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DEPARTMENT OF RADIOLOGY**



**A CROSS-SECTIONAL STUDY ON THE PREVALENCE OF
BURNOUT AND ASSOCIATED FACTOR AMONG
RADIOLOGISTS IN ETHIOPIA JUNE 2025**

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APPROVAL

This to certify that the research entitled “**A Cross Sectional Study On The prevalence of Burnout and Associated factors among Radiologists in Ethiopia**” by Dr. Benyam Goa for partial fulfilment of the requirement for the degree of specialty certificate of Radiology adheres to university rules and fulfills recognized criteria for uniqueness and quality, which were carried out under advisors Dr. Tequam Debebe and Dr. Assefa Getachew.

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ACRONYMS AND ABBREVIATIONS

ACR	American College of Radiology
AJR	American journal of Radiologist
DP	Depersonalization
EE	Emotional Exhaustion
MBI-HSS	Maslach burnout inventor-Health Sciences survey
PA	Personal Accomplishment
PACS	Picture Archiving and Communication System
RSE	Radiology Society of Ethiopia
TASH	Tikur Anbessa Specialized Hospital

ABSTRACT

Background: Burnout is a syndrome among health professionals, especially physicians who experience intense occupational stress. It is characterized by emotional exhaustion, a feeling of depersonalization, and a sense of ineffective/low personal accomplishment. Higher rates of burnout are often seen across all medical specialties globally negatively influences clinical outcomes. The issue of burnout do not spare the radiology department. Although burnout among radiologists has received growing attention globally, there is a lack of data specifically addressing among Ethiopian Radiologist, the purpose of this study is to evaluate burnout among radiologists in Ethiopia.

Objectives: To determine the prevalence and associated factors of burnout among Ethiopian Radiologist working in Ethiopia, 2025.

Methods: A cross sectional study was conducted between January27, 2025 to May27, 2025. Anonymized Google form based 47-item questionnaire including included the standard Maslach burnout inventor-Health Sciences survey (MBI-HSS) was disseminated to radiologists through Telegram group of Radiology society of Ethiopia (RSE). R software 4.5.1 was used for data analysis., Bivariate, and multivariable logistic regression as well as descriptive statistics were analyzed.

Result: Among 410 radiologists, 204 completed the survey and were enrolled in the study. The majority of the respondents (79.4%) were males. The age range was 30 to 65 years old, with a mean of 35.5 years and a standard deviation of 7.1. The overall prevalence meeting all three MBI criteria was 26 % (n=53). However, 76.96% (n=157) reported high emotional exhaustion, and 58% (n=119) of respondents reported moderate to high depersonalization, while 52.9% (n=108) maintained a high sense of personal accomplishment. Female radiologist were much more likely of experiencing burnout than males (AOR = 0.31; p = 0.038); a daily caseload of >50 cases greatly increased odds compared to 10-20 cases (AOR = 0.03; p = 0.009); engagement in other income generating activities had 89% reduced odd of burnout (AOR = 0.11; p = 0.001), and each additional year of practice lowered odds by 30% (AOR = 0.70; p = 0.005). Recommended preventive strategies by radiologists included improving working environment, increase income and hiring additional radiologists to reduce workload and stress.

Conclusion: In this baseline study assessing burnout among Ethiopian radiologist, 26% met full MBI criteria (elevated EE, increased DP and diminished PA). However, individual subscales revealed alarmingly high rates of EE and DP. High daily caseloads and female gender emerged as significant

risk factors, whereas engagement in other income generating activities and greater year of practice were protective against burnout.

Keywords; Maslach burnout inventor-Health Science Survey (MBI-HSS), Burnout, Depersonalization (DP) , Emotional Exhaustion(EE)

1. INTRODUCTION

1.1. Background

Burnout syndrome defined as a condition of prolonged/extended state of physical, emotional and mental depletion resulting due to chronic stress. It can present with symptoms such as poor concentrating, exhaustion, anxiety and increased irritability. It is first introduced by Freudenberg in 1974 [1], then later elaborated by Maslach in 1976 [2] as a stress induced syndrome affecting emotional health mainly observed in peoples without a history of psychological illness [4]. Burnout is not classified as a medical disorder in “Diagnostic and Statistical Manual of Mental Disorder”, Fifth Edition (DSM-5). However most recent edition of the “International Classification of Disease (ICD-11)” defines it as a syndrome brought on chronic, ongoing workplace stress that has not been adequately controlled [5].

According to Maslach [4] and WHO [5] burnout syndrome is further described by three dimensions; emotional exhaustion, depersonalization and a sense of reduced level of personal/professional accomplishment. Burnout is typically evaluated using the Maslach Burnout Inventory (MBI), a subjective self-assessment tool that provides separate scores for each of the three primary components of burnout [4].

Burnout is prevalent in developed countries, with estimates suggesting it affects between 13% to 27%, [6] while healthcare professionals like physicians are more likely than the general population to experience burnout, with a prevalence rate or more than 50 % [7]. Burnout has been found to be more common among radiologists than several other medical specialties [8] rose significantly, from 36% in 2013 to 49% in 2017.

High level of burnout can result serious effect on the physicians, including reduced productivity, diminished attention and engagement at work, resulting physicians to withdraw and retire [9], it can also affect functionality increasing medical errors, exposing healthcare to malpractice and lawsuits [10] [11]. It can also contribute to serious personal outcomes, such as dependency on substance and suicide [12].

Major source of burnout among radiologist was increased workload, a growing workload in radiology department, particularly following the transition to PACS (“Picture Archiving and Communication System”), while PACS has contributed to enhanced efficiency and overall productivity, it has also significantly increased the volume of work. [14] [15]. Work load has also been contributed by long hours of work, overly demanding job expectation, such as short turnaround time and staff shortage.

In Radiology, workplace isolation has been found to be a contributing risk factor [16], the increased advanced technologies like PACS and ease access of electronic medical record(EMR) reduces face to face

consultation with others [16] [15], leading many radiologists to feel demeaned, which may diminish their sense of professional accomplishment.

Regarding academic and private radiologists, academic radiologists need to be involved in research and teaching to ensure that the quality of their work continues to grow. They also need to be involved in management activities. On the other hand, working in facilities owned by private individuals or organizations has been found to be a major contributing factor of radiologist burnout, due to poor interactions and working conditions [17].

1.2. Statement of the Problem

Radiology is one of the most rapidly developing medical specialty in Africa. Radiology residency training is now being offered by seven teaching hospitals across the country in Ethiopia. With growing number of radiologists, current number of practicing radiologist is 410 based on official data from the RSE. However, this remains far below the minimum acceptable threshold and is not comparable with the recommended radiologist to population ratio.

Work places behaviors like burnout have been extensively studied in developed countries, but due to various constraints, research on burnout is lacking in developing nations, particularly in Africa. This necessitates researches looking into the incidence of burnout among radiologists in Ethiopia and associated risk factors. This will therefore help to create a comfortable working atmosphere which will enhance the standard of patient care and services.

Until now there are no published papers in Ethiopia regarding prevalence and contributing factors of burnout among radiologists in Ethiopia.

1.3. Significance of the Study

The study's primary goal was to evaluate the prevalence of burnout among Radiologists in Ethiopia and identify the associated factors with it. The findings are important baseline for understanding the burnout challenges faced by Radiologists in Ethiopia.

It is an output for health care institutions and health policy makers to understand the cause of burnout and proposed recommendations provided by the radiologists, so they can establish a more comfortable and encouraging work environment, ultimately enhancing the quality of care provided.

2. LITERATURE REVIEW

2.1. Introduction

Several conceptual models have been developed to quantify the evolution of burnout, with the Maslach Burnout Inventory recognized as one of the most widely adopted and validated tools. The MBI assesses burnout based on three dimensions [20] Emotional exhaustion explained by feeling of being emotionally drained, overworked and unable to complete a given task. Depersonalization is when an individual becomes emotionally detached and feeling negativism about their work. Reduced personal accomplishment which is the third dimension of burnout, refers to a diminished sense of personal or professional accomplishment.

2.2. World Wide Prevalence of Burnout among Radiologists

A comprehensive review of 22 studies conducted on radiology trainees and radiologists, published in June 2023, concluded that over 80% of radiologists report symptoms of burnout in at least one of the three MBI subcategories [21]. While American Journal of Radiologist (AJR) meta-analysis of 57 studies of 11,405 radiologists, the prevalence of burnout ranged from 5% to 85% depending on the instrument implemented [22]

In February 2024, cross sectional study utilizing an online survey was conducted among 172 Radiologists in Germany. The prevalence of burnout was 76.7%, which was significantly linked to factors such as increased workload, poor sleep quality, suboptimal working conditions and decreased job satisfaction. Radiologists between ages of 30 and 40 had the highest rate or burnout, accounting for 40.7% [23].

Another research conducted in among 262 Canadian radiologist and radiology trainees in 2018 states burnout symptoms, with 72% experiencing high level of emotional exhaustion(EE) and depersonalization(DP), while mild symptoms were noted in the personal accomplishment domain [24]. Another recent journal in entitled “current status of burnout in Canadian radiology” reveal the alarming burnout rate among radiologists, states the associated factors like increasing demand of diagnostic and medical imaging like CT and MRI which is projected more than double between 2017 and 2040 along with supply shortage of radiologists due to significant decreased number of radiology resident spot. Equipment shortage on the number of CT and MRI, and pandemic related changes are also listed associated factors [25].

On study carried out in May 2022 with 132 radiologists and radiology trainees in Kenya to assess burnout prevalence, awareness and associated factors, the burnout prevalence was 51.5% and the predisposing factor to burnout were unstable income, not involved in academia, dissatisfaction with the physical work environment and unavailability of resting room, distance to work and type of employer [26]

Prior to the introduction of PACS, radiologists had more frequent in-person interactions and consultations among doctors from various specialties, which helped them to have a better understanding of the clinical issue at hand and, as a result, provide reports that were more significant and impactful. Unfortunately, the implementation of PACS significantly decreased professional interaction, leading to self-isolation that unfortunately resulting to a rise in low feeling of PA [27]

In the study done among musculoskeletal radiologists, it has also been noted that working in a private practice setting may have a role in the burnout of radiologists. According to Chew et al., radiologists in

private practice were more likely than those in academic practice to experience higher level of burnout [17].

The American College of Radiology (ACR) Commission outlined strategies to mitigate associated risk factors with radiologist burnout in their article "Burnout of Radiologist: Frequency, Factors, and Remedies." Some strategies for preventing or treating burnout included having enough radiologists on staff, cutting down on long work hours, minimizing isolation for diagnostic radiologists by providing big reading rooms with multiple radiologists, cutting down on weekend and night calls, balancing work and vacation time, etc. [16].

2.3. Prevalence of Burnout in Ethiopia

In June 2017, a study was carried out to evaluate burnout levels and related factors among Ethiopian physicians employed in public hospitals. The prevalence of burnout was high across all dimensions and was positively associated with the number of patients observed per week, physicians working in primary hospital, and low income salary [28]. Similarly, a 2020 survey of medical professionals working for the city of Dire Dawa reported a 54.1% occurrence of burnout [29].

A related cross-sectional study at “Tikur-Anbessa Specialized Hospital (TASH)” in Addis Ababa, Ethiopia conducted among 190 surgical residents to assess burnout among surgical residents. The study reported a high burnout rate of 60.3%, associated factors listed was more frequent duty programs [30].

A high level of carrier satisfaction has been consistently linked to reduced burnout rates. In a recent study conducted in 2022 in Ethiopia by T. Kebede, D. Zewdineh, A. Getachew and K. Abate titled “Assessment of the level of job satisfactions of radiologists practicing in Ethiopia” surveyed 80 Radiologists who attended the 22nd annual radiology conference of the Radiology society of Ethiopia(RSE). An overall satisfaction rate of 62.8% was observed in the study. Among the participants, male Radiologists in the age range of 35-44 were more satisfied and radiologists working in larger cities other than Addis Ababa also expressed higher satisfaction [31]. However as of now, there haven't been any published papers in Ethiopia specifically addressing the burnout among Radiologist.

3. OBJECTIVES

3.1. General objectives

- To assess the prevalence and associated factors of burnout among Ethiopian Radiologists

3.2. Specific Objectives

- To determine the prevalence of burnout among Ethiopian Radiologists
- To identify associated factors with burnout among Ethiopian Radiologists

4. METHODOLOGY

4.1. Study design

This was cross sectional study using the standard MBI questionnaire.

4.2. Study Setting

Google-form based online survey was disseminated to the members of Radiology Society of Ethiopia (RSE), a non- profit professional association that represent radiologists and radiology professionals in Ethiopia. The society's membership includes radiologists and radiology residents, although full membership is granted only to certified radiologists. Full members of RSE comprises radiologist working in private, public and academic sectors throughout the country.

4.3. Study population

This study targeted full member radiologists registered under the Radiology Society of Ethiopia (RSE) who are currently working in private, public and academic health institutions at the time of data collection. There are 410 registered radiologists in Ethiopia.

4.3.1. Inclusion criteria

All eligible Radiologists who are full member of RSE, available during the data collection period.

4.3.2. Exclusion Criteria

Registered radiologist who decline to provide consent.

4.4. Sampling size and Sampling Technique

This study employed a census method by surveying all members of the Radiology Society of Ethiopia (RSE), thereby did not involve sampling. According to official data obtained from the RSE, there are currently 410 radiologists in Ethiopia.

4.5. Study variables

4.5.1. Dependent variable

Three primary dimensions are used to quantify burnout: Emotional exhaustions, Depersonalization and Personal accomplishment (PA)

4.5.2. Independent variable

- **Socio-demographic characteristics:** Number of dependents, age, sex and marital status
- **Work-related characteristics:** Professional status, employer, place of employment, distance from work, academia and Managerial roles, night and weekend duty schedules, Imaging modalities, extra responsibilities, availability of PACS, average daily caseload, Number of hours worked per week, , Physical working environment, availability of staff resting room,

4.6. Data collection tool and procedure

Data on burnout levels among radiologists were collected using a structures questionnaire derived from the English version of the “Maslach Burnout Inventory – Human Service Survey (MBI-HSS)”. This validated tool includes 22 items that evaluate burnout across three distinct domains; emotional fatigue (9 items), depersonalization (5 items) and reduced sense of professional or personal accomplishment (8 items).

Each component of burnout syndrome was tested and scored independently, and each item was rated on on a seven-Likert scale ranging from “never” (0) to “everyday” (6). Burnout levels were categorized as low, moderate or high based on the individual subscale score. A high level was defined by elevated score in EE and DP, together with a low score in personal accomplishment. In contrast, a high score on PA and low score on EE and DP indicated by low burnout [4].

Participants were also requested to provide information regarding their demographics and work-related factors associated to stress.

In this study, the EE dimension was assessed with nine items yielding a Cronbach's alpha of 0.874, which indicates high internal consistency. The depersonalization dimension measured with five items, demonstrating a good reliability with a Cronbach's alpha of 0.816. Personal accomplishment was evaluated using eight items, resulting in a Cronbach's alpha of 0.796, reflecting acceptable reliability.

4.6.1. Data collection procedure

A 47-item survey including the standard licensed MBI was administered along with additional 25 extra questions including demographics, variables related to stress and potential social activities they may be participate. An open ended, response questions about any suggestions for potential burnout interventions was included.

Google form-based questionnaire was prepared (see annex) and suitably disseminated to radiologist via the Ethiopian society of radiologist Telegram group and email. Reminders were regularly sent by the RSE admin, for radiologists to participate and to ensure timely completion of the questionnaires.

4.7. Operational Definition

High emotional exhaustion (EE), high depersonalization (DP) and low personal accomplishment (PA) are indicators of burnout syndrome; if these subscales are not met, we consider normal.

“Emotional exhaustion (EE): low (≤ 16), Moderate (17-26), and high (≥ 27)”

“Depersonalization (DP): low (≤ 6), Moderate (7-12), and high (≥ 13)”

“Personal accomplishment (PA): low (≤ 31), moderate (32-38) and high (≥ 39)”

4.8. Data quality control

The data were collected with Google-form online questionnaire. The data were exported to Excel and reviewed for completeness, accuracy and consistency. The complete data was exported from excel to the latest version of R software 4.5.1.

4.8.1. Data Processing and Analysis

R software version 4.5.1 utilized for processing. Descriptive analysis like Frequencies, proportions, and summary of the socio-demographic and occupational characteristics was used to describe the background information of the respondents. A two-step logistic regression modelling approach was used to determine the independent variables linked to burnout among radiologists. First, we evaluated each independent variable's rough correlation with burnout using bivariate logistic regression. Then variables having a p-value of less than 0.25 in bivariate analysis were regarded as potential predictors, and these variables were

included in multivariate logistic regression model. A criterion of $p < 0.05$ in multivariate was used to establish statistical significance in the final multivariate model.

4.9. Ethical Consideration

Ethical permission was obtained from the Research and Ethics Committee of Radiology department at AAU. All information provided by the radiologists was kept with strict confidentiality. Direct identifiers, such as names and specific addresses, were not collected. It was completely voluntary to take part in study.

5. ANALYSIS AND RESULTS

5.1. Descriptive Results

5.1.1. Introduction

The study targeted all 410 radiologists currently registered with the Radiology Society of Ethiopia (RSE), based on official data obtained from the society. A total of 204 radiologists responded and were enrolled in the study.

5.1.2. Socio demographic Characteristics

Males radiologists made up the majority of study participants (79.4%) and regarding marital status majority were married (58.8%). The age range was 30 to 65 years old, with median age was 35.5 years

Table 1 : Demographic Characteristics

Characteristics	Category	Frequency (N)	Percentage (%)
Gender	Female	42	20.6
	Male	162	79.4
Age	</=31	39	19.1
	32-40	143	70.1
	41-50	11	5.4
	51-60	6	2.9
	>/=61	5	2.5
Marital Status	Married	120	58.8
	Single	81	39.7

5.1.3. Work- Related Characteristics

In terms of professional background, 83.8% were general radiologists, 9.8% were fellows and 6.4% are sub-specialists. The total year of practice as a radiologists varied between 0 to 31 years, with a mean of 4.5 years. Among 204 radiologist, 46.6% of the respondents worked exclusively in private practice, while 45.1 were working in both public and private sectors. About 39.7% were engaged in academic work, and only 23% reported having administrative responsibilities.

The majority of the respondents reported working long hours, specifically 39.7% worked more than 60 hours per week, while 26 % worked 49 to 59 hours per week. Furthermore, a significant portion (79.9%) indicated that they regularly work extra hours, including nights and weekends.

Regarding the primary location of employment, majority of the radiologists 73.5% were based in capital cities, 19.1% located in large towns, and only 7.4% of the respondents work in a small towns or rural areas.

When asked about how readily available radiology resources (including personnel and equipment) the majority 45.6% considered them as inadequate, 32.4% reported that resources were somehow adequate and only 22% reported that available resources were adequate.

In terms of daily workload, 21.1% of respondents reported a caseload of more than 50 cases daily, while 27.5% of respondents 30 to 40 cases per day and 22% reported 20 to 30 cases daily.

The result also shows 70.1 % of radiologists perceived their income as unstable, and 63.7% of respondents claimed they earn over 80,000 Ethiopian birr per month. Only 32.4% of the participants had taken leave days with in the last year. 70.6% (144) expressed dis-satisfaction with their physical work environment, 80.9 % of respondents reported no resting room at their workplace.

Table 2: Work-Related Characteristics

Variables	Category	Frequency(N)	Percentage (%)
Professional Status	Radiologist only	171	83.8
	Fellow(subspecializing)	20	9.8
	Subspecialized	13	6.4
Employment Type	Public & Private Practice	92	45.1
	Private Practice Only	95	46.1
	Public Practice Only	3	1.5
	Self Employed	14	6.86
In Academia	Yes	81	39.7
	No	123	60.3
Administrative/Managerial Role	Yes	47	23
	No	157	77
Weekly Working Hours	<40 hours	24	11.8
	40-48 hours	46	22.5
	49-59 hrs	53	26.0
	>60hrs	81	39.7
Extra Hours(Nights/Weekends)	Yes	163	79.9
	No	41	20.1
Place of Employment Area	Capital City	150	73.5
	Large Town	39	19.1
	Small Town/Rural	15	7.4
Radiology Resources Available	Adequate	45	22.1
	Inadequate	93	45.6
	Somehow Adequate	66	32.4
Case load per Day	<10	6	2.9
	11 to 20	24	11.8

	21 to 30	45	22.1
	31 to 40	56	27.5
	41 to 50	30	14.7
	>51	43	21.1
PACS Availability	Yes	103	50.5
	No	101	49.5
Stable Income	Yes	61	29.9
	No	143	70.1
Monthly Net Income(Birr)	<20,000	5	2.5
	20,000-39,999	20	9.8
	40,000-79,999	49	24.0
	>80,000	130	63.7
Other Income Generating Activity	Yes	56	27.5
	No	148	72.5
Taken Leave In Last Year	Yes	66	32.4
	No	138	67.6
Satisfied with work Environment	Yes	60	29.4
	No	144	70.6
Resting Room at Work	Yes	39	19.1
	No	165	80.9

5.2. Prevalence of Burnout Syndrome

The magnitude of burnout in radiologist on the Study was approximately 26%. Out of a total of 204 participants, 53 Radiologists (26%) met the full criteria for burnout, characterized by high EE, increased DP and reduced PA. However, the finding from the burnout subscale analysis indicate that emotional exhaustion was alarmingly high with 76.96% (N=157) of respondents classified having high EE levels, followed by 13.24% (N=27) with moderate level of EE and 9.8% (N=20) with low EE level. In the dimension of depersonalization, 32.8% (N=67) of radiologists exhibited high level of DP, while 25.4% (N=52) had moderate levels and 41.1% (N=85) were in low category.

In contrast, the majority of respondents 52.9% (N=108) reported a high sense of personal accomplishment, where as 14.2% (N=29) and 32.8% (N=67) reported moderate and low PA respectively. All shown in Table 3 below

Table 3: Frequency and proportion of Burnout Dimensions among Ethiopian Radiologists

Category	Level	Frequency (n)	Percentage (%)
Overall Burnout Status	Burnout	53	26%
	Normal	151	74%
Emotional Exhaustion	High	157	76.96%
	Moderate	27	13.24%
	Low	20	9.8%
Depersonalization	High	67	32.8%
	Moderate	52	25.5%
	Low	85	41.6%
Personal Accomplishment	High	108	52.9%
	Moderate	29	14.2%
	Low	67	32.8%

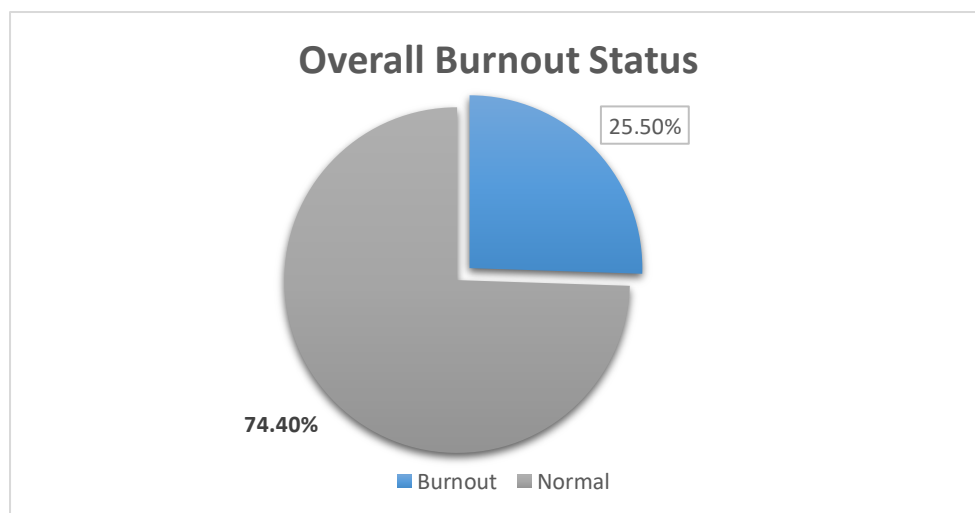


Figure 1: The overall prevalence of burnout in all the subscale

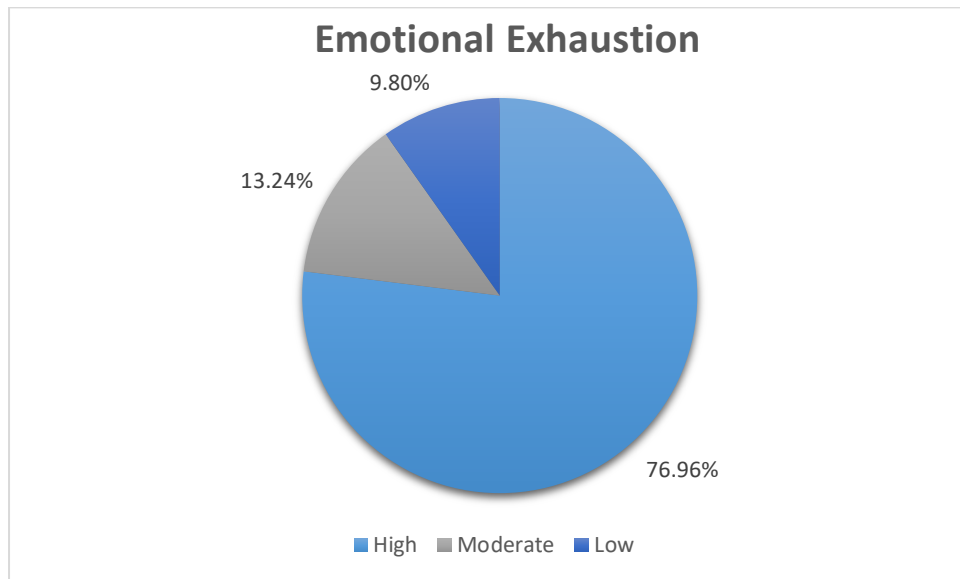


Figure 2: The prevalence of Emotional Exhaustion (EE) among Ethiopian radiologist

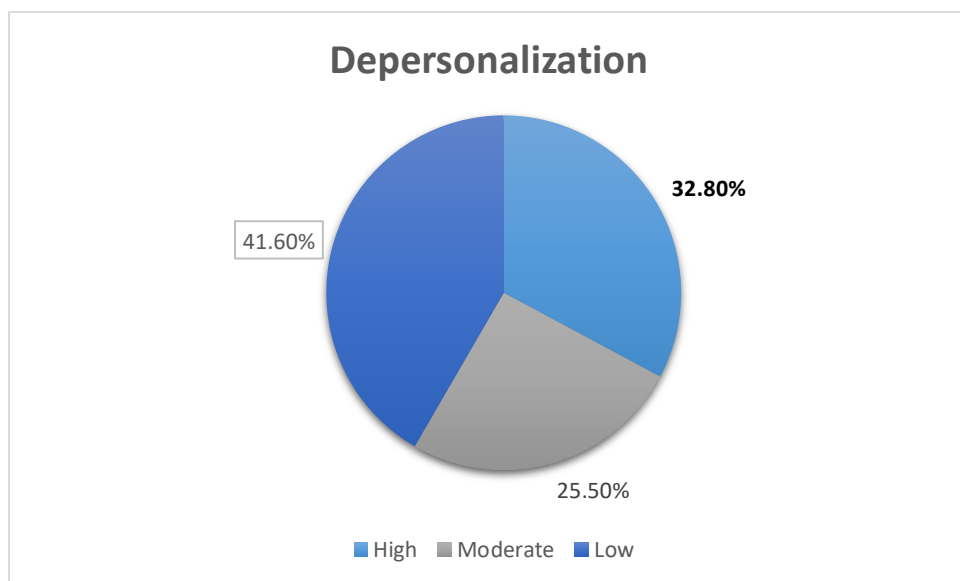


Figure 3: The prevalence of Depersonalization (DP) among Ethiopian radiologist

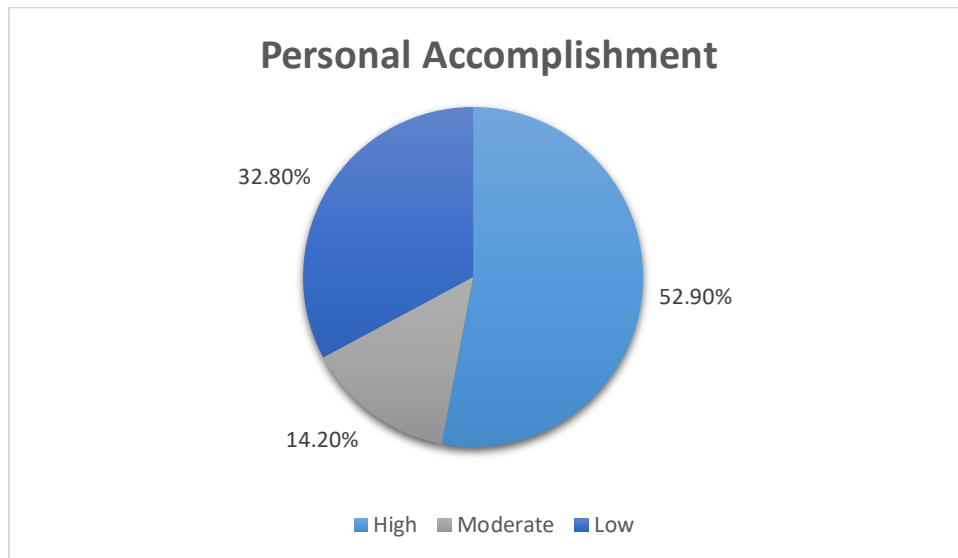


Figure 4: The prevalence of Personal Accomplishment among Ethiopian radiologist

5.3. Factors associated with burnout syndrome among Ethiopian Radiologists

The study examined demographic and work associated factors in relation to a binary burnout outcome (1=burnout, 0=normal). The multivariable model contained predictor variables whose p-value in bivariate logistic regression was less than 0.25. The final models used $p < 0.05$ as the threshold for statistical significance. The results together with their respective 95%CI, are presented as the crude odds ratio (COR) and adjusted odds ratio (AOR).

The MVLR model identified that female radiologists were 69% more likely to report burnout compared to their male counterparts (AOR = 0.31; $p = 0.038$).

Engagement in other income generating activities apart from their main employment had 89% reduced odds of burnout (AOR = 0.11; $p = 0.001$).

Regarding case load per day, radiologists seeing 10-20 cases per day has significantly lower odds of burnout compared to those seeing more than >50 cases per day (AOR = 0.03; $p = 0.009$), suggesting a moderate workload may be optimal and protective.

In our study sample radiologists with fewer years of practice appear vulnerable to burnout. Statistically, each additional year in practice lowered the odds of burnout by 19% in unadjusted analysis (COR=0.81, $p=0.004$) and by 30% after controlling for other factors (AOR=0.70, $p=0.005$)

Table 4: Bivariate and multivariate Logistic Regression Result

Variable	Category	Burnout (n, %)	Normal (n, %)	COR (95% CI)	p-value	AOR (95% CI)	p-value	Significance
Age (years)	—	33.8 ± 2.84	36.1 ± 7.12	0.92 (0.84, 0.98)	0.033	1.15 (0.98, 1.36)	0.085	.
Other Income-Generatin	No	47 (88.7%)	101 (66.9%)	Ref	—	Ref	—	—
	Yes	6 (11.3%)	50 (33.1%)	0.26 (0.09, 0.6)	0.004	0.11 (0.03, 0.41)	0.001	**
Gender	Female	17 (32.1%)	25 (16.6%)	Ref	—	Ref	—	—
	Male	36 (67.9%)	126 (83.4%)	0.42 (0.21, 0.87)	0.018	0.31 (0.1, 0.94)	0.038	*
Number of Dependen	—	2.94 ± 2.27	3.93 ± 2.83	0.85 (0.72, 0.97)	0.026	0.94 (0.78, 1.14)	0.549	—
Years of Experience as	—	5.81 ± 5.12	9. (1) ± 7.86	0.81 (0.7, 0.92)	0.004	0.7 (0.55, 0.9)	0.005	**
Marital Status	Married	26 (49.1%)	94 (62.3%)	Ref	—	Ref	—	—
	Single	27 (50.9%)	54 (35.8%)	1.81 (0.96, 3.42)	0.067	1.35 (0.57, 3.18)	0.496	—
	Widowed	—	3 (2.0%)	0 (NA, ∞)	0.986	18.8 (0, Inf)	0.999	—
Primary Employment Area	City	38 (71.7%)	112 (74.2%)	Ref	—	Ref	—	—
	Large town	6 (11.3%)	33 (21.9%)	0.54 (0.19, 1.3)	0.195	0.81 (0.25, 2.61)	0.724	—
	Small town / Rural	9 (17.0%)	6 (4.0%)	4.42 (1.5, 13.97)	0.008	2.93 (0.62, 13.91)	0.176	—
Average Daily Caseload	>50	12 (22.6%)	31 (20.5%)	Ref	—	Ref	—	—

	40–50	8 (15.1%)	22 (14.6%)	0.18 (0.02, 1.11)	0.076	0.21 (0.02, 2.14)	0.188	—
	30–40	15 (28.3%)	41 (27.2%)	0.18 (0.02, 1.04)	0.064	0.16 (0.02, 1.55)	0.113	—
	20–30	9 (17.0%)	36 (23.8%)	0.13 (0.02, 0.74)	0.027	0.13 (0.01, 1.24)	0.076	.
	10–20	5 (9.4%)	19 (12.6%)	0.13 (0.01, 0.87)	0.043	0.03 (0, 0.43)	0.009	**
	<10	4 (7.5%)	2 (1.3%)	0.19 (0.02, 1.12)	0.078	0.36 (0.03, 3.71)	0.391	—

Significance level. () $p < 0.001$, (**) $p < 0.01$, (*) $p < 0.05$, $p < 0.1$**

5.4. Burnout Prevention

5.4.1. Recommendations by Radiologist

An open-ended question was included in the survey to gather radiologists' recommendation for improving their working condition and reducing burnout. Out of the total respondents, 113 radiologist (55.3%) provided written recommendation. These responses were analyzed using thematic coding, resulting in identification of several major themes.

The most frequently mentioned theme was need to improve the working environment, recommended by 39 radiologists. Specific suggestions include creating a calm and quiet reading room, ensuring adequate lighting and ventilation, providing stable internet access, and improving bathroom and general room setups.

A total of 24 radiologist recommended an increase in income, highlighting the financial stress associated with the current workload. Another 16 respondents emphasized the need to increase the radiologists number to distribute the workload more evenly and reduce individual burden. 14 radiologist mentioned the need to reduce the number of cases and 11 responses suggesting better resting facilities. Described in bar chart shown below- Figure 3

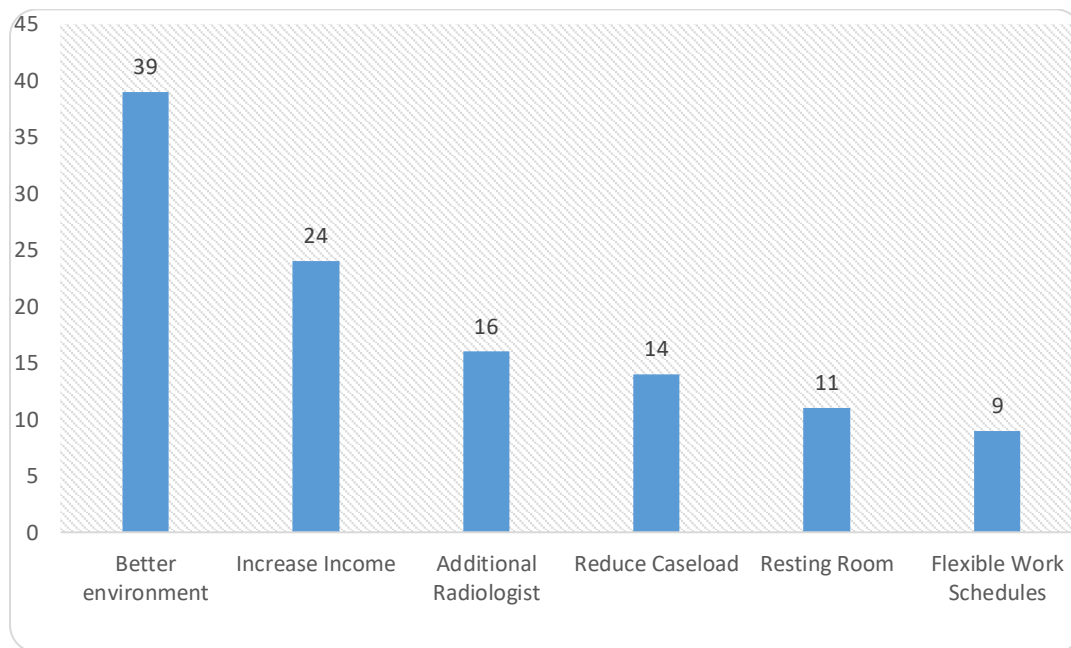


Figure 5: Recommendations made by the Radiologists

6. DISCUSSION and CONCLUSION

6.1. Discussion

6.1.1. Demographics and prevalence of burn out

This study revealed the prevalence of burnout and associated factors among Ethiopian radiologists. The study targeted 410 radiologists currently registered with the Radiology Society of Ethiopia (RSE), of which 204 radiologists responded to the survey and participated in the study. Although survey response rates among physicians are generally low due to demanding schedules and survey fatigue [32], our study achieved a relatively high response rate. This can be attributed to the extended data collection period of over four months and implementation of a consistent reminder strategy.

The average age of the study respondents was 35.5 and the majority of the participants 79.4% were male. The median age and the male respondents' findings were comparable with a study done among Kenyan

radiologist which was 36 [26], and the research conducted among MSK radiologists in which 79.2% of them were male [17].

The study's overall burnout prevalence, defined by presence of low personal accomplishment (PA), depersonalization (DP) and high emotional exhaustion (EE), was found to be 26%. This figure is comparable to previous studies conducted among academic radiologist in United States, which states 29% of the radiologist met all three criteria for high burnout [15], and to a meta-analysis of radiologists' burnout conducted in 2024, [21] which reported a full burnout prevalence of 16.7% among radiologist across multiple countries

Notably, the main indicator of burnout, emotional exhaustion was alarmingly elevated in 76.96% of the participants, which is consistent with other studies done among Canadian radiologists which scored 71.8% of high EE [24] U.S. radiologists also report high EE(61%) supporting the universality. This high prevalence of EE in our study may reflect the increase workloads in radiology practice, which have been expanded in recent years by increasing imaging modalities and demand for imaging as well as faster turnaround times.

In terms of depersonalization (DP), we observed moderate and high levels in 58% of respondents. This aligns with study done among Canadian radiologist where 63% of the respondents reported moderate and high score in DP domain [24], where DP often emerges as a coping response to sustained emotional overload.

Interestingly, personal accomplishment (PA) which is a self-protective response against burnout, was preserved in the majority of participants, with 52.9% reporting high PA which is congruent to study in USA and Canada reporting a high PA [7] [24]. This may be explained by the fact that Radiology is one of the medical specialties associated with relatively high job satisfaction and favorable work-life environment [7]. A 2022 study conducted among Ethiopian radiologists reported a job satisfaction rate of 62.8% [31], supporting the observation.

Compared to neighboring countries such as Kenya, where a study reported high emotional exhaustion (EE) in 47% of the radiologists, depersonalization (DP) in 37% and a high level of personal accomplishment (PA) in 56% [26], our findings reveal a markedly higher prevalence of EE at 76.96%. Although the level of high DP and PA in our study are relatively close to those reported in Kenya, the substantially elevated level of emotional exhaustion among Ethiopian radiologists may indicate greater work-related stress.

In this study, female radiologists were more likely to experience burnout than male radiologists, with an adjusted odds ratio indicating they were 69% more likely to report burnout ($p=0.038$). This gender gap

mirrors finding from the Medscape report which showed that 65% of female radiologists experienced burnout, compared to only 44% of male radiologists [18]. Likewise, studies in the U.S found that female radiologists had higher score in EE and DP on the MBI, suggesting greater vulnerability to burnout [3]. As female radiologists often shoulder a disproportionate share of domestic and caregiving responsibilities. The cumulative stress of balancing patient care, academic duties and family obligations can enhance EE and DP.

In the current study, we found that radiologists reporting 10-20 cases per day were far less likely to experience burnout than radiologists reporting over 50 cases ($p = 0.009$). This shows that excessive workloads in radiology directly contributes to emotional exhaustion and dissatisfaction. Our finding is align with those of Mamlouk et al. (2021), in a study examining burnout in academic setting found that radiologist handling more than 70 cases daily were significantly more likely to experience elevated scores on both EE and DP subscales [33]. This finding suggests that moderate daily workload acting as a protective buffer against burnout balancing clinical engagement and cognitive fatigue.

Radiologist engaged in additional income generating activities had 89% lower odds of burnout ($p = 0.001$). This aligns with a study done in U.S. stated that radiologists who combined clinical duties with teaching or research roles, reported significantly lower level of EE and DP [35] In excessive workload and insufficient recovery time even when taken for financial reasons can lead to EE, in Harolds et al. (2016) found that long working hours and lack of work-life balance were the main causes of burnout among radiologist [16].

6.1.2. Burnout Prevention and Management

Radiologists in this study provided several recommendation to reduce workplace stress. The majority emphasized the need to improve the working environment, specifically, by creating calm and quiet reading room with adequate lighting, proper ventilation, and providing stable internet access along with improved overall room setups. Since radiologists spend most of their time in interpretation rooms, proper ergonomic design is essential for both their health and productivity. Good practice includes using adequate ambient lighting, with about 90% of light coming from indirect sources to reduce screen glare [34]. Fluorescent light should be above the head and windows should have blinds to control natural light [34]. However, in Ethiopia such ergonomics and safe work environment are poorly established in academics and most private institutions, this lack of supportive infrastructure may negatively affect both comfort and efficiency, ultimately contributing to burnout.

Radiologists in our study also recommended increasing income, hiring more radiologists, reducing daily caseloads and providing resting rooms and flexible work schedules. They are similar to what the American College of Radiology (ACR) recommends, having enough staff, ensuring a good work-life balance and offering competitive salaries [16]. These changes can help create a more productive and healthier working condition for the radiologist.

6.2. Limitations

The study is not without limitation. First, radiology residents were not included, which may affect the generalizability of the result, as residents often face more workload and may experience different level of burnout compared to practicing radiologists. Second, the data collection period extended beyond the initially planned schedule, taking over four months. This delay was primarily due to low response rate and survey fatigue, as many radiologist were busy to complete the questionnaire. The length and nature of the survey may have contributed to this burden. Additionally, gathering responses during the Annual meeting of the Radiology Society of Ethiopia (RSE), couldn't be implemented due to practical challenges as there was no available time allotted to present or distribute the survey.

6.3. Conclusion

Burnout particularly emotional exhaustion (EE) and depersonalization (DP) is becoming increasingly common among radiologist worldwide, and Ethiopian radiologist are no exception. Its impact extends beyond individual well-being, compromising the overall quality and safety of patient care. Therefore, timely and targeted interventions are essential. Efforts should focus on improving the working environment and reducing excessive workloads, including the recruitment of additional radiologist as a key preventive measures. This study provides an initial insight into burnout among Ethiopian radiologists and highlights the need for future systemic researches to be conducted on this topic.

7. REFERENCES

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