investigator ensured the data was managed and analyzed appropriately.

3.11 Ethical consideration

Approval to conduct the study was sought from the University of Nairobi department of Psychiatry and Kenyatta National Hospital- University of Nairobi Ethics and Research Committee (KNH-UON ERC). Data collection did not commence until ethical approval was obtained.

Participation in the study was voluntary and based on recorded informed consent before beginning the online survey. Anonymity and participant confidentiality was ensured by not using any personal identifiers. The system generated identification numbers were used as the study identification numbers. The data collected was stored in the Survey Monkey data base that was restricted to the principal investigator's account which was password protected. An encrypted code was then used to protect the downloaded data on the software during and after data analysis.

3.12 Data management and analysis

Survey Monkey which is an online survey development cloud based software was used for data collection. An account was created for the development of data collection tools and storage of data that was generated. The Survey Monkey account was password protected and restricted access to the principal investigator who was the 'owner' of the account. Information collected was stored in Survey Monkey's cloud database and later exported as a Microsoft excel file for cleaning and coding. The data was then exported to STATA 13.0 software for verification and analysis.

For continuous variables, demographic data was presented as means and standard deviation. Data for categorical variables was presented as tables of frequencies and percentages. Levels of perceived stress were classified as mild, moderate and severe and presented as proportions in form of a bar graph. Binary logistic regression (odds ratio (95%CI) and p value <0.05) was used to determine the association between the dependent and independent variables. Significant associations were defined by a p value < 0.05. Stress-coping strategies were clustered into adaptive and maladaptive strategies. Adaptive strategies included religion, active coping, planning, acceptance, positive reframing, instrumental support, humor and emotional support. Maladaptive strategies included denial, self-blame, self-distraction, venting, behavioral disengagement and substance use. The scores were analyzed as continuous variables. Spearman's correlation was used to analyze the correlation between perceived stress and coping strategies employed. Significant correlations were defined by a p value < 0.05.

CHAPTER FOUR

RESULTS

4.1 Response

A total of 260 medical residents who were training at UON teaching hospitals (KNH and MNTRH) participated in the online survey. The calculated sample size was 258 but on proportional allocation per the various specialty programs, the sample size arrived at was 260.

4.2 Demographic characteristics of Medical residents

More than half of the participants, 147 (56.5%) were females while 113 (43.5%) were males. About half of the medical residents 136 (52.3%) were aged 31-34 years. The mean age was 32.9 years (SD=3.37) with the youngest medical resident being 26 years old while the oldest was 48 years old. Majority of the medical residents were married 159 (61.2%) and had children 171(65.8%).

Regarding residency characteristics, most of the medical residents were in a surgical specialty 143 (55%) and had training sponsorship 165(63.5%). About a third of the participants were in their 3rd year of study 93 (35.8%). Majority of the medical residents 221 (85%) would not choose a different specialty program if given the opportunity while only 39 (15%) would.

With regards to years of practice, most 171 (65.8%) had worked between 5-10 years post-internship. The mean years of experience was 5.9 years (SD= 2.7)

Only 37 (14.7%) and 35 (18.3%) of medical residents reported having medical and psychiatric conditions respectively. Of these, 28 (75.7%) of those with medical conditions and 6 (17.1%) of those with psychiatric conditions were on follow up.

The table below summarizes the demographic characteristics of the medical residents who participated in the study.

Table 1: Demographic characteristics of medical residents

Variable	Characteristic	Frequency	Percentage
Sex	Female	147	56.5
	Male	113	43.5
Age	< =30 Years	58	22.3
	31-34 Years	136	52.3
	> =35 Years	66	25.4
Marital status	Single	91	35
	Married	159	61.2
	Divorced	6	2.3
	Widowed	4	1.5
Have children	No	89	34.2
	Yes	171	65.8
Specialty	Medical	117	45
	Surgical	143	55
Training sponsorship	No	95	36.5
	Yes	165	63.5
Year of study	1	48	18.5
	2	68	26.2
	3	93	35.8
	4	38	14.6
	5	11	4.2
	6	2	0.7
Years of practice	< 5 Years	79	30.4
	5-10 Years	171	65.8
	> 10 Years	10	3.8
Change specialty	No	221	85
	Yes	39	15
Medical condition	No	214	85.3
	Yes	37	14.7
Follow up	No	9	24.3
	Yes	28	75.7
Psychiatric condition	No	217	91.7
	Yes	35	8.3
Follow up	No	29	82.9
	Yes	6	17.1

4.3 Medical conditions reported by medical residents

There were 37 medical residents who reported having a medical condition. Of these, asthma 17 (46%) was the most commonly reported condition while conditions of the genitourinary tract were the least reported 1 (2.7%). The figure below shows the distribution of the medical conditions.

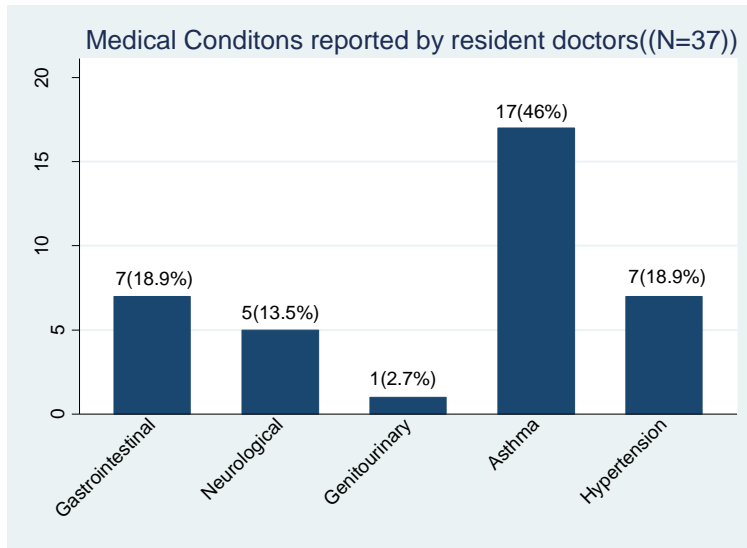


Figure 3: Medical conditions reported by medical residents

4.4 Psychiatric conditions reported by medical residents

There were 35 medical residents who reported having a psychiatric condition. Of these, anxiety 16 (45.7%) was the most commonly reported condition while bipolar 3 (8.6%) was the least reported condition. The figure below shows the distribution of the psychiatric conditions.

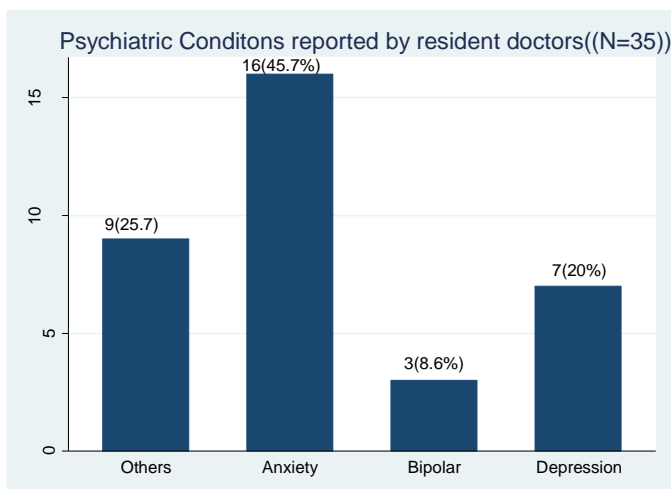


Figure 4: Psychiatric conditions reported by medical residents

4.5 Levels of Perceived Stress among medical residents

Among the medical residents, 43 (16.5%, 95%CI: 11.7-20.5%) had mild stress, 165 (63.5%, 95%CI: 57.4-68.9%) had moderate stress and 52 (20%, 95%CI: 15.8-25.5%) had severe stress. The mean score for perceived stress was 20 (SD=6.8).

The PSS-10 which consists of 10 items scored on a Likert scale with 0 = Never, 1= Almost never, 2= Sometimes, 3= fairly often and 4= very often was used. Scores were reversed for items 4, 5, 7 and 8. To get a total, scores for each item were then added up. Mild stress scores were between 0 and 13, Moderate stress scores were between 14 and 26 while severe stress scores ranged between 27 and 40.

The figure below shows the levels of perceived stress among the medical residents.

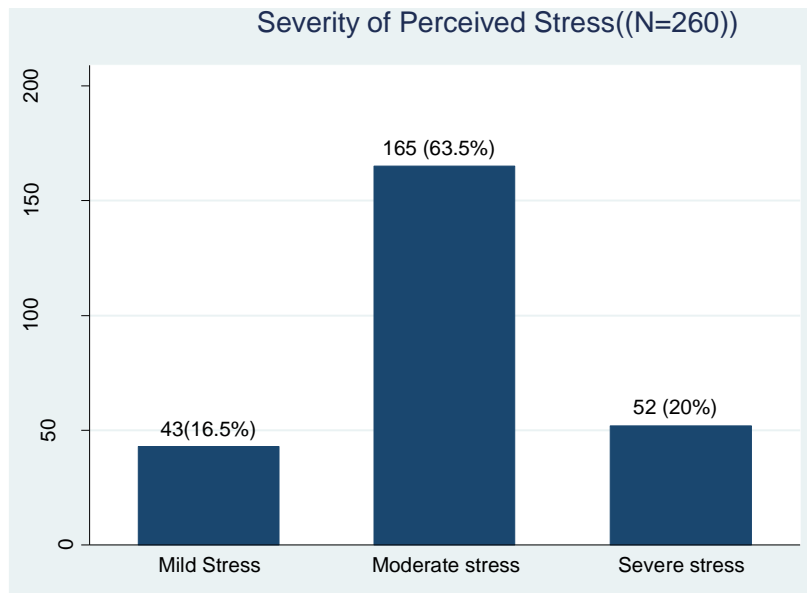


Figure 5: Levels of perceived stress

4.6 Coping strategies employed by medical residents

The table below summarizes the adaptive and maladaptive coping strategies utilized by medical residents with a minimum score of 2 and a maximum score of 8 for each strategy while using Brief COPE inventory. Higher scores indicated more frequent use of a strategy. Adaptive strategies were more frequently used compared to maladaptive strategies.

The most commonly used adaptive strategies were planning (72.5%), acceptance (68.9%) and active coping (68.5%). The least used was humor (50.9%). The most commonly used

maladaptive coping strategies were self-distraction (63.8%), self-blame (56.1%) and venting (55.6%). The least strategy used was substance use (36.5%)

Table 2: Coping strategies employed by medical residents

Coping strategy	Maximum score	Mean	SD.	Relative score (%)
Adaptive	64	41.45	8.12	64.8
Active Coping	8	5.48	1.52	68.5
Emotional Support	8	5.13	1.72	64.1
Instrumental Support	8	4.88	1.69	61
Positive Reframing	8	5.39	1.57	67.4
Planning	8	5.80	1.52	72.5
Humor	8	4.07	1.70	50.9
Acceptance	8	5.51	1.46	68.9
Religion	8	5.20	1.94	65
Maladaptive	48	23.79	6.45	49.6
Self-Distraction	8	5.10	1.69	63.8
Denial	8	3.35	1.57	41.9
Substance Use	8	2.92	1.53	36.5
Behavioral Disengagement	8	3.48	1.54	43.5
Venting	8	4.45	1.53	55.6
Self-Blame	8	4.49	1.81	56.1

4.7 Association between perceived stress and demographic factors of medical residents

In bivariate analysis, males ($p=0.016$), surgical specialty ($p=0.017$), medical condition ($p=0.001$) and psychiatric condition ($p=0.000$) were significantly associated with perceived stress among the medical residents. Male medical residents had 57% lower odds of reporting perceived stress compared to their female counterparts. Medical residents in surgical specialties had 54% higher odds of reporting perceived stress compared to residents in medical specialties. Medical residents who suffered from a medical condition had 3.4 times higher odds of reporting perceived stress compared to those who did not have a medical condition. Those who had a psychiatric condition had 5.2 times higher odds of reporting perceived stress compared to those who did not suffer any psychiatric condition.

In multivariate analysis, gender, education sponsorship and presence of a psychiatric condition were significantly associated with perceived stress. Male medical residents had 41% lower odds of having stress compared to the female medical residents, AOR 0.59(0.29, 1.27) ($p=0.004$)

Medical residents who were on sponsorship, either from government or county, had 63% lower odds of having stress compared to medical residents who were self-sponsored. AOR 0.37 (0.15, 0.89) (p=0.027). Medical residents who reported that they have a psychiatric condition had 2.83 times higher odds of having stress compared to those who did not report any psychiatric condition. AOR 2.83 (1.32, 8.68) (p=0.030). These findings are demonstrated in Table 3 below.

Table 3: Logistic regression on demographic factors associated with stress

Variable	No stress N=43 (%)	Stress N=217(%)	COR (95%CI.)	P value	AOR (95% CI.)	p value
Sex						
Female	19 (12.9)	128 (87.1)	1 (Ref.)		1 (Ref.)	
Male	24 (21.2)	89 9(78.8)	0.43(0.18,1.06)	0.016	0.59 (0.29,1.27)	0.004
Age						
< =30 years	3 (5.1%)	55 (94.9)	1 (Ref.)		1 (Ref.)	
31-34 years	26 (19.1)	110(80.8)	1.07(0.51,2.22)	0.866	0.29 (0.08,1.12)	0.073
> =35 years	14 (35.9)	25 (64.1)	0.41(0.15,1,11)	0.080	2.6 (1.71,3.48)	0.143
Marital status						
Single	16 (17.6)	75 (82.4%)	1 (Ref.)		1 (Ref.)	
Married	24 (15.1)	135 (84.9)	0.88(0.46,1.68)	0.700	1.62 (0.78,3.38)	0.194
Others	3(33.3)	7(66.7)	1.62(0.39,2.7)	0.510	0.5 (0.11,2.3)	0.377
Sponsorship						
No	8(8.4)	87 (91.6)	1 (Ref.)		1 (Ref.)	
Yes	35 (21.2)	130(78.8)	0.82(0.44,1.52)	0.520	0.37 (0.15,0.89)	0.027
Specialty						
Medical	20 (17.1)	97 (82.9)	1 (Ref.)		1 (Ref.)	
Surgical	23 (16.1)	120(83.9)	1.54(0.83,2.9)	0.017	1.3 (0.64,2.62)	0.472
Years of practice						
<5 years	9 (11.4)	70(88.6)	1 (Ref.)		1 (Ref.)	
> =5 years	34 (18.8)	147(81.2)	0.57(0.31,1.07)	0.082	0.92 (0.38,2.21)	0.850
Medical Condition						
No	41 (18.6)	179 (81.4)	1 (Ref.)		1 (Ref.)	
Yes	2 (5.7)	35 (94.3)	3.41(1.65,7.05)	0.001	4.59 (0.98,21.6)	0.053
Psychiatric Condition						
No	40 (17.7)	185 (82.3)	1 (Ref.)		1 (Ref.)	
Yes	3 (8.6)	32 (91.4)	5.23(2.09,13.2)	0.000	2.83 (1.32,8.68)	0.030
Children						
No	13 (14.6)	76 (85.4)	1 (Ref.)		1 (Ref.)	
Yes	30 (17.5)	141 (82.5)	0.72(0.38,1.34)	0.297	1.13 (0.39,3.20)	0.223

4.8 Association between perceived stress and coping strategies employed by medical residents

There was a significant negative correlation ($p=0.0013$) between adaptive coping strategies and the severity of perceived stress. Medical residents who had higher scores of adaptive coping strategies generally reported lower perceived stress levels. This association was significant with regards to active coping ($p=0.0003$), positive reframing ($p=0.0000$) and acceptance ($p=0.0003$) coping strategies.

There was a significant positive correlation ($p=0.0000$) between maladaptive coping strategies and the severity of perceived stress. Medical residents who had higher scores of maladaptive coping strategies generally reported higher perceived stress levels. This association was significant for all maladaptive coping strategies with the exception of substance use. The table below summarizes the findings.

Table 4: Correlation between perceived stress and coping strategies

Coping strategy	Spearman's (rho)	p <0.05
Adaptive	-0.1988	0.0013
Active Coping	-0.2231	0.0003
Emotional Support	-0.0656	0.2921
Instrumental Support	-0.0586	0.3467
Positive Reframing	-0.3823	0.0000
Planning	-0.0095	0.8786
Humor	0.0978	0.1157
Acceptance	-0.2205	0.0003
Religion	-0.0476	0.4444
Maladaptive	0.4948	0.0000
Self-Distraction	0.3293	0.0000
Denial	0.2518	0.0000
Substance Use	0.1028	0.0980
Behavioral Disengagement	0.4549	0.0000
Venting	0.2294	0.0002
Self-Blame	0.4667	0.0000

CHAPTER FIVE

DISCUSSION

This chapter shall focus on addressing the study objectives as well as recommendations emanating from the study findings. It will also address the study strengths and limitations. The specific objectives of this study were:

1. To determine the levels of perceived stress among medical residents at the university of Nairobi.
2. To determine the positive and negative coping strategies employed by medical residents at the university of Nairobi.
3. To determine the association between perceived stress and demographic factors of medical residents at the university of Nairobi.
4. To determine the association between perceived levels of stress and coping strategies employed by medical residents at the university of Nairobi.

5.1 Perceived stress levels

This study revealed that majority of the medical residents were stressed with more than half (63.5%) recording moderate stress levels which was somewhat similar to a previous Kenyan study that found most of the medical doctors who included medical residents, had high levels of stress and burnout (Kokonya et al., 2014) as well as medical residents in South Africa (Sirsawy et al., 2016). The findings of this study are also comparable to a survey done by Abodunrin et al. (2017) among medical residents in a teaching hospital in Nigeria where more than half of them were found to be moderately stressed. These findings are also replicated among medical residents in Germany (Bernburg et al., 2016), Jordan (Maswadi et al., 2019a) as well as India (Mamidipalli et al., 2018).

The mean PSS-10 score among medical residents in this study was 20 (moderate stress). This finding was comparable to studies carried out among medical residents in Jordan (mean 21.6), Turkey (mean 19.9) and India where the mean PSS score was 18 (Alosaimi, Kazim, et al., 2015; Datar et al., 2017; Maswadi et al., 2019a). These similarities could be attributed to the use of similar stress assessment tools and the fact that globally, medical training is considered to be

stressful with stress prevalence rates among medical doctors documented to be among the highest of all professions (Govender et al., 2012).

However, the levels of perceived stress in this study were found to differ from similar studies done in Malaysia (Saiful & Yusoff, 2010), Bangladesh (Shibli Sadiq et al., 2019) and Dubai (Monsef et al., 2015) that found most of the medical residents had low stress levels. These variations may be due to differences in the data collection instruments as well as environmental factors with regards to training environment.

5.2 Demographic characteristics and Perceived stress

This study revealed that female medical residents were more stressed than male medical residents and this was statistically significant, AOR 0.59(0.29, 1.27) ($p=0.004$). This finding was comparable to similar studies done in Saudi Arabia (Alosaimi, Kazim, et al., 2015), Dubai (Monsef et al., 2015), Jordan (Maswadi et al., 2019a) as well as in Singapore (Chew et al., 2019). It is possible that this may be due to the competing demands female medical residents encounter when balancing motherhood, spousal obligations and their professional ambitions. Other studies have however found no significant association between sex and stress levels (Braun, 2012; Datar et al., 2017; Mumtaz et al., 2010; Vankar et al., 2011). Some studies have reported comparable stress levels between male and female residents (Hussein et al., 2012; Issa et al., 2009) and this may be due to the expectation that medical residents, regardless of gender, perform comparable duties in their various specialties.

Another significant finding in this study was that medical residents who were on sponsorship, either from government or county, had 63% lower odds of having stress compared to medical residents who were self-sponsored AOR 0.37 (0.15, 0.89) ($p=0.027$). Financial responsibilities are a well-documented source of stress during medical residency training, therefore having some of these obligations reduced by obtaining study sponsorship lessens some of the burden on medical residents.

During bivariate analysis, this study found that medical residents with medical conditions ($p=0.001$) and those with psychiatric conditions ($p=0.000$) were more stressed than those without. However, during multivariate analysis medical residents who reported that they had a psychiatric condition had 2.83 times higher odds of having stress compared to those who did not

report any psychiatric condition. AOR 2.83 (1.32, 8.68) ($p=0.030$). This finding was comparable to a study among postgraduate medical students in India that revealed a significant correlation between perceived stress and self-reported psychopathology and also that medical residents with a medical illness had higher stress scores (Datar et al., 2017). This might be attributed to the additional stress that comes with having an illness on top of the daily stressors encountered in the course of training. Medical training may take a toll on an individual's physical and mental well-being.

Medical residents in the surgical specialties in this study, were found to have higher odds of reporting perceived stress compared to residents in medical specialties although this was not statistically significant during multivariate analysis. Studies carried out in Pakistan and India among postgraduate medical trainees have also shown no significant correlation between the area of specialization and stress level (Mamidipalli et al., 2018; Mumtaz et al., 2010; Vankar et al., 2011)

This study also found no significant association between perceived stress and age, marital status, having children and years of practice. A study done in Kenya among medical workers who included medical residents also found no significant association between burnout and age, marital status and years of experience (Kokonya et al., 2014). There was also no significant relationship between stress and marital status as well as having children among medical residents in Iran, Singapore, Malaysia and Nigeria (Chew et al., 2019; Ebrahimi & Kargar, 2018; Hussein et al., 2012; O.L. et al., 2017).

5.3 Coping strategies

Medical residents in this study were found to be using adaptive coping strategies more frequently than maladaptive coping strategies. The most frequently used adaptive strategies were planning, acceptance and active coping with the least being humor. Maladaptive coping strategies that were more frequently employed included self- distraction, self- blame and venting. Substance use was the least used maladaptive strategy.

These findings are similar to a study done in Nigeria by Akinsulore et al. (2020) that found medical doctors including medical residents, were utilizing adaptive coping strategies more frequently than maladaptive strategies. Active coping was the most frequently used adaptive

strategy while humor was the least. The maladaptive coping strategy that was frequently employed was self-distraction while substance use was the least utilized.

The findings of this study are also replicated among medical residents in Saudi Arabia who were found to be using adaptive strategies more than the maladaptive ones with religion, planning and acceptance being the most frequently used adaptive coping strategies while self-blame, self-distraction and venting were the most frequently employed maladaptive coping strategies (Alosaimi, Almufleh, et al., 2015). Similarly, surgical residents across Canada were found to utilize positive coping strategies more frequently than negative strategies with substance use also being the least employed coping strategy (Aminazadeh et al., 2012). The use of substances as the least employed maladaptive strategy may either be as a result of the scientific knowledge possessed by medical residents with regards to the harmful effects of alcohol and other drugs or the reluctance by medical residents to reveal the actual frequency with which they indulge in such behaviour.

However, the study findings differed with a survey carried out among medical doctors in England, Scotland, Wales and Northern Ireland that concluded maladaptive coping strategies were more frequently used compared to adaptive strategies (McKinley et al., 2020). This difference may be explained by the observation that people not only have varying stress thresholds but also coping methods while dealing with stress (O.L. et al., 2017).

5.4 Perceived stress and coping strategies

Based on the results of this study, medical residents who had higher scores of adaptive coping strategies generally reported lower perceived stress levels and this was significant with regards to active coping ($p=0.0003$), positive reframing ($p=0.0000$) and acceptance ($p=0.0003$) coping strategies. The study also revealed that medical residents who had higher scores of maladaptive coping strategies generally reported higher perceived stress levels ($p=0.0000$) and that this association was significant for all maladaptive coping strategies with the exception of substance use.

These findings are in keeping with the results of a majority of other similar studies across the globe that have found medical residents who employed maladaptive strategies in response to stress were more likely to be stressed compared to those who utilized adaptive coping strategies

(Datar et al., 2017; Kasi et al., 2007; Mamidipalli et al., 2018; Vankar et al., 2011). A study among 917 medical residents in Saudi Arabia revealed that maladaptive coping strategies were associated with higher stress levels and that the correlation was significant for all individual and overall maladaptive strategies ($p < 0.001$) with the exception of substance use (Alosaimi, Almufleh, et al., 2015).

Empirical studies have also noted that when a stressor is perceived as highly threatening, a person is more likely to utilize coping strategies that shift attention away from the stressor such as denial or cognitive and behavioral avoidance but when the threat severity and possibility of personal harm is appraised as something one can sufficiently handle, then adaptive coping strategies are employed such as seeking information geared towards solving the problem (Glanz et al., 2008).

5.5 Conclusion

Majority of the medical residents in this study were stressed and were experiencing moderate stress levels. There was a significant association between perceived stress and sex, availability of training sponsorship and presence of a psychiatric illness. Medical residents employed adaptive coping strategies more frequently than maladaptive strategies. Higher perceived stress levels were reported among medical residents utilizing maladaptive coping strategies compared to those who employed adaptive coping strategies.

5.6 Recommendations

Incorporation of regular informal programs into the various curriculums such as team building activities that encourage social connectedness among medical residents as well as between medical residents and faculty members thus enhancing social support which can be used to mitigate stress.

Development of peer support programs within the various specialties that promote an open and safe space to actively discuss any issues encountered in the course of residency training and how to tackle them.

Departments should strengthen mentorship programs with the aim of empowering and supporting medical residents in both their personal and professional goals.

There is a need for each specialty department to create regular stress management programs that can promote the appropriate use of adaptive coping strategies. These programs can also be part of the undergraduate medical training curriculum thereby equipping medical students with skills that they can employ during internship all the way to the postgraduate period.

Since factors that cause stress among medical residents may be unique to each specialty, further studies are needed to identify such stressors. This information may be helpful in developing stress management programs that are tailored towards the specific needs of medical residents.

5.7 Study strengths

This study provided insight into the stress- coping strategies employed by medical residents at the University of Nairobi in Kenya for the first time.

The use of empirically validated data collection instruments increased the validity of the study findings.

5.8 Study limitations

The study was conducted among medical residents from one university in Kenya thus findings may not be able to be generalized to other medical residents in other universities owing to the fact that each university may have its own regulations.

Since the study utilized a non-probability method, the findings of the study may not be generalized to the entire medical resident population.

The data was self-reported thus the possibility of social desirability bias with regards to some coping strategies may not be excluded.

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APPENDICES

Appendix 1: Consent explanation

Introduction

Dr Yvonne Njeri who is currently a medical resident at the Department of Psychiatry, University of Nairobi, is conducting a study on stress and coping strategies among medical residents at the University of Nairobi and would like to request for your participation.

Study purpose

The purpose of the study is to determine the levels of perceived stress during medical residency training and the stress-coping strategies utilized by medical residents at the UON.

Study procedures

Your participation in this survey is entirely voluntary and if you decide to participate, you are free to withdraw at any time without any repercussions with regards to your academic and professional standing at the university. There will be no compensation provided for participating in the study.

This will be an online survey among medical residents in the various specialty programs currently training at UON teaching hospitals (KNH& Mathari). Should you choose to participate, you will be required to answer some questions pertaining to the study title. The questions will be categorized into 3 parts.

Part 1 will include questions about socio-demographic factors, general health information and residency characteristics

Part 2 will comprise questions pertaining to perceived stress.

Part 3 will comprise questions to determine coping strategies.

Potential benefits

The findings of the study will be useful to medical residents in terms of enhancing awareness on the appropriateness of the coping strategies they employ. The principal investigator will share the study findings and any recommendations emanating from the study with the dean school of medicine and the chairpersons of the various departments who in turn could utilize the information gathered to create programs that enhance and promote medical residents' well-being during training.

Risks and discomforts

A potential risk of the study may include concerns regarding privacy in which case you can be assured that every information you share will be kept as confidential as possible and that a code number will be the only identifier in a password protected computer database.

Confidentiality: No name or any other personal identifier will be used in any report or publications arising from this study. The data collected will be stored into a password protected computer which will only be accessible to the principal investigator, supervisors and statistician.

Additional information

If you have further questions or concerns about participating in this study that have not been answered above, you may contact the following:

Principal Investigator:

Dr Yvonne Njeri

Tel: 0722528257

Email: rinjennovy@gmail.com

Supervisors:

1. Prof. Muthoni Mathai

Email: amuthoni@uonbi.ac.ke

2. Prof. David Ndetei

Email: dmndetei@uonbi.ac.ke

Kenyatta National Hospital/ University of Nairobi Ethics and Research Committee

P.O Box 19676-00202 Nairobi

Tel: (020) 2726300-9 Ext. 44355

Email: uonknh_erc@uonbi.ac.ke

Certificate of consent

I have read the foregoing information and I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction.

I consent to voluntarily participate in this study: Yes No

Appendix 2: Socio-demographic and Residency characteristics questionnaire

Please answer each question as accurately as possible by selecting the correct answer or filling in the space provided.

1. Age in years
20-24 25-29 30-34 35-39 40 and above
2. Sex: Male Female
3. What is your marital status? Single Married Separated
Divorced Widowed
4. Do you have any children? Yes No
5. How many children do you have? 1 2 3 More than 3
6. Who finances your medical residency training at the university? Self
County/ Government Other
7. How many years have you practiced since qualification (post internship)? <5 years
5-10 years >10years
8. Which master of medicine program are you enrolled in?
9. What is your current year of study as per your program ? 1st 2nd 3rd 4th
5th 6th
10. Would you consider choosing a different specialty program if you could?
Yes No

General health information

1. Do you suffer from any chronic medical condition? Yes No
2. If Yes above, select from the options below Hypertension Diabetes Asthma
Genitourinary Neurological Gastrointestinal
3. Are you on treatment and/ or follow up for the above? Yes No
4. Do you suffer from any psychiatric condition? Yes No
5. If yes, select from the options Depression Bipolar disorder Anxiety
Substance Use Disorder Others
6. If yes, are you on treatment and/ or follow up? Yes No

Appendix 3: Perceived stress scale – 10

This is a self-reported questionnaire intended to determine the extent to which people evaluate circumstances in their lives as being stressful. The original version of the instrument which has 14 items was developed in 1983 by Cohen et al followed by this shorter 10 item version in 1988. The following questions ask about your feelings and thoughts during the last one month. Indicate how often you thought or felt a certain way.(Cohen, S., Kamarck, T., & Mermelstein, 1983)

0= Never 1= Almost never 2= sometimes 3= fairly often 4= very often

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and stressed?
4. In the last month, how often have you felt confident about your ability to handle your personal problems?
5. In the last month, how often have you felt that things were going your way?
6. In the last month, how often have you found that you could not cope with all the things that you had to do?
7. In the last month, how often have you been able to control irritations in your life?
8. In the last month, how often have you felt that you were on top of things?
9. In the last month, how often have you been angered because of things that happened that were outside of your control?
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Appendix 4: Brief COPE Inventory

This is a shortened version of the initial 60 item COPE inventory by Carver et al in 1989. The following questions seek to understand the frequency with which you utilize various strategies in response to stress (Carver C.S., 1997).

In each question kindly select how often you engage in the said action in response to stress.

	Not at all	A little	Fairly	A lot
I've been turning to work or other things to take my mind off things				
I've been concentrating my efforts on doing something about the situation I'm in				
I've been saying to myself "this isn't real"				
I've been using alcohol or other drugs to make myself feel better				
I've been getting emotional support from others				
I've been giving up trying to deal with it				
I've been taking action to try to make the situation better				
I've been refusing to believe that it has happened				
I've been saying things to let my unpleasant feelings escape				
I've been getting help and advice from other people				
I've been using alcohol or other drugs to help me get through it				
I've been trying to see it in a different light, to make it more positive				
I've been criticizing myself				
I've been trying to come up with a strategy about what to do				
I've been getting comfort and understanding from someone				
I've been giving up the attempt to cope				
I've been looking for something good in what is happening				
I've been making jokes about it				
I've been doing something to think about it less e.g. going to movies, watching TV, reading, sleeping, daydreaming				
I've been accepting the reality of the fact that it has happened				
I've been expressing my negative feelings				
I've been trying to find comfort in my religion or spiritual beliefs				
I've been trying to get advice or help from other people				
I've been learning to live with it				
I've been thinking hard about what steps to take				
I've been blaming myself for things that happened				
I've been praying or meditating				
I've been making fun of the situation				

Appendix 5: Total number of medical residents per department training at UON teaching hospitals (KNH&MNTRH) as of April 2021

No.	Master of Medicine Program	Total (814)
1.	Psychiatry	86
2.	Pediatrics and child health	111
3.	Internal medicine	90
4.	Ophthalmology	40
5.	Diagnostic Radiology	52
6.	Human Pathology	30
7.	Anesthesiology	53
8.	Obstetrics & Gynecology	177
9.	General Surgery	24
10.	Urology	21
11.	Orthopedic Surgery	40
12.	Pediatric Surgery	12
13.	Cardiovascular & Thoracic surgery	12
14.	Otorhinolaryngology, Head & Neck surgery	25
15.	Plastic, Reconstructive & Aesthetic surgery	21
16.	Neurosurgery	20

Appendix 6: Budget

Category	Remarks	Units	Unit cost	Total (KES)
Proposal development	Proposal copies	7 copies	1000	7000
Ethical clearance	One-time fee	1	2000	2000
Data collection	Survey Monkey subscription	2 Months	3900	7800
	Internet bundles	3 Months	4000	12000
Data analysis	Statistician	1	35000	35000
Thesis	Printing drafts	1000 pages	5	5000
	Thesis copies	10 copies	1500	15000
Contingency fund				5000
TOTAL				88800

Appendix 7: Study Time frame

Number	Activity	Estimated time
1	Development of proposal and presentation	July 2020 to January 2021
2	Proposal submission for ethical approval and subsequent corrections	February 2021 to May 2021
3	Data collection	June 2021
4	Data analysis	July 2021
5	Thesis writing	July 2021
6	Thesis submission	August 2021