Occupational Safety and Health Conditions of the Work Environment Affecting Air Traffic Controllers in Kenya

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Abstract

Background: Air traffic management (ATM) is vital for maintaining a safe and efficient aviation system. It requires seamless coordination of air traffic controllers (ATCOs), equipment, and procedures. ATCOs must make split-second decisions under pressure, exposing them to occupational safety and health (OSH) risks stemming from inadequately designed work environments. Existing studies prioritise the role of controllers in ensuring flight safety, with less attention given to their own well-being. Thus, this study aimed to examine workplace factors, including lighting, noise, sanitation, emergency exits, and equipment condition, that influence the health of Kenyan ATCOs.

Methodology: A quantitative descriptive study was conducted among 64 ATCOs sampled from a target population of 172 at seven purposively selected airports in Kenya. Participants were selected using proportionate stratified random sampling. Data were collected via structured questionnaires and analysed using descriptive and inferential statistics in SPSS.

Results: The study found high prevalence of health issues: headaches (77%), back pain (68.8%), and work-related stress (47.6%). Respondents reported environmental concerns, including inadequate lighting, screen glare, and poor access to workplace amenities. Station preference was linked to perceived stress, with 85.7% of those experiencing stress resorting to self-medication. Chi-square analysis showed significant associations between equipment unserviceability and stress ($\chi^2 = 6.24$, $p < 0.05$), stress and help-seeking behaviour ($\chi^2 = 23.3$, $p < 0.001$), and back pain and posture deterioration ($\chi^2 = 28.96$, $p < 0.001$), leading to rejection of all null hypotheses.

Conclusion: This study reveals critical OSH issues affecting ATCOs in Kenya, primarily driven by suboptimal work environments. Key concerns include inadequate lighting, excessive screen glare, unreliable equipment, and insufficient workplace amenities. Significant associations between equipment unserviceability, stress, reluctance to seek help, and posture-related back pain during high traffic periods highlight both technical and behavioural OSH gaps.

Recommendations: The study recommends improving lighting, maintaining equipment regularly, and enhancing cleanliness to ensure a safer, healthier work environment for ATCOs.

Keywords: *Safety, Health, Work environment, Air Traffic Controllers*
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Introduction

The World Health Organisation (WHO) defines a healthy work environment as one where employees and management collaborate in a process that protects and promotes employee health, safety, and well-being [1]. The physical work environment includes all sensory-detectable aspects such as chemicals, lighting, noise, air quality, vibration, and materials that may impact safety and well-being [1]. Air Traffic Controllers

(ATCOs) are pivotal to the safety of the aviation industry, ensuring the orderly and efficient movement of aircraft [2]. Their responsibilities demand exceptional mental acuity, rapid decision-making, and a high tolerance for stress. However, these demands come with significant occupational health challenges, particularly related to stress and fatigue, which can impair cognitive performance and overall well-being.

Globally, measures have been implemented to address these challenges. For instance, in the United States, the Federal Aviation Administration (FAA) has partnered with the Occupational Safety and Health Administration (OSHA) to enforce health and safety standards for aviation personnel. These standards focus on managing occupational hazards, thereby enhancing the health of cabin crew and ATCOs without compromising aviation safety [3]. Such efforts underscore the importance of prioritising workplace health in high-stress professions.

Stress and fatigue are major concerns in high-stakes professions. Kumar identifies medicine as highly stressful, and similarly, ATCOs make decisions where errors can be life-threatening [4]. Work-related stress contributes to burnout and other health issues, as seen in healthcare [5,6], underscoring the need for targeted interventions for ATCOs.

In Brazil ATCOs faced significant health risks due to physical inactivity, excess weight, sleep deprivation, and limited social engagement [7]. These factors contributed to chronic illnesses and reduced job performance. The report advocates for better diets, physical activity, and improved work conditions [7].

Subotic and colleagues explored how equipment failures pose safety risks when human operators must compensate for system breakdowns. While technical safeguards help, human intervention remains critical in time-constrained situations. The study recommended improved equipment design, structured recovery protocols, and regular training [5].

Costa (2000) found that Italian ATCOs often suffered from stress-related illnesses, including headaches, fatigue, digestive issues, and serious conditions like peptic ulcers and coronary disease, driven by high job demands [8]. These studies illustrate the multidimensional OSH challenges facing ATCOs globally. However, there is limited research addressing how such challenges manifest in the Kenyan context.

In Kenya, the Occupational Safety and Health Act, 2007 requires employers to mitigate workplace risks, while KCAA regulations limit ATCO working hours and mandate periodic medical evaluations [9–11]. Nonetheless, poor lighting, noise, faulty equipment, and limited facilities still threaten ATCO's health and performance [7].

While OSH issues in aviation have been widely studied in contexts such as noise and fatigue, limited research exists on how these factors uniquely affect Kenyan ATCOs [12–18]. Existing studies emphasise ATCOs' role in aviation safety but give little attention to their occupational challenges. This gap underscores the need to safeguard controllers, as their performance is shaped by working conditions. This study aimed to investigate workplace health and safety challenges specific to Kenyan ATCOs, focusing on lighting, noise, and equipment availability. The findings could inform KCAA management and other stakeholders about the interventions required to enhance ATCOs' safety and health.

Hypothesis testing

The study examined three specific null hypotheses related to occupational safety and health among ATCOs in Kenya:

- **H_{01}:** There is no association between equipment unserviceability and stress among ATCOs.

- **H_{02}:** There is no association between stress status and help-seeking behaviour among ATCOs.
- **H_{03}:** There is no association between back pain and posture deterioration among ATCOs.

Corresponding alternative hypotheses proposed that each of these factors is significantly associated.

Methodology

Research design

A quantitative descriptive research design was used in this study. A cross-sectional descriptive survey was used to collect data.

Study population

The study population comprised ATCOs permanently deployed at the nine manned airports in Kenya. However, after excluding those on temporary postings (Wajir and Lokichogio), the target population was reduced to 172 ATCOs. Only ATCOs holding at least one valid ATC rating were considered eligible ensuring a stable and representative population.

Sampling Method

A purposive sampling approach was first applied to select seven of the nine airports, as these have permanent ATCO postings (Table 1). Wajir and Lokichogio were excluded because their ATCOs serve on temporary one-year postings and experience relatively low traffic workloads. Subsequently, a two-stage stratified random sampling design was employed. In the first stage, each of the seven selected airports was treated as a stratum. In the second stage, participants were randomly selected from each stratum in proportion to the number of ATCOs stationed at that airport, yielding a final sample size of 64 (Equation 2). This ensured balanced representation of ATCOs across all target airports, as detailed in Table 1.

Sample Size Determination

Yamane's formula was employed to determine the sample size for this study [19]. Proportionate distribution was then used to obtain the sample size in each airport.

$$n = \frac{N}{1+N(\propto)^2}$$

Where, N = target population (172), α = margin error (10%) and n = sample size.

$$n = \frac{172}{1+172(0.1)^2} = 63.24$$

Therefore, the total number of respondents considered for this study was 64 Air Traffic controllers. The sample was distributed using proportionate distribution across all the airports considered for this study. The sample size for each airport was given by:

$$(\frac{Population\ of\ a\ specific\ station}{,Total\ Population\ for\ the\ study}) * sample\ size(n)$$

The study focused exclusively on ATCOs who were actively involved in live air traffic control duties to capture OSH challenges of real-time control. Individuals who held administrative positions that did not subject them to the same occupational exposures as operational controllers, were excluded.

Table 1

Sample distribution

S/No.	Station Name	Population	$\frac{Population}{(Total\ Population)}$*n	Sample size (n)
1	Moi International Airport	36	13.4	13
2	Malindi Airport	8	2.98	3
3	Diani Airport	6	2.23	2
4	Kisumu Airport	7	2.60	3
5	Eldoret International Airport	7	2.60	3
6	Jomo Kenyatta International Airport	86	32	32
7	Wilson Airport	22	8.19	8
Total Population		172		64

Data collection Instruments

Noise and lighting in control rooms were measured using a sound level meter (serial 10225185) and a lux meter (serial 200401318), respectively, with lighting assessed during both day and night for airports with night operations. A checklist documented noise and lighting levels, washroom provision, insect-vector control, and availability of restrooms, canteens, and gym facilities. Equipment serviceability was assessed via a questionnaire, where ATCOs indicated their agreement on a 5-point Likert scale from "strongly agree" to "strongly disagree."

Data processing and analysis

SPSS software was used to analyse the quantitative data collected. The statistical tools employed included mean, standard deviation, percentage, frequency, and chi-squared test. The Chi-square test was used to test the hypothesis through associations between the categorical variables at a 95% confidence level ($\alpha = 0.05$). For each significant association, the effect size was calculated using Cramér's V, with thresholds of 0.10 (small), 0.30 (medium), and 0.50 (large). Additionally, measured sound and lighting levels were analysed and compared with the recommended standards.

Ethical consideration

Ethical approval was granted by the Ethical Review Committee (TUM SERC MSC/007/2023), and a research license (829298) was obtained from NACOSTI in compliance with Kenyan research regulations. Participants were recruited ethically, with confidentiality assured and no coercion applied. Informed consent was obtained, and participation was voluntary, with respondents free to withdraw at any time.

Results

Respondents' demographic profile

All 64 respondents completed the survey, resulting in a 100% response rate. The sample was predominantly male (65.6%), with females comprising 34.4%. Most respondents were aged 36–45 (51.6%) and 26–35 (40.6%), with only 7.8% above 45 years. Regarding marital status, 62.5% were married, 32.8% single, and 4.7% separated.

In terms of education, 48.4% held a bachelor's degree, 28.1% a master's degree, and 9.4% had postgraduate diplomas or certificates. Only 4.7% held diplomas. Work experience varied, with 46.9% having 10–20 years, 28.1% between 5–10 years, 15.6% under 5 years, and 9.4% over 20 years.

Impact of the work environment on ATCOs in Kenya

Respondents rated predetermined statements of work environment factors on a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1). Results are summarised in Table 2. The data analysis shows that most respondents strongly perceived the work environment as having a significant impact on ATCOs. They indicated that lighting levels affected their efficiency, equipment serviceability influenced their work performance, and equipment unserviceability increased their workload and stress levels.

Conversely, most respondents had a low perception that noise affected their concentration, and similarly, they did not strongly perceive the availability of gyms, restrooms, and canteens as contributing significantly to stress reduction or improved work morale.

These work environment factors have been analysed and discussed under the following themes: human factors and station preference, environmental conditions, health outcomes, and workplace amenities and infrastructure.

Human factors and station preference

The ATCOs were asked to select their most suitable workstation based on pre-determined factors, as illustrated in Figure 1**.** A significant proportion (46.9%**)** chose a station they perceived to be less stressful, indicating that psychological well-being was a top priority. Other important factors included a relaxed work

environment (20.3%), proximity to family (18.8%), and opportunities for personal growth (14.1%).

Environmental Conditions

a) Sound level. Sound levels in various control rooms were measured during both day and night, with results presented in Table 3. The highest recorded level was 85 dBA, and the lowest was 27 dBA. This noise is equivalent to standard radio communications and not likely to cause hearing impairment. The average daytime noise levels in most stations exceeded the FAA-recommended range of 55–65 dBA. These elevated levels could potentially interfere with effective two-way pilot communication.

Table 2

Responses to Work Environment Factors Affecting ATCOs

Work Environment	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	Std. Dev	Decision
Noise affects my concentration when working	4.7%	6.3%	12.5%	37.5%	39.1%	4.0	1.2	Low Perception
Lighting levels affect my efficiency when working.	-	4.7%	10.9%	40.6%	43.8%	4.2	0.8	High Perception
Equipment unserviceability increases my workload & stress.	-	-	-	12.5%	87.5%	4.9	0.3	High Perception
Availability of gym, restrooms and canteen has helped me in reducing stress and improving work morale	9.4%	18.8%	37.5%	18.8%	15.6%	3.1	1.2	Low perception

[1]Weighted Average-4.19

[2]low perception decision if the mean <weighted average and high perception decision if the mean >weighted average

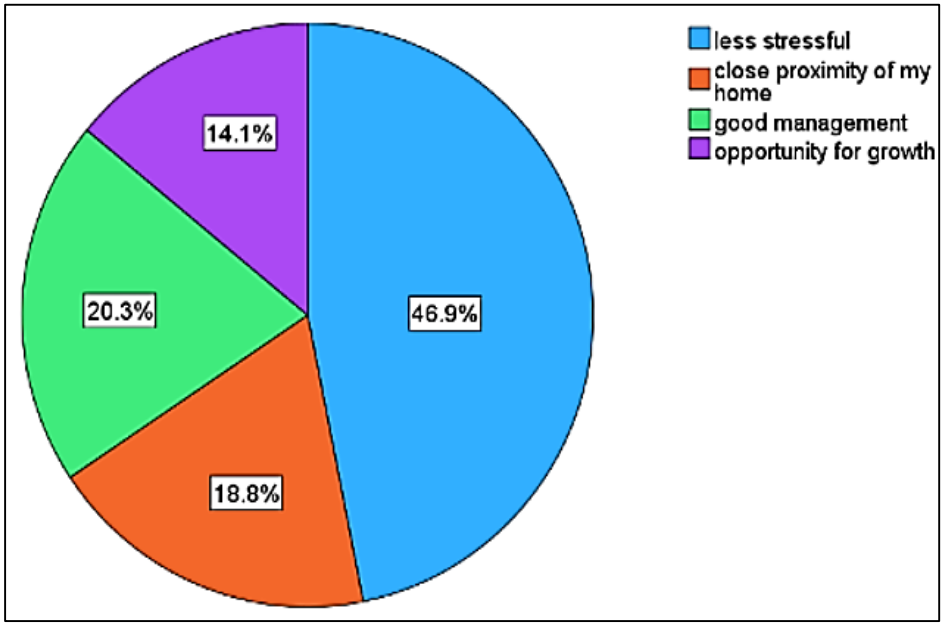

Figure 1

Respondents' Choice of a Station

b) Lighting and glare. Lighting intensity was measured in the control rooms during both day and night shifts, as presented in Table 4. Daytime measurements averaged 181 lux (range: 11–294 lux), while nighttime readings averaged just 6.5 lux (range: 1–30 lux), which was below the FAA-recommended 100 lux standard. Some locations, such as JKIA Approach, JKIA Enroute, and MIA Approach, recorded lighting levels significantly below the recommended 200 lux during the day. Additional feedback from respondents on the impact of lighting and glare on screen use among ATCOs was obtained. Most respondents (95.1%) indicated that anti-glare screens were not provided at their workstations, while only 4.9% reported having access to them. Regarding anti-glare glasses, 38.3% of respondents stated that such eyewear was provided, compared to 61.7% who indicated otherwise.

In terms of anti-glare window treatments or blinds on tower screens, 40.7% reported their availability, while 59.3% stated they were not provided. Only 32.8% of ATCOs reported taking regular breaks from screens, while a larger proportion (67.2%) said they did not take such breaks. Notably, 95.2% of ATCOs indicated that they use screens throughout their entire shift, with only 4.8% reporting limited screen time. Furthermore, 73.0% of respondents found the screens irritating due to glare or reflections, whereas 27.0% did not experience such irritation.

Table 3
Measured Sound Levels

	Measured Noise (dBA) During the Day (10 am to 1 pm)	Measured Noise (dBA) During the Night (10 pm-1 am)	Standard FAA Recommended Noise Level (dBA)
JKIA Tower	85	62	55-65
Wilson Tower	79	-	55-65
MIA Tower	69	59	55-65
Diani Tower	61	-	55-65
Malindi Tower	57	-	55-65
Eldoret Tower	58	35	55-65
KIA Tower	59	27	55-65
JKIA Approach	68	58	55-65
JKIA Enroute	78	61	55-65
MIA Approach	68	52	55-65

Table 4
Measured Light Levels

	Measured Light Levels (Lux) During the Day (10 am to 1 pm)	Standard Recommended Day Lighting Level (Lux)	Measured Light Levels (Lux) During the Night (10 pm-1 am)	Standard Recommended Night Lighting Level (Lux)
JKIA Tower	238	200	30	100
Wilson Tower	294	200	-	100
MIA Tower	235	200	3	100
Diani Tower	226	200	-	100
Malindi Tower	237	200	-	100
Eldoret Tower	233	200	2	100
KIA Tower	219	200	2	100
JKIA Approach	37	200	4	100
JKIA Enroute	72	200	4	100
MIA Approach	11	200	1	100

Health outcomes

Regarding health outcomes 47.6% of the respondents reported experiencing work-related stress, while 31.1% had been diagnosed with stress-related conditions such as depression and high blood pressure. Eye problems were reported by 38.1% of respondents as diagnosed by an Aviation Medical Examiner (AME), and 77.0% experienced mild headaches after shifts.

Among the 47.6% stressed controllers, 85.7% preferred self-treatment over seeking professional help, compared to 26.7% of the 34 non-stressed controllers. Chi-square analysis confirmed a significant association between stress and self-treatment (χ^2 (1, N = 64) = 23.3, p < 0.001, Cramér's V = 0.60), leading to rejection of H_{02}.

Regarding musculoskeletal health, 68.8% reported back pain, of whom 91% also experienced posture deterioration during high traffic volume, compared to the 20% without back pain. Despite 80% of the respondents reporting availability of ergonomic chairs, chi-square analysis showed a significant association between back pain and posture deterioration, χ^2 (1, N=64) = 28.96, p < 0.001, Cramér's V = 0.67, indicating a large effect and leading to rejection of H_{03}.

Workplace Amenities and Infrastructure

a) Equipment serviceability. To examine the relationship between perceived equipment unserviceability and reported work-related stress among ATCOs. Out of the 30 controllers who reported being stressed, 80% indicated that equipment unserviceability was the cause of their stress, while only 20% did not attribute their stress to equipment problems. In contrast, among the 34 controllers who reported not being stressed, 50% reported working with unserviceable equipment, while the other 50% did not. A Chi-square test revealed a statistically significant association between equipment unserviceability and reported work-related stress among ATCOs (χ^2 = 6.24, p =0.00125), while Cramér's V = 0.31, suggesting a medium effect size. This suggests that ATCOs who experienced frequent equipment unserviceability were more likely to report experiencing stress, leading to rejection of the null hypothesis H_{01}.

Table 5

Distribution of Health and Behavioural Outcomes among ATCOs (N =64)

Variable	Category	Frequency (n)	Percentage (%)
Work-related stress	Yes	30	47.6
	No	34	52.4
Stressed due to unserviceable equipment	Yes	24	80
	No	6	20
Help-seeking behaviour for stressed workers	Self-treatment	26	85.7
	Professional help	4	14.3
Help-seeking behaviour for non-stressed workers	Self treatment	9	26.7
	Professional help	25	73.3
Back pain	Yes	44	68.8
	No	20	31.2
Posture deterioration for ATCOs with back pain	Yes	40	91
	No	4	8
Posture deterioration for ATCOs without back pain	Yes	4	20
	No	16	80

b) Regular fumigation and cleaning of control rooms. Only 50% of control rooms were reported to be regularly cleaned and fumigated. Most of the ATC equipment, including radar systems, AWOS, communication systems, and especially keyboards, were dusty. Fumigation and cleaning were inconsistent across the stations, raising hygiene concerns. Respondents acknowledged the importance of maintaining a clean environment.

c) Availability of safe emergency exits. All control towers had only one exit route, except for Wilson Airport, which had an escape chute installed. Although emergency exits were well labelled and marked with directional arrows, none of the facilities had emergency lighting along evacuation paths. ATCOs expressed concern about visibility during emergencies, especially during power outages or fire-related smoke conditions. Evacuation drills were either irregular or absent in most stations.

Discussion

The ATCO workforce in Kenya was relatively mature and experienced, with over 90% aged between 26 and 45 years old and nearly half with more than a decade of experience. The high level of education supports the classification of air traffic control as a highly skilled profession [20]. The predominance of married individuals may also reflect the stable, long-term nature of the career. The gender distribution, while still male-dominated, suggests growing female representation in the field.

Human factors and station preference

A notable 46.9% of respondents selected station preference based on perceived stress levels, demonstrating high self-awareness of the link between mental health and job performance. Factors such as good management, proximity to family, and personal growth also played a role. These findings align with EUROCONTROL's emphasis on human factors and psychosocial support in maintaining operational efficiency and staff well-being [15]. They suggest the need for integrating flexible deployment policies and mental wellness initiatives into ATC workforce planning.

Environmental Conditions

a) Sound Levels. While measured noise levels in several control towers exceeded the FAA-recommended 55–65 dBA, most respondents reported a low perception of noise-related interference.

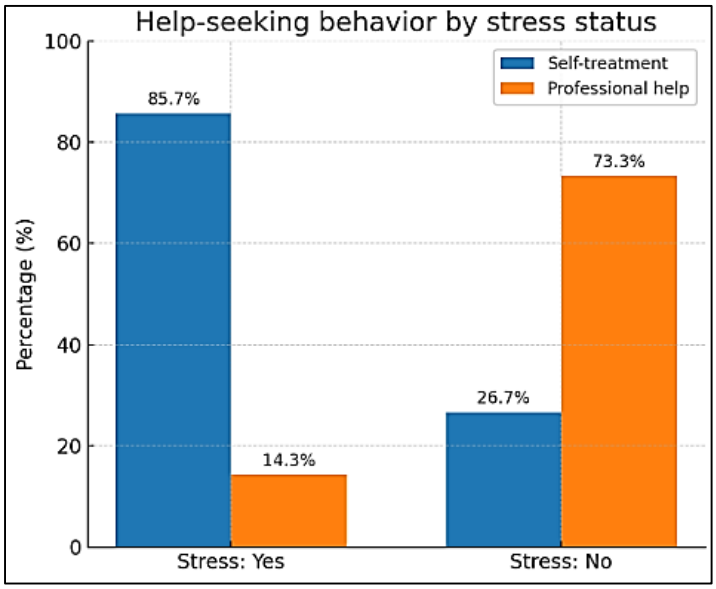

Figure 2
Stress versus seeking help

This may be due to habituation or effective mitigation through equipment like noise-cancelling headsets. Nonetheless, studies from EUROCONTROL [12] caution that exposure to noise above 60 dBA can reduce communication accuracy and increase cognitive load, especially in complex operational environments. These findings highlight the importance of noise mitigation in ATC workspaces to preserve attention and speech clarity during high traffic volume.

b) Lighting and Glare. The study revealed consistently poor lighting levels**,** especially at night, with lux values falling below FAA-recommended standards in many stations. Furthermore, 95.1% of respondents reported the absence of anti-glare screens, 61.7% lacked anti-glare glasses, and 59.3% indicated the lack of window blinds, contributing to screen glare and visual discomfort. This is consistent with Saralee's findings [12], which confirmed that inadequate lighting and glare reduce situation awareness and hinder task execution in ATC. Additionally, the fact that 95.2% of ATCOs work full shifts without relief and 67.2% do not take screen breaks intensifies visual strain, which was reported by 73.0% of respondents. These outcomes show the urgent need for engineering controls such as proper lighting & anti-glare materials, and administrative policies such as planned screen breaks to reduce eye fatigue and cognitive overload.

Workplace amenities and infrastructure

a) Equipment Serviceability. A key finding was the significant statistical association between equipment unserviceability and stress levels ($\chi^2 = 6.24$, $p = 0.0125$). Respondents who reported unserviceable equipment were more likely to experience work-related stress. This aligns with a report by Subotic et al. who emphasised that while equipment failures may not directly impact flight safety, they significantly burden controllers, especially when recovery depends on rapid human response [5]. This is also consistent with findings by Costa [8], who reported that inadequate or malfunctioning equipment increases cognitive load and psychological strain in air traffic control operations. This suggests that ensuring high serviceability of critical ATM systems is not only a safety issue but also a mental health imperative.

b) Cleanliness and Fumigation. Only 50% of control rooms were reported as being regularly cleaned and fumigated. Observations showed dust accumulation on keyboards and radar equipment, posing both hygiene and functionality concerns**.** Poor sanitation increases the risk of infections and can compromise sensitive electronics. These findings stress the importance of routine cleaning protocols and proper oversight to maintain both equipment integrity and staff health.

c) Emergency Exits and Safety Infrastructure. Most towers had only one emergency exit, lacked emergency lighting, and did not conduct regular evacuation drills. While signage was present, its utility was undermined in low visibility conditions, such as power outages or smoke. These shortcomings highlight critical safety gaps in emergency preparedness, contrary to the requirements of the Occupational Safety and Health Act, 2007 [9]. Establishing secondary exits, emergency lighting**,** and frequent drills is essential to improving staff safety during emergencies.

Health outcomes and help-seeking behaviour

Nearly half of the respondents (47.6%) reported work-related stress, and a substantial number reported headaches (77%)**,** back pain (68.8%)**,** and eye problems (38.1%)**.** These symptoms could be associated with poor ergonomics, prolonged screen use, and environmental discomfort. These issues were more prevalent among the most active ATCO demographic (26–45 years), suggesting that prolonged exposure without intervention could

worsen with age [13]. Despite mandatory medical examinations, 85.7% of those experiencing stress opted for self-medication, likely due to fear of losing their Class 3 certification. This is consistent with trends reported by Kumar [4] and the American Foundation for Stress Prevention [6], where health professionals in high-stakes fields avoid seeking help due to stigma or perceived job risk.

Moreover, a significant association was found between posture deterioration during periods of high traffic intensity and the occurrence of back pain. While 80% of respondents acknowledged the availability of ergonomic chairs in control rooms, this did not appear sufficient to prevent musculoskeletal issues. This suggests that ergonomic equipment alone is inadequate without complementary measures such as posture education, workload management, and proper usage practices. This is consistent with a study by Costa, which found that ATCOs frequently experienced musculoskeletal issues, particularly back pain, due to prolonged static postures and increased workload during operational shifts [8]. Given the sedentary nature of air traffic control work, these results underscore the importance of ergonomic workstation design, regular posture breaks, and targeted physical activity programs.

Future research directions

- Expanding the sample size to include more ATCOs across different regions for better generalizability.
- Exploring the effectiveness of specific interventions, such as improved lighting standards, regular equipment maintenance schedules, and enhanced facilities, in reducing OSH-related illnesses and improving workplace safety.

Limitations of the Study

Organisational factors such as shift patterns, work schedules, and workload distribution were not examined in this study. These elements were intentionally excluded, as they are addressed in a separate publication by the authors.

This study also heavily relied on self-reported data, which may have introduced a bias. This is particularly relevant in areas such as stress and medical issues, where respondents might have underreported symptoms. Although participants were sensitised to the importance of accurate reporting, the potential for underreporting remains a limitation in this study.

Conclusion

This study revealed significant OSH issues within the work environment affecting ATCOs in Kenya. Key OSH concerns were poor lighting, equipment issues, and lack of rest facilities, contributing to headaches, back pain, and eye strain. Significant associations between equipment unserviceability, stress, reluctance to seek help, and posture-related back pain during high traffic periods highlight both technical and behavioural OSH gaps.

Recommendations

KCAA management should take immediate action by implementing engineering controls to improve lighting, ergonomics, and equipment maintenance. The Human Resource Department should establish policies that promote mental health support to reduce reliance on self-medication. Regulatory bodies should enforce workplace standards through regular inspections and audits. This will ensure a safer, healthier, and more efficient work environment for ATCOs.

Abbreviations and Acronyms

AME - Aviation Medical Examiner
ATC - Air Traffic Control
ATCOs - Air Traffic Controllers
ATM - Air Traffic Management
AWOS Automated Weather Observing System
FAA - Federal Aviation Administration
ICAO - International Civil Aviation Organisation

JKIA - Jomo Kenyatta International Airport
KCAA - Kenya Civil Aviation Authority
KIA - Kisumu International Airport
MIA - Moi International Airport
OSH - Occupational Safety and Health
RADAR - Radio Detection and Ranging
VCCS - Voice Communication and Control Systems

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References

[1] World Health Organization. Healthy workplaces: a model for action: for employers, workers, policy-makers and practitioners. World Health Organization; 2010.

[2] International Civil Aviation Organisation. Air Traffic Management – Procedures for Air Navigation Services. 2010.

[3] Federal Aviation Administration. Memorandum of Understanding on OSH Standards for Cabin Crew Safety. Washington: 2021.

[4] Kumar S. Burnout and Doctors: Prevalence, Prevention and Intervention. Healthcare 2016; 4:37. https://doi.org/10.3390/healthcare4030037.

[5] Subotic B, Schuster W, Majumdar A, Ochieng W. Controller recovery from equipment failures in air traffic control: A framework for the quantitative assessment of the recovery context. Reliability Engineering & System Safety 2014; 132:60–71. https://doi.org/10.1016/j.ress.2014.06.010.

[6] American Foundation for Stress Prevention. Occupational Stress in High-Pressure Professions. New York: 2021.

[7] Sonati JG, De Martino MMF, Vilarta R, da Silva Maciel É, Sonati RJF, Paduan PC. Quality of Life, Sleep, and Health of Air Traffic Controllers with Rapid Counterclockwise Shift Rotation. Workplace Health Saf 2016; 64:377–84. https://doi.org/10.1177/2165079916634710.

[8] Costa G. Working and Health Conditions of Italian Air Traffic Controllers. International Journal of Occupational Safety and Ergonomics 2000; 6:365–82. https://doi.org/10.1080/10803548.2000.11076461.

[9] Kenya Ministry of Labour and Social Protection. Occupational Safety and Health Act 2007. Nairobi: 2007.

[10] International Civil Aviation Organisation. Annex 1 – Personnel Licensing. 2nd ed. Montreal: ICAO; 2022.

[11] Kenya Civil Aviation Authority. Personnel Licensing Regulations. KCAA; 2015.

[12] Pruksaritanon S. Effects of Lighting and Noise on Performance and Situation Awareness in Air Traffic Control Tasks 2018.

[13] Mzenga MW. Occupational stress and its implications on performance among air traffic controllers in Kenya. University of Nairobi, 2016.

[14] Fatigue management in shift work. Kinesiol Res Rev 2019; 41:145–67.

[15] European Organisation for the Safety of Air Navigation (EUROCONTROL). Human Factors in Air Traffic Management. Brussels: EUROCONTROL; 2018.

[16] Zhang X, Yuan L, Zhao M, Bai P. Effect of Fatigue and Stress on Air Traffic Control Performance. 2019 5th International Conference on Transportation Information and Safety (ICTIS), 2019, p. 977–83. https://doi.org/10.1109/ICTIS.2019.8883823.

[17] Eastwood G. OSH awareness in aviation sectors: Key guidelines and policies. Occupational Safety Health Journal 2020; 18:55–64.

[18] Rao S, Singh P. Sleep disorders in ATCOs: A study of circadian rhythms. 2019;16(1):18–25. J Hum Perform Extreme Environment 2019; 16:18–25.

[19] Yamane T. Statistics: An introductory analysis 1973.

[20] Sobieralski JB, Hubbard T. The effect of stress and training on ATCO productivity: Insights from behavioral economic. Aviat Econ Q 2021; 19:50–61.