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Navigating the skies: a cross-sectional study of depression among Saudi Arabian airline pilots

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Abstract

Background Depression poses a significant challenge globally, including in safety-critical industries such as aviation. In Saudi Arabia, where the aviation sector is rapidly expanding, pilots encounter unique stressors inherent to their profession. However, research on pilot mental health, particularly within the Saudi context, remains limited despite its critical role in flight safety.

Methods This cross-sectional survey was designed to estimate the self-reported prevalence of depression in a convenience sample of airline pilots in Saudi Arabia. Participants were recruited from various commercial airlines in Saudi Arabia. Recruitment efforts utilized targeted outreach on social media platforms, focusing on pilot forums and groups. The survey was administered online for accessibility and convenience. The structured questionnaire, developed through a literature review and expert consultation, comprises sections on demographic and professional characteristics, occupational information, health habits, and depression assessment via the Patient Health Questionnaire-9 (PHQ-9).

Results This study enrolled 310 participants, with the largest cohort (34.8%, $n=108$) falling within the 30–39 years age group, closely followed by individuals under 30 years (30.0%, $n=93$). Males dominated the sex distribution (99.0%, $n=307$). The mean PHQ-9 score was 8.2 ± 5.4. Notably, 40.6% ($n=126$) of the participants had a score of 10 or higher, indicating the potential for moderate, moderate-severe, or severe depression. Multivariable binary logistic regression analysis revealed that pilots with 11–15 years of experience had greater odds of experiencing depression than did those with 0–10 years of experience did (odds ratio [OR]: 3.0, 95% confidence interval [CI]: [1.1–8.4], $p=0.04$). Pilots with rest times exceeding 24 h had lower odds of depression than did those with rest times less than 1 h (OR: 0.3, 95% CI: [0.1–0.8], $p=0.02$). Engaging in regular exercise was associated with reduced odds of depression (OR: 0.3, 95% CI: [0.2–0.5], $p<0.01$), as was longer sleep duration (> 8 h) (OR: 0.2, 95% CI: [0.1–1.0], $p=0.04$).

Conclusion Our study estimates the prevalence and severity of self-reported depressive symptoms among airline pilots in Saudi Arabia, surpassing global estimates. The identified factors, including lack of regular exercise, short sleep

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duration, and insufficient rest between flights, underscore the complex mental health challenges faced by pilots in this region. Addressing these issues is crucial not only for pilot well-being but also for flight safety.

Keywords Depression, Airline pilots, Occupational stress, Mental health, Prevalence, Saudi Arabia, Sleep duration, Exercise, Flight safety, Cross-sectional study

Background

Depression is a pervasive mental health disorder with profound implications for individuals, communities, and societies worldwide, representing a leading cause of disability and contributing significantly to the global burden of disease [1]. Its impact spans diverse populations and professions, drawing particular attention to its ramifications within safety-critical industries [2].

The aviation sector serves as a cornerstone of modern transportation systems, facilitating global connectivity and economic growth. In Saudi Arabia, a country experiencing rapid growth in its aviation sector, pilots play a crucial role in ensuring the safety of air travel. However, operating within the aviation industry entails a complex and demanding environment characterized by irregular working hours, long flights, time zone changes, and extended periods away from home [3–5]. These factors can disrupt circadian rhythms, exacerbate sleep disturbances, and contribute to chronic fatigue, which are recognized risk factors for depression [6, 7].

Pilots are exposed to various physical stressors, including cosmic radiation and electromagnetic fields, which may increase their cancer risk. Chemical stressors, such as pollutants from jet fuels and aircraft materials, can impact air quality. Additionally, the associated biological risks include exposure to foodborne pathogens and airborne microorganisms, further complicating health management. Environmental factors such as acceleration forces, hypoxia, and noise also pose significant health risks [8, 9].

Research on pilot mental health has garnered increasing attention in recent years because of its profound implications for flight safety. The mental well-being of pilots is crucial because it directly affects their cognitive function, decision-making ability, situational awareness, and overall performance during flight operations, thereby compromising flight safety [10].

Limited research has been conducted on mental health disorders among commercial pilots globally. A systematic review by Terouz et al. [11] in 2018 included 20 studies, shedding light on the prevalence and types of mental health challenges faced by commercial airline pilots. The review revealed a wide range of depression prevalence rates, ranging from 1.9 to 12.6%. The study also identified various contributing factors to pilots' mental health challenges, including substance abuse, exposure to verbal or sexual abuse, disrupted sleep patterns, and chronic fatigue. However, none of the studies included in the review were conducted in Saudi Arabia or the broader Middle East region, indicating a significant research gap within this specific geographical context.

Understanding the unique challenges shaping pilot mental health in Saudi Arabia is crucial not only for ensuring the well-being of these individuals but also for safeguarding the safety of air travel passengers and crews. This study aimed to address this knowledge gap by requesting self-reported data on depressive symptom prevalence and severity in a convenience sample of pilots in Saudi Arabia.

Methods

Study design and settings

This cross-sectional survey was designed to estimate the self-reported prevalence of depression in a convenience sample of airline pilots in Saudi Arabia and identify associated demographic, occupational, and health behavior factors.

In Saudi Arabia, the General Authority of Civil Aviation (GACA) is responsible for establishing and overseeing health surveillance protocols for pilots. Saudi aviation medical examiners conduct thorough evaluations during mandatory occupational health visits. These examinations are typically performed at least annually for medical certification [12].

Study participants

Participants were recruited from various commercial airlines in Saudi Arabia. The inclusion criterion included active pilots. Pilots were recruited through targeted outreach on social media platforms, with a focus on pilot forums and groups to ensure diverse representations. Referrals within professional networks were encouraged, and no incentives were provided for referrals to maintain voluntary participation. Approximately 500 pilots were estimated to be targeted for recruitment.

Survey administration

To ensure accessibility and convenience, the questionnaire was administered online. A survey link was disseminated through social media platforms, including LinkedIn, Twitter, and Facebook, allowing diverse types of participation. This mode accommodates pilots' busy schedules, with an estimated completion time of 7 min. The data were collected over 6 weeks, from August 1, 2023, to September 12, 2023.

Questionnaire development

A structured questionnaire was developed through a literature review and expert consultation. The questionnaire comprises sections on demographic and professional characteristics, occupational information, health habits, and the Patient Health Questionnaire-9 (PHQ-9) questionnaire for depression assessment [13]. Prior to the main study, the questionnaire underwent preliminary testing through a pilot study involving 20 participants to ensure its clarity, relevance, and comprehensiveness.

Content of questionnaire

Exposure variables

The questionnaire covered various demographic variables, such as age group (<30 years, 30–39 years, 40–49 years, ≥50 years), sex (male or female), marital status (single, married, divorced), self-reported weight (kg), height (cm), and the presence of chronic disease. Occupational information included position (captain or senior officer), years of experience, total flying hours (<3,000, 3,000–5,000, 5,000–10,000, >10,000), flying hours in the past year (<500, 500–700, >700), rest time between flights (<1 h, 1–4 h, 4–24 h, >24 h), and flight route duration (<6 h, 6–12 h, >12 h). The health behavior habit questions included whether the participant engaged in regular exercise, defined as exercising at least 3 times per week, exercise intensity (low, moderate, or high), smoking status (nonsmoker or smoker), and sleep duration (<5 h, 5–8 h, or >8 h). The survey questionnaire also included a section about musculoskeletal complaints, which were reported separately.

Outcome variables

Depression severity was assessed via the PHQ-9 questionnaire, which categorizes scores into different severity levels. The PHQ-9 scores were categorized into five distinct severity levels: minimal depression (scores ranging from 0 to 4), mild depression (scores between 5 and 9), moderate depression (scores ranging from 10 to 14), moderately severe depression (scores ranging from 15 to 19), and severe depression (scores falling within the range of 20–27). The cutoff point for significant depression on the PHQ-9 questionnaire was defined as a score of 10 or higher, indicating the presence of moderate to severe depressive symptoms requiring clinical attention [13]. The primary outcome was the prevalence of depression among pilots. The secondary outcomes included associations between depression and demographic, occupational, and health behavior factors.

Statistical analysis

The data were analyzed via IBM SPSS Statistics version 26 (IBM Corp., Armonk, NY, USA). The chi-square test was used for comparisons between variables. Multivariable logistic regression analysis was conducted to identify independent factors associated with depression, with odds ratios (ORs) and 95% confidence intervals (CIs) estimated. All p values were calculated via two-tailed tests with an alpha level of 0.05.

To assess the potential confounding effects of age on the relationships between flying hours, years of experience, and depression, a sensitivity analysis was performed. This analysis included interaction terms between age groups and years of experience to explore whether age influenced these relationships. The results of the sensitivity analysis revealed no significant interactions, indicating that age did not substantially confound the associations between flying hours, years of experience, and depression.

Ethical considerations

Ethical approval was obtained from the Ethics Committee of King Abdulaziz University. Informed consent was obtained, ensuring voluntary participation and confidentiality. Stringent data privacy and security measures were implemented to uphold ethical standards. The participants were informed that the survey was not a diagnostic tool and encouraged them to consult their healthcare provider if they were concerned about their mental health.

Results

Demographic characteristics of the participants

The study included 310 participants. The largest cohort comprised 34.8% (108 participants) of the 30–39 age group, closely followed by individuals under 30 years, constituting 30.0% (93 participants) of the sample. Males heavily dominated the sex distribution, representing 99.0% (307 participants) of the cohort. Marital status analysis revealed that 59.7% (185 individuals) were married. Regarding body mass index categories, the majority of participants were classified as normal (42.6%, 132 participants), followed by overweight (39.7%, 123 participants) and obese (17.1%, 53 participants) (Table 1).

Occupational characteristics of the participants

Occupationally, the distribution between captains and senior officers was fairly balanced, with senior officers slightly outnumbering captains at 54.5% (169 participants) and 45.5% (141 participants), respectively. The number of years of experience varied, with the majority (57.7%, 179 participants) having between 0 and 10 years of experience. Flying hours were diverse, with nearly half of the participants (47.7%, 148 participants) accumulating fewer than 3,000 flying hours. Approximately one-third of the participants (31.0%, 96 participants) logged less than 500 h in the past year. The remaining time between flights varied as well, with 49.0% of participants

Table 1 Participant demographic characteristics and occupational information (*N* = 310)

Category	Variable		*N*	(%)
Demographic Information	Age Group	< 30 Years	93	(30.0)
		30–39 Years	108	(34.8)
		40–49 Years	61	(19.7)
		≥ 50 Years	48	(15.5)
	Gender	Male	307	(99.0)
		Female	3	(1.0)
	Marital Status	Single	118	(38.1)
		Married	185	(59.7)
		Divorced	7	(2.3)
	BMI Category	Underweight	2	(0.6)
		Normal	132	(42.6)
		Overweight	123	(39.7)
		Obesity	53	(17.1)
Occupational Information	Position	Captain	141	(45.5)
		Senior Officer	169	(54.5)
	Experience Years	0–10	179	(57.7)
		11–15	43	(13.9)
		> 15	88	(28.4)
	Flying Hours (Total)	< 3,000	148	(47.7)
		3,000–5,000	49	(15.8)
		5,000–10,000	62	(20.0)
		> 10,000	51	(16.5)
	Flying Hours (Past Year)	< 500	96	(31.0)
		500–700	116	(37.4)
		> 700	98	(31.6)
	Rest Time Between Flights	< 1 h	152	(49.0)
		1–4 h	68	(21.9)
		4–24 h	58	(18.7)
		> 24 h	32	(10.3)
	Flight Routes Duration	< 6 h	203	(65.5)
		6–12 h	33	(10.6)
		> 12 h	74	(23.9)

Abbreviations: N: number of participants, BMI: body mass index

(152 individuals) having less than 1 h of rest, 21.9% (68 individuals) having 1–4 h, 18.7% (58 individuals) having 4–24 h, and 10.3% (32 individuals) having more than 24 h. The flight route duration data revealed that the majority of flights (65.5%, 203 participants) lasted less than 6 h, followed by 23.9% (74 participants) lasting more than 12 h and 10.6% (33 participants) lasting between 6 and 12 h (Table 1).

Participants' health behaviors

Regarding the health habits of the participants, 194 participants (62.6%) identified as smokers. With respect to exercise, 158 participants (51.0%) engaged in physical activity regularly 3–5 times per week. The majority, 176 individuals (56.8%), reported exercising at a low intensity, whereas 86 participants (27.7%) exercised at a medium intensity. Additionally, 48 participants (15.5%) engaged in high-intensity exercise. The sleep duration among the participants varied, with 259 participants (83.5%) reporting a sleep duration of 5–8 h, 32 participants (10.3%) reporting more than 8 h, and 19 participants (6.1%) reporting less than 5 h (Fig. 1).

PHQ-9 score and depression severity

The mean PHQ-9 score among the study participants was 8.2 ± 5.4. Notably, 126 participants (40.6%) had a score of 10 or higher, indicating significant depression. Analysis of the PHQ-9 score distribution revealed that 88 participants (28.4%) exhibited minimal depression, 96 (31.0%) reported mild depression, 87 (28.1%) indicated moderate depression, 30 (9.7%) had moderately severe depression, and 9 (2.9%) had severe depression (Fig. 2).

Associations with depression: bivariate analysis

Table 2 presents the bivariate associations of depression with demographic, occupational, and health behavior factors. A total of 59.0% of the pilots aged 40–49 years presented with depression, whereas 34.4% of those aged < 30 years presented with depression ($p = 0.01$). In terms of occupational factors, pilots with 0–10 years of experience had a lower prevalence of depression than did those with 11–15 years of experience (35.8% vs. 58.1%, $p = 0.03$). Similarly, pilots with 3,000–5,000 and 5,000–10,000 flying hours presented greater proportions of depression than did those with fewer flying hours (< 3,000) (49.0% and 51.6% vs. 37.2%, respectively; $p = 0.04$). Additionally, pilots with shorter rest times between flights (< 1 h) had a greater prevalence of depression than did those with longer rest times of 24 h (48.0% vs. 21.9%, $p = 0.03$).

In examining the associations between health habits and the prevalence of moderate to severe depression among the study participants, several noteworthy patterns emerged. With respect to smoking status, no significant difference was observed between nonsmokers (37.9%, 44 individuals) and smokers (42.3%, 82 individuals) in terms of experiencing depression ($p = 0.45$). However, a statistically significant association was found between regular exercise and depression status ($p < 0.01$). The participants who engaged in regular exercise presented a lower prevalence of depression (27.8%, 44 individuals) than did those who did not (53.9%, 82 individuals). Those engaging in low-intensity exercise had a greater prevalence of depression (51.1%, 90 individuals), followed by individuals engaging in moderate-intensity exercise (26.7%, 23 individuals) and those engaging in high-intensity exercise (27.1%, 13 individuals). Additionally, sleep duration was significantly associated with depression ($p = 0.01$). Individuals reporting less than 5 h of sleep had a greater prevalence of moderate to severe depression (42.1%, 8 individuals), whereas those reporting 5–8 h of sleep presented a slightly greater prevalence (43.3%, 113 individuals), and individuals reporting

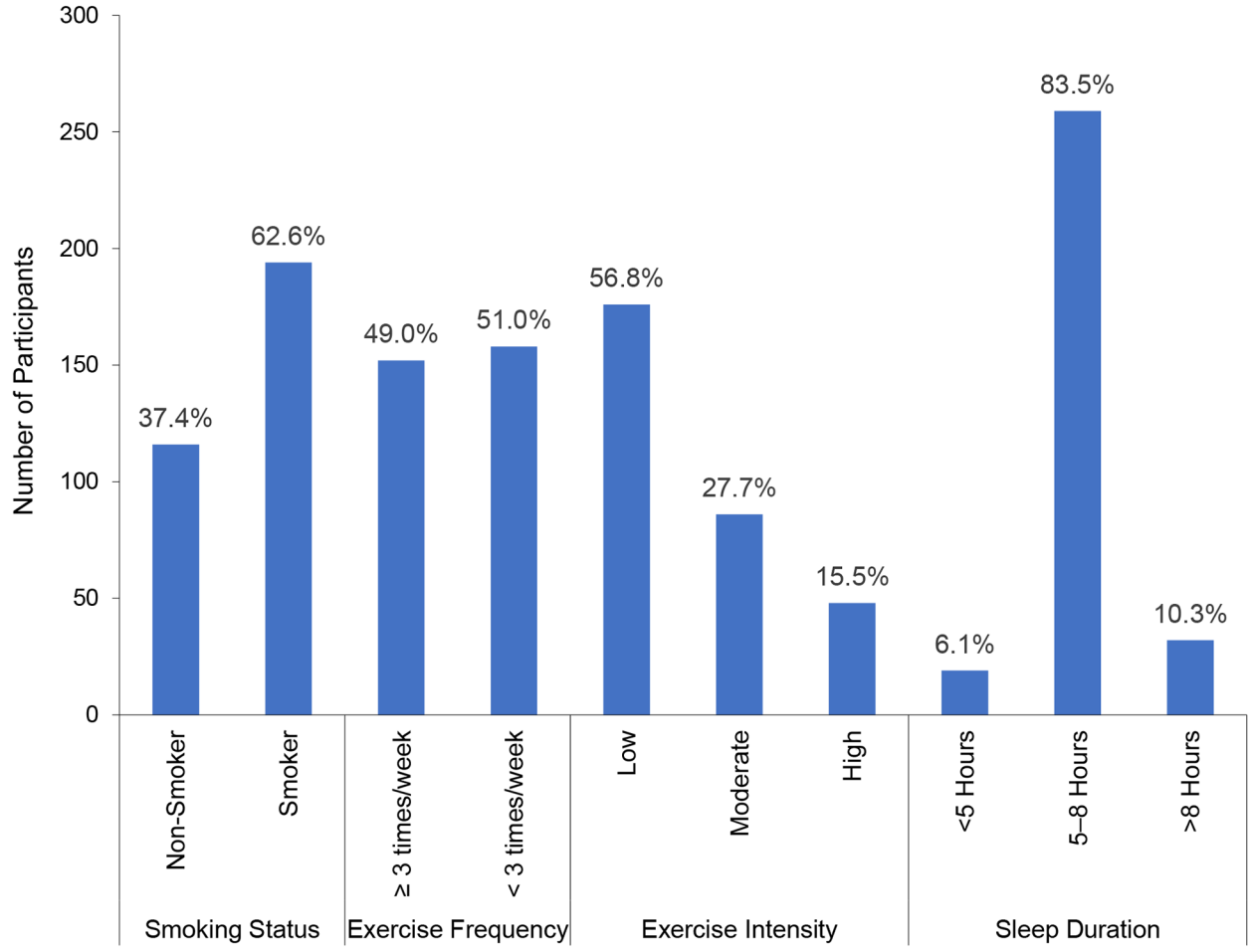

Fig. 1 Health habits of the participants ($N=310$)

more than 8 h of sleep had a lower prevalence (15.6%, 5 individuals).

Associations with depression: multivariable analysis

Table 3 presents the findings from the multivariable analysis examining the relationships between various factors and depression among airline pilots. Notably, pilots with 11–15 years of experience had markedly greater odds of experiencing depression than did those with 0–10 years of experience (OR: 3.0, 95% CI: [1.1–8.4], $p=0.04$). Additionally, pilots who had rest times between flights exceeding 24 h had significantly lower odds of depression than did those who had rest times less than 1 h (OR: 0.3, 95% CI: [0.1–0.8], $p=0.02$). Furthermore, engaging in regular exercise was significantly associated with reduced odds of depression (OR: 0.3, 95% CI: [0.2–0.5], $p<0.01$). Similarly, individuals with longer sleep durations (>8 h) had a significantly lower likelihood of depression than did those with shorter sleep durations did (OR: 0.2, 95% CI: [0.1–1.0], $p=0.04$).

Discussion

The present study revealed an alarmingly high prevalence of depression among airline pilots, with 40.6% of the sample screening positive for depression via the PHQ-9. This figure is notably higher than the rates reported in previous studies, which range from 1.9 to 12.6% [11, 14]. This substantial discrepancy raises important questions regarding the factors contributing to such elevated rates.

A key consideration is the screening tool used. Our study employed the PHQ-9, whereas other studies in the field have utilized different measures, including the Beck Depression Inventory-II (BDI-II) [10], Symptoms of Stress Questionnaire [15], Symptom Checklist 90 (SCL 90) [16], New Zealand Health Survey [17], and Self-Reporting Questionnaire-20 items (SRQ-20) [18]. The variation in tools across studies may partly account for differences in reported prevalence rates.

While it might be tempting to attribute this difference to the screening tool used—in our case, the PHQ-9—a deeper examination reveals that this explanation

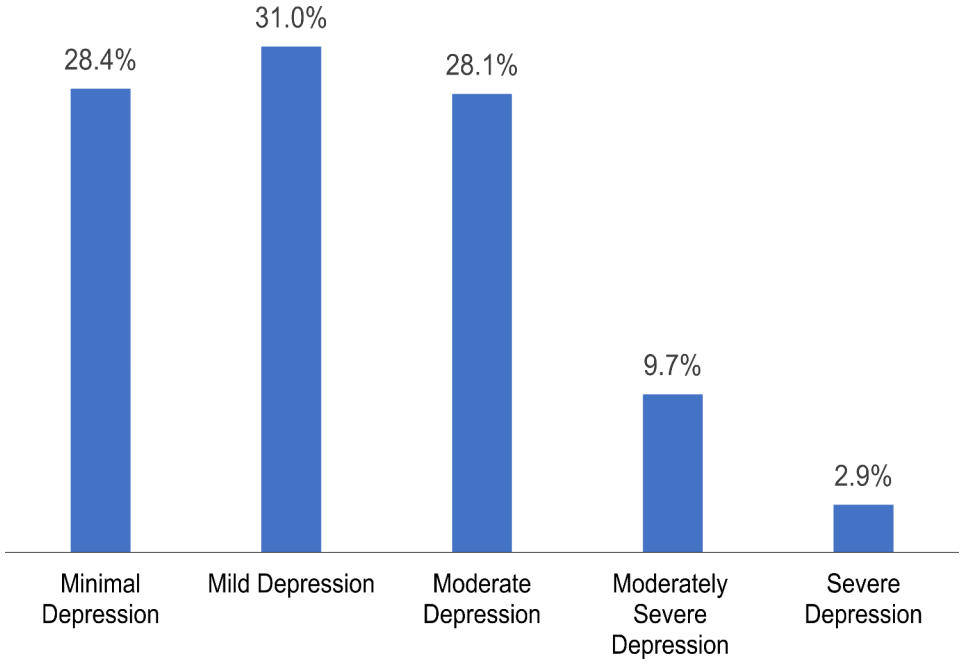

Fig. 2 Categorization of depression severity on the basis of PHQ-9 scores (*N* = 310)

may not be sufficient. For example, Wu et al. [19] conducted a cross-sectional study focusing on mental health among airline pilots and utilized the PHQ-9. Their findings indicated that 12.6% of pilots met the depression threshold according to the PHQ-9 and that 4.1% reported suicidal thoughts within the past two weeks. A recent study by Minoretti et al. [14] investigated the impact of mild depressive symptoms on executive functions in airline pilots and revealed that 12% of the study population experienced mild depression according to the BDI-II. In fact, a previous study comparing the PHQ-9 and the BDI-II often categorized a greater proportion of participants with severe depression than did the PHQ-9.

Given this, the elevated depression rate observed in our study likely results from other factors. These could include unique characteristics of our sample, such as higher exposure to occupational stressors, fatigue, or other environmental and psychological factors specific to the airline pilot population in our country. In particular, occupational factors have emerged as significant contributors to the mental health outcomes of airline pilots in Saudi Arabia. Rest time between flights, in particular, has emerged as a critical determinant of mental health among pilots. Pilots with shorter intervals between flights demonstrated a greater prevalence of moderate to severe depression than did those with longer rest times exceeding 24 h. Sleep duration has emerged as another critical determinant of mental health among airline pilots. Sleep plays a pivotal role in regulating mood, cognitive function, and emotional stability [20]. Prolonged sleep deprivation can disrupt neurobiological processes, exacerbate stress responses, and increase vulnerability to mental health disorders [21]. Pilots who reported participating in regular physical activity presented lower prevalence rates of moderate to severe depression than did those who did not engage in regular exercise. It is unclear from our results whether those who exercised more frequently had fewer/milder depressive symptoms or whether those with more depressive symptoms felt less motivated to exercise.

Our findings reveal a concerning prevalence of depression among Saudi airline pilots. According to the GACA standards for Class 1 medical certification, pilots are disqualified if they have a history or clinical diagnosis of mood disorders, including clinical depression. The GACA guidelines explicitly state that mood disorders are grounds for disqualification [12]. The high prevalence of depression observed in our study raises questions about the fitness-to-fly licensing of pilots in Saudi Arabia. Given that pilots with severe depression may be at risk of disqualification under these standards, it is crucial to investigate whether affected pilots are being appropriately evaluated and treated. The reluctance to pursue treatment due to concerns about medical certification may result in pilots remaining untreated, potentially compromising their safety and performance. This issue underscores the need for a supportive framework that encourages pilots to seek help without fear of negative repercussions for their careers.

While our study provides valuable insights into the prevalence and correlates of depression among airline pilots in Saudi Arabia, several limitations should be

Table 2 Bivariate associations of depression with demographic and occupational factors

Category	Variable		Moderate to Severe Depression		*P* value
			N	(%)	
Demographic Information	Age Group	< 30 Years	32	(34.4)	**0.01**
		30–39 Years	44	(40.7)	
		40–49 Years	36	(59.0)	
		≥ 50 Years	14	(29.2)	
	Gender	Male	124	(40.4)	0.36
		Female	2	(66.7)	
	Marital Status	Single	44	(37.3)	0.19
		Married	77	(41.6)	
		Divorced	5	(71.4)	
	BMI Category	Underweight	2	(100.0)	0.08
		Normal	45	(34.1)	
		Overweight	56	(45.5)	
		Obesity	23	(43.4)	
Occupational Information	Position	Captain	59	(41.8)	0.70
		Senior Officer	67	(39.6)	
	Experience Years	0–10	64	(35.8)	**0.03**
		11–15	25	(58.1)	
		> 15	37	(42.0)	
	Flying Hours (Total)	< 3,000	55	(37.2)	0.04
		3,000–5,000	24	(49.0)	
		5,000–10,000	32	(51.6)	
		> 10,000	15	(29.4)	
	Flying Hours (Past Year)	< 500	38	(39.6)	0.97
		500–700	48	(41.4)	
		> 700	40	(40.8)	
	Time Between Flights	< 1 h	73	(48.0)	**0.03**
		1–4 h	25	(36.8)	
		4–24 h	21	(36.2)	
		> 24 h	7	(21.9)	
	Flight Routes Duration	< 6 h	86	(42.4)	0.25
		6–12 h	9	(27.3)	
		> 12 h	31	(41.9)	
Health Habits	Smoking Status	Non-Smoker	44	(37.9)	0.45
		Smoker	82	(42.3)	
	Regular Exercise	No	82	(53.9)	**< 0.01**
		Yes	44	(27.8)	
	Sleep Duration	< 5 h	8	(42.1)	**0.01**
		5–8 h	113	(43.3)	
		> 8 h	5	(15.6)	

Abbreviations: N: number of participants, BMI: body mass index

Statistical significance was defined as a p value less than 0.05

acknowledged to contextualize the findings and guide future research endeavors. First, the cross-sectional nature of the survey design restricts our ability to establish causal relationships between variables. Although we can identify associations between certain factors and depression incidence, we cannot infer causation or temporal sequencing. Second, self-reporting biases may have influenced the accuracy and reliability of the data collected in our study. The participants may have underreported or overreported their symptoms of depression due to social desirability bias or recall errors. Third, the sampling strategy employed in our study may limit the generalizability of the results to the broader population of airline pilots in Saudi Arabia. Convenience sampling via online recruitment methods may have introduced selection bias, favoring participation among certain demographic groups or individuals with specific characteristics. Fourth, self-reported measures of depression relied upon the use of the PHQ-9. While the PHQ-9 is a validated screening tool for depression, it does not substitute for a comprehensive clinical evaluation conducted by trained mental health professionals. Finally, the questionnaire did not undergo formal validation, which should be considered a limitation of the study.

Conclusion

In conclusion, this study recruited pilots to self-report their depressive symptoms, and a greater percentage of the pilots experienced more severe symptoms than the authors expected on the basis of their background research. The identification of associated factors such as lack of regular exercise, short sleep duration, and inadequate rest between flights underscores the multifaceted nature of the mental health challenges faced by pilots in this region. Addressing these issues is paramount not only for safeguarding the well-being of pilots but also for ensuring flight safety. In the future, targeted interventions and policy initiatives should be implemented to promote mental health awareness, facilitate access to support services, and mitigate occupational stressors within the aviation industry. By prioritizing the mental well-being of pilots, stakeholders can contribute to a safer and healthier aviation environment for all.

Table 3 Factors associated with depression: multivariable analysis

Category	Variable		Univariable Analysis		Multivariable Analysis		*P* value
			OR	95% CI	OR	95% CI	
Demographic Information	Age Group	< 30 Years	Reference Group				
		30–39 Years	1.3	[0.7–2.3]	1.2	[0.6–2.3]	0.69
		40–49 Years	2.7	[1.4–5.3]	2.1	[0.7–6.4]	0.19
		≥ 50 Years	0.8	[0.4–1.7]	1.1	[0.2–4.9]	0.91
	Marital Status	Single	Reference Group				
		Married	1.2	[0.7–1.9]	0.6	[0.3–1.2]	0.15
		Divorced	4.2	[0.8–22.6]	2.4	[0.4–15.1]	0.36
Health Habits	Regular Exercise	No	Reference Group				
		Yes	0.3	[0.2–0.5]	0.3	[0.2–0.5]	**< 0.01**
	Sleep Duration	< 5 h	Reference Group				
		5–8 h	1.1	[0.4–2.7]	0.8	[0.3–2.4]	0.74
		> 8 h	0.3	[0.1–1.0]	0.2	[0.1–1.0]	**0.04**
Occupational Information	Experience Years	0–10	Reference Group				
		11–15	2.5	[1.3–4.9]	3.0	[1.1–8.4]	**0.04**
		> 15	1.3	[0.8–2.2]	3.2	[0.9–11.4]	0.07
	Total Flying Hours	< 3,000	Reference Group				
		3,000–5,000	1.6	[0.8–3.1]	1.1	[0.5–2.4]	0.82
		5,000–10,000	1.8	[1.0–3.3]	0.6	[0.2–1.6]	0.34
		> 10,000	0.7	[0.4–1.4]	0.5	[0.1–1.7]	0.26
	Time Between Flights	< 1 h	Reference Group				
		1–4 h	0.6	[0.4–1.1]	0.6	[0.3–1.2]	0.15
		4–24 h	0.6	[0.3–1.1]	0.8	[0.4–1.7]	0.57
		> 24 h	0.3	[0.1–0.7]	0.3	[0.1–0.8]	**0.02**

Abbreviations: OR: odds ratio; CI: confidence interval

Statistical significance was defined as a p value less than 0.05

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Author contributions
All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and informed consent
The study was conducted in strict adherence to the principles outlined in the Declaration of Helsinki, with ethical clearance obtained from the Institutional Review Board at King Abdulaziz University. The informed consent process included a comprehensive explanation of the voluntary nature of participation, with a particular emphasis on measures taken to ensure the confidentiality of participant information.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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