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Health-related quality of life among radiology technicians in hospitals: a cross sectional study

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ABSTRACT

Background: Despite its potential impact on occupational well-being, the health-related quality of life (HRQoL) of radiology technicians remains underexplored.

Objective: This study aims to assess the HRQoL of radiology technicians and its association with sociodemographic and occupational variables.

Methods: A cross-sectional questionnaire-based study was conducted , involving 115 radiology technicians from three major hospitals . The questionnaire included items on sociodemographic characteristics, occupational factors, and the 36-item Short Form Health Survey (SF-36).

Results: The majority (94.8%) of technicians reported previous training in radiation protection, yet 92.2% expressed doubts about their knowledge in this area. Additionally, 47.8% reported infrequent use of radiation protection measures, and 55.7% lacked confidence in radiation exposure measurements. Multiple regression analysis indicated that older age, female gender, employment at a university hospital, and infrequent use of protection were associated with poorer HRQoL ($p = 0.042$ to 0.001). Conversely, working in interventional radiology and having confidence in radiation exposure measurements predicted better HRQoL ($p = 0.006$ to 0.001) across certain domains.

Conclusion: The study highlights a lack of confidence in radiation protection knowledge among radiology technicians, with half of them reporting infrequent use of protection measures. Specific occupational and radiation safety factors significantly influenced HRQoL, underscoring the need for targeted interventions to improve well-being in this population.

INTRODUCTION

Ionizing radiation represents a significant physical hazard, with medical procedures accounting for the majority of artificial radiation sources (Adliene et al., 2020; Ozkan et al., 2016). Although the doses used in diagnostic and imaging procedures are typically low, minimizing exposure is crucial for both patients and healthcare workers directly handling radiation or radioactive materials (Kiguli-Malwadde et al., 2006; Ozkan et al., 2016).

Radiology technicians are among the healthcare professionals at risk of occupational hazards due to radiation exposure, including an increased risk of certain cancers such as leukemia and thyroid cancer, as well as other non-communicable diseases (Adliene et al., 2020; Bernier et al., 2018; Kitahara et al., 2018; Seo et al., 2018; Yoshinaga et al., 2004). Consequently, they bear specific responsibilities to ensure radiation protection and safety, not only for patients but also for themselves (Adliene et al., 2020).

A high level of knowledge regarding radiation protection and adherence to safety protocols are critical for safeguarding radiology technicians from the harmful effects of radiation exposure (Mojiri and

Moghimbeigi, 2011; Ozkan et al., 2016). However, there are consistent reports of inadequate knowledge and non-compliance with safety measures among healthcare staff, including radiology technicians (Dauda et al., 2019; Mojiri and Moghimbeigi, 2011; Ozkan et al., 2016; Szarmach et al., 2015; Taqi et al., 2018). Additionally, radiology technicians often express dissatisfaction with the safety of their working environments (Dargahi et al., 2012; Taqi et al., 2018).

A decline in quality of life (QoL) within healthcare settings has been linked to various physical and social issues, such as increased absenteeism, reduced engagement in activities, work-related accidents, headaches, depression, and disrupted sleep patterns. These factors can negatively impact motivation and the quality of healthcare delivery (Azevedo et al., 2017).

Assessing the quality of life among healthcare professionals, particularly using health-related quality of life (HRQoL) measures, is essential. HRQoL offers a multidimensional assessment of physical functioning, psychological well-being, and social functioning, aligning with the World Health Organization's definition of health as a state of complete physical, mental, and social well-being (Calvert and Skelton, 2008; World Health Organization, 2013; Domantay, 2014).

While the health effects of radiation exposure on medically exposed workers have received increasing attention (Adliene et al., 2020; Ulutasdemir et al., 2017), the health-related quality of life (HRQoL) of these professionals remains relatively understudied, despite its potential interplay with occupational risks.

This cross-sectional questionnaire-based survey aims to evaluate the HRQoL among radiology technicians working directly with ionizing radiation sources. The study will explore the association between HRQoL and sociodemographic as well as occupational risk factors, shedding light on potential determinants of poor HRQoL in this population.

MATERIALS AND METHODS

Study Population:

A total of 175 radiology technicians employed in three large hospitals (university, state, and private hospitals) with more than 600 beds , providing services in interventional and conventional radiology, were invited to participate in this survey. Of these, 115 technicians voluntarily participated in this cross-sectional questionnaire-based study conducted . The study centers were selected based on the presence of advanced radiology units and the number of employed technicians. The response rate was 69.7% (115 out of 165 technicians).

Questionnaire:

The questionnaire was administered through face-to-face interviews and consisted of three sections: (a) socio-demographic characteristics (age, gender, education, marital status, smoking, alcohol consumption, regular exercise), (b) occupational characteristics (hospital type, radiology unit, years in practice, weekly work hours, daily x-ray films processed, training on radiation protection, trust in self-knowledge on radiation protection, use of protection measures, trust in radiation exposure measurements, routine check-ups for radiation hazards), and (c) the 36-item Short-Form Health Survey (SF-36).

Study Parameters:

The SF-36 was used to assess physical and mental component sub-domains based on sociodemographic and occupational factors. Multiple regression analysis with bootstrap method determined risk factors for poor HRQoL in each SF-36 domain. Inter-scale correlations, internal consistency, and descriptive statistics for the SF-36 were also analyzed. Variables significantly related to SF-36 were included in the multiple regression analysis.

SF-36 Evaluation:

The SF-36 comprises eight domains measuring HRQoL, with two summary scales for physical and mental components. Raw scores were transformed to a 0 to 100 scale, with higher scores indicating better health status. The reliability and validity of the Turkish version of SF-36 were previously established.

Statistical Analysis:

Statistical analysis included tests for normality, correlation analysis, Cronbach's alpha for internal consistency, and various inferential tests (Mann–Whitney U, Kruskal–Wallis-H, One-way ANOVA). Variables strongly associated with SF-36 were analyzed via Cramér's V values. Multiple regression analysis

using the bootstrap method determined risk factors for poor HRQoL. Data were expressed as mean ± SD, median (min–max), and percentages.

Ethical Approval:
The study was conducted following the principles of the Declaration of Helsinki and approved by the institutional ethics committee (Protocol No: 09.2017.346; Approval Date: 05/05/2017). Written informed consent was obtained from all participants.

RESULTS

The study delved into a comprehensive assessment of sociodemographic and occupational characteristics among radiology technicians . Findings revealed that 75.7% of participants were younger than 32 years, with 53.0% being females and 56.5% single. A substantial portion held an associate degree (61.4%), were non-smokers (58.3%), and did not regularly consume alcohol (82.6%) or engage in physical exercise (68.7%). University hospitals employed the majority (54.8%) of technicians, and 50.4% had seven or more years of experience. Most worked 35–37 hours weekly, processing at least 51 x-ray films per day (61.8%).
The analysis of SF-36 subscales yielded significant correlations and internal consistency, although the mental health ($\alpha = 0.60$) and general health ($\alpha = 0.65$) domains showed lower reliability. Notably, physical functioning, role-physical, and role-emotional domains had the highest mean scores (≥ 82.9). Male technicians scored higher in bodily pain ($p = 0.002$), general health ($p = 0.010$), vitality ($p < 0.001$), and social functioning ($p = 0.043$) compared to females. Those over 32 years had significantly lower scores across all domains (p values ranged 0.018 to < 0.001).
Technicians with an associate degree scored highest in bodily pain ($p < 0.001$), general health ($p < 0.001$), vitality ($p < 0.001$), and mental health ($p < 0.001$). Single technicians had higher scores in physical functioning ($p = 0.029$), vitality ($p = 0.017$), and social functioning ($p = 0.020$). Regular exercise was associated with higher vitality scores ($p = 0.031$), while smoking correlated with higher physical functioning ($p < 0.001$) but lower mental health ($p = 0.011$) scores.
Working in a university hospital was linked to lower role-physical ($p = 0.016$) and social functioning ($p = 0.003$) scores compared to private hospitals. Interventional radiology was associated with higher role-physical ($p < 0.001$) and role-emotional ($p = 0.010$) scores. Longer practice years (>7) correlated with lower scores across all domains (p values ranged 0.011 to < 0.001).
Multiple regression analysis identified older age as a significant risk factor for poor HRQoL in various domains (p values ranged 0.001 to 0.039). Female gender was a risk factor for bodily pain ($p = 0.006$), general health ($p = 0.022$), and vitality ($p = 0.001$). Working in a university hospital was a risk factor for role limitations due to physical problems ($p = 0.018$) and bodily pain ($p = 0.007$). Conversely, working in interventional radiology was favorable for better HRQoL (p values ranged 0.001 to 0.003), as was trusting in radiation exposure measurements and frequent use of protective measures (p values ranged 0.001 to 0.042).

DISCUSSION

In our study, the SF-36 assessment revealed the lowest scores for vitality and general health domains overall, indicating an increased likelihood of poor Health-Related Quality of Life (HRQoL) in all domains among older technicians and those with more than 7 years of experience. The multiple regression analysis identified older age, working in a university hospital or in a unit other than interventional radiology, infrequent use of protective measures, a higher number of films processed daily, and distrust in radiation exposure measurement as potential determinants of poor HRQoL (Çakır et al., 2015).
This finding contrasts with data from past studies among healthcare professionals in Turkey, which revealed a moderate-to-good level of Quality of Life (QoL). Primary care general practitioners were found to have a higher likelihood of better QoL than specialists working in tertiary care university hospitals, and longer years in practice were associated with an improved QoL due to increased familiarity with the work environment and a more positive perception of job security with increasing seniority (Sevimli & İşcan, 2005; Tözün et al., 2008; Çakır et al., 2015; Şavlı-Emiroğlu & Pala, 2015; Akova & Hasdemir, 2019).

The majority of radiology technicians in our study reported distrust in their current knowledge of radiation protection and safety, despite previous training. Nearly half of them reported only seldom use of radiation protection measures. These findings are critical given that most radiology technicians in our cohort reported working 35–37 hours per week, processing at least 51 x-ray films per day. Lack of measures and knowledge among personnel has been considered responsible for most mistakes in radiology practice (Ozkan et al., 2016), and a strong relationship exists between knowledge/awareness levels of radiology technicians and protection from harmful effects of radiation (Mojiri & Moghimbeigi, 2011).

Similar discordance between theory and practice was reported in a study on radiation safety practice among operating room staff, indicating inadequacy of behaviors toward safety measures despite satisfactory knowledge levels (Vural et al., 2012). Likewise, a past study among radiology technicians in Turkey reported irregular use of protective measures and emphasized the need for in-service training and increased awareness for improved safety practice (Ozkan et al., 2016).

Identifying poor HRQoL among older technicians with more than 7 years in practice in our study is notable given higher knowledge levels among technicians with 1–5 years of experience, attributed to a lack of in-service training (Szarmach et al., 2015).

Our findings underscore the importance of implementing in-service refresh training and regularly updating self-knowledge among radiology technicians regarding radiation protection and safety. This ensures radiological imaging is done within safety standards for employees and patients (Bernier et al., 2018; Mojiri & Moghimbeigi, 2011; Ozkan et al., 2016; Szarmach et al., 2015).

While routine radiation exposure measurements are implemented every 6 months, nearly two-thirds of radiology technicians in our study considered these measurements unreliable. This is crucial not only due to potential radiation exposure but also for maintaining motivation and performance among personnel (Ozkan et al., 2016).

Technicians who trust radiation exposure measurements and frequently use protective measures had significantly better HRQoL in our study. Conversely, seldom use of protective measures and distrust in exposure measurements were significant risk factors for poor HRQoL. These findings highlight the importance of addressing occupational factors and radiation safety through continuous training and quality assurance programs (Szarmach et al., 2015).

In conclusion, our study emphasizes the need for improved radiation safety practices and in-service training among radiology technicians to ensure compatibility with safety standards and improve HRQoL for both employees and patients.

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