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Research Article

PREVALENCE AND DETERMINANTS OF INSOMNIA AND FATIGUE AMONG SAUDI ARABIAN AIRLINES PILOTS IN JEDDAH, 2018

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Abstract:

Background: The aviation industry is at highest annual growth in Middle East and is facing shortage of skilled pilots along with increased expenses due to security measures and competitive prices; companies use maximum hours of their pilots to overcome these challenges. However, long working hours lead to fatigue, depression and sleep problems; affecting performance and attentiveness during flight. To address these concerns, this study aims to estimate the prevalence and determinants of insomnia and fatigue among pilots in the region among Saudi Arabian airline pilots in Jeddah during 2018.

Materials and Methods: A cross-sectional analytical study was done among 350 respondents using a self-administered, validated questionnaire related to demographic, professional and social data, including both the Fatigue Severity Scale and Insomnia Severity Index.

Results: Among the 350 respondents, 95.8% reported to have insomnia. For fatigue, regular exercise remains to be the leading factor related to fatigue ($\text{Exp}(B)=1.604$; C.I. 1.248, 2.061; $p<0.001$), followed by work experience ($\text{Exp}(B)=1.505$; C.I. 1.169, 1.938; $p=0.002$). For insomnia, the leading factors are feeling of tiredness ($\text{Exp}(B)=2.342$, C.I. 1.681, 3.263; $p<0.001$), followed by the intake of caffeinated drinks ($\text{Exp}(B)=2.019$, C.I. 1.490, 2.736; $p<0.001$).

Conclusion: Physical activity is the leading factor affecting fatigue, while feeling of tiredness by the controls has an impact on both fatigue and insomnia. Insomnia has a relationship with fatigue that can be explored in detail in further studies. Results emphasize the need to address fatigue and insomnia among pilots, not only for their welfare but also for the safety and security of the crew and passengers.

Key words: Airline, insomnia, fatigue, pilots, Saudi Arabia, sleep.

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INTRODUCTION

Insomnia is a disorder characterized by having difficulty in falling asleep or in keeping asleep (1). Thirty percent of adults across the world experience various symptoms of insomnia (2). There are several risk factors associated with insomnia with the most important demographic risk factors being either older or female (3). Among older adults, comorbid medical conditions contribute to the development of insomnia while in women, onset of menopause, psychological disorders, late night working and rotating shifts contribute to insomnia (4-6).

Fatigue is defined as a subjective sensation of tiredness, which may be either physical and/or mental in nature (4). Physical fatigue pertains to the temporary inability to sustain maximal physical performance (5). Mental fatigue on the other hand is a temporary decline in optimal cognitive performance brought about by extended periods of cognitive engagement (6).

Piloting deals with extended, random working shifts as well as jet lag, associated with fatigue and inadequate sleep (7). At present, the aviation industry is at highest annual growth in Middle East and is currently facing a shortage of skilled pilots(8) along with increased expenses due to security measures and competitive prices. Therefore, to overcome these challenges, companies use maximum hours of their pilots (9) leading to fatigue, depression and sleep problems and affecting performance and attentiveness during flight (10). It can also lead to aviation accidents and it has been reported that 15-20% of aviation accidents are due to pilot's fatigue (11).

Maintaining peak cognitive performance is integral in safely operating aircraft. However, airline pilots often cross several time zones, expose themselves in areas of both sunlight and darkness in a day, and spend long waking hours both in the morning and evening. This prevents them from following sleep patterns in the natural circadian rhythm, leaving them fatigued, and vulnerable to accidents. Insomnia and fatigue can cause a pilot to fall asleep during flight or may negatively affect alertness, especially during take-off or landing. The study of insomnia, fatigue and determinants can help improve the sleeping habits of pilots. This in return can help prevent accidents and can make aviation industry safer and more productive. Furthermore, there are limited studies pertaining to pilot health in Saudi Arabia.

A cross-sectional study was conducted in Riyadh among 328 Gulf Cooperation Council commercial airline pilots to assess the level of fatigue last 2017 (12). It revealed that 68.3%pilots had severe fatigue. These pilots reported that they made mistakes in the

cockpit because of fatigue. 52.1 % said that they were underreporting their fatigue. A Pakistani study conducted on 2014 among 108 commercial airline crew members, reported that 51.9% had complains of subthreshold insomnia, 31.5 % had moderate clinically significant insomnia and 7.4% were suffers of severe clinically significant insomnia. Fatigue was found to be clinically significant in 60% members (13). Furthermore, a Portuguese cross-sectional study was done in 2016 to measure the prevalence of sleep complains and fatigue using *Jenkins Sleep Scale*. 34.9 % pilots were suffering from sleep complaints and 90.6% had complains of fatigue. Sleep complaints were higher among pilots with early morning flights and long flight hours (14). Fatigue and sleep loss were established contributing factors in a crash last August 14, 2013 in Birmingham, Alabama (15). In that after accident report, the first officer during that flight was not able to get sufficient sleep during her off-duty and neither called-in fatigued for work. These, along with fatigue from acute sleep loss, circadian factors, among others, contributed to her sleep deficit and likely resulted from multiple errors the first officer made during that flight.

In another after accident report by the National Transport Safety Board (16), prolonged wakefulness contributed towards the incident, where the captain and the first officer were awake for 19 and 12 hours, respectively. It was established by the NTSB (17) that extended wakefulness for more than 11 hours made significantly higher procedural and tactical errors compared to those awake for less time, hence underscoring the need for proper sleep and fatigue management among pilots.

MATERIALS AND METHODS:

A cross-section analytical study was conducted in the flight operational building where every pilot has to report before his flight. The total number of pilots in Saudi Arabian airlines are 1994 according to the data taken from flight operations. By incorporating these numbers in Raosoft calculator, sample size was calculated with 95% confidence interval and desired precision at 0.05. Keeping insomnia and fatigue expected proportion as 50%, a sample size of 323 was calculated. To address any non-response a 10% addition to the calculated sample size was made, making it to 356 as our final sample size. The sample of pilots was selected using systematic sampling with a random start approach. Data was collected from the pilots in the Saudi Arabian airlines by submitting the questionnaire to the selected pilots reporting in the flight operational building before their flight. A self-administered validated questionnaire designed in English language was used in this study.

The first part of the questionnaire included social demographic and personal characteristics (age, nationality, marital status), taking medication, having a medical condition, taking hypnotics to reduce level of sleeping while travelling, drinking coffee drinks, regular physical exercise, abusing tobacco. Work, position (First officer or commanders), work experience, working hours, length of the flight (short haul, medium haul and long-haul flight), average flying hours per week, usual rest between flights.

For the second and third part of this questionnaire we used two widely used, reliable, and validated instruments to gather the data. Responses were added to form a score for each subscale, thus giving each participant two scores for the two components. To measure insomnia, we used 'Insomnia Severity Index' which is a validated questionnaire with seven components to evaluate the nature, severity, and impact of insomnia. Using the recommended cut off values insomnia was categorized as no clinically significant insomnia, sub threshold insomnia, clinical insomnia moderate severity and clinical insomnia severe. Fatigue severity scale (FSS) was used to measure fatigue. This questionnaire has nine questions to evaluate the prevalence and impact of fatigue among the pilots. Using the recommended cut off values fatigue was categorized as no fatigue and fatigue present.

The dependent variables were the prevalence and risk factors of both insomnia and fatigue among the pilots. The independent variables were age, nationality, marital status, presence of illness, medication, use of hypnotics and/or stimulants such as coffee, physical activity, smoking, work position, working hours, working experience, average flying hours, flying duration and rest between flights. Data was analyzed and entered through the active incorporation of the statistical product and service solution (SPSS) Version 21. A significant statistical variable was considered at P-value <0.05 and confidence interval of 95%. Frequencies and

percentages were calculated for the descriptive variables. Chi square analysis was used to measure any association and regression analysis was used to identify the predictors for insomnia and fatigue.

An initial study among 10% of the pilots who were not included within the actual study was made to test the questionnaire feasibility and applicability as well as to make necessary adjustments. Results of this pilot study were not included in the final results.

Written permission from the Joint Program of Family and Community in Jeddah, as well from the Saudi Arabian airline was obtained for ethical clearance in the study. Consent was also obtained from the respondents to conduct the study with utmost confidentiality.

As with all other structured questionnaires, respondents may have limited options subject to the selections provided by the researcher. This could result in limited outcomes as the responses are often close-ended. While the study gives a big picture of the sleep and fatigue conditions among the pilots in the region, the broad coverage of the questionnaire opens a new set of questions as well. The limited number of similar previous studies also affect the scope of the present study. Nonetheless, this limitation presents the opportunity to explore specific topics related to pilot fatigue and insomnia in the future.

RESULTS:

Among the 350 respondents, 205 were greater than 40 years of age, with 94 being between 30 to 40 years old. Only 51 were younger than 30. Three hundred four of the respondents are Saudi and 288 are married. Hundred sixty-five of the respondents smoked while only 72 reported to have any chronic medical condition. Only 68 reported that they were presently taking any medication (Figure1).

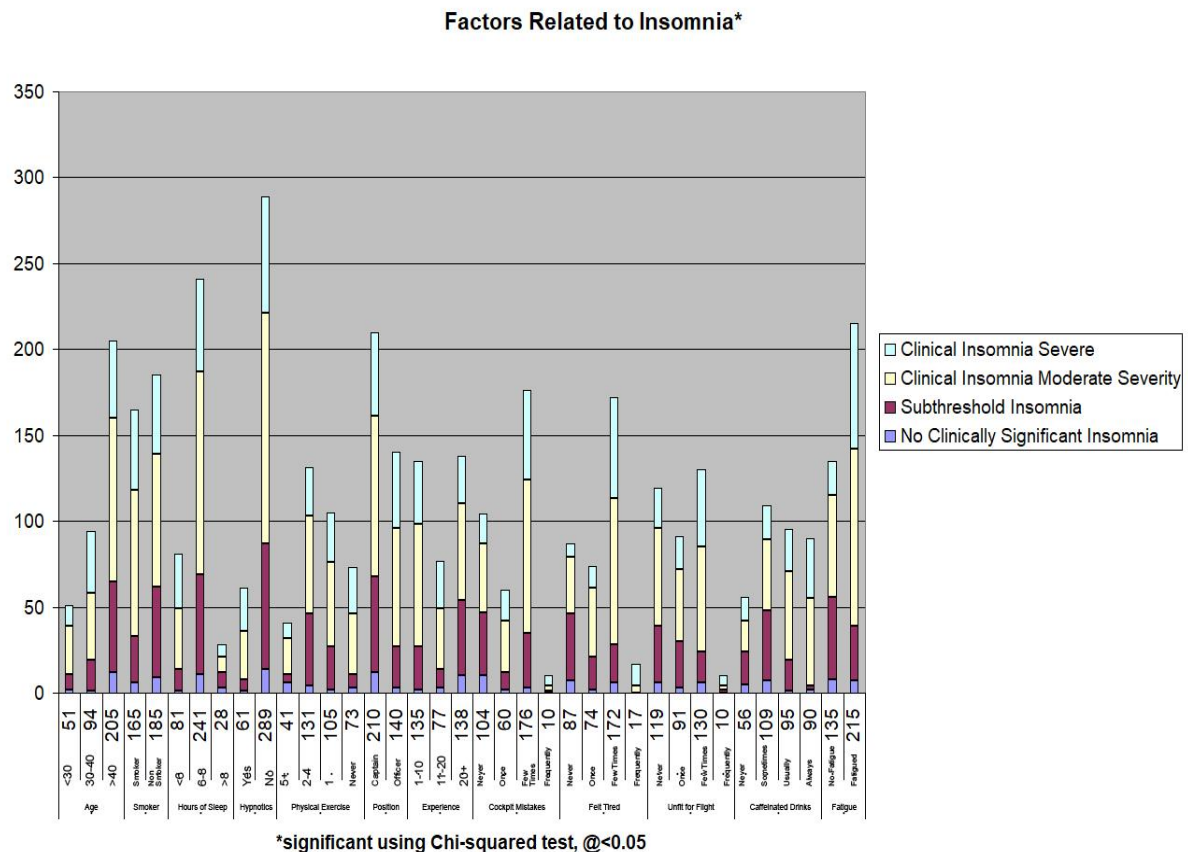


Figure 1. Factors Related to Insomnia

With regards to sleep, 241 of the respondents have 6-8 hours of sleep per day. Only 81 respondents reported that they have less than 6 hours of sleep, while only 28 respondents reported to have more than 8 hours of sleep. 289 of the respondents reported that they did not take hypnotics to help with sleep, while 61 reported taking hypnotics.

In terms of physical activity, 131 respondents reported to have regular physical exercise for 2-4 days a week, while 105 respondents reported to have regular physical exercise at least once a week. 73 respondents reported not having any regular physical exercise.

In terms of career, 210 of the respondents were captains, while 140 were first officers. 138 of the respondents reported to have more than 20 years of experience, while 135 reported to have 1-10 years of experience. Only 77 respondents reported to have between 11-20 years of experience.

In terms of working conditions, 151 respondents reported to take flights greater than 6 hours, while 138 respondents

reported to have flights between 2-6 hours. 157 respondents reported to have 20 to 40 average flying

hours per week, while 148 respondents reported to have 1 to 20 average flying hours per week. Only 45 respondents reported to have average weekly flying hours greater than 60. For rest hours, only 35 respondents reported to have less than 8 hours rest time while 218 respondents =reported to have more than 12 rest hours.

With regards to caffeinated drink intake, 109 reported they did take-in caffeinated drinks sometimes to help with alertness during flights. Ninety-five respondents took caffeinated drinks usually while 90 respondents always took caffeinated drinks.

For insomnia, 255 reported that they have insomnia. 162 have moderately severe clinical insomnia while 93 have severe clinical insomnia. Only 80 have sub threshold insomnia while 15 have no clinically significant insomnia. For fatigue, 215 respondents reported having fatigue present while only 135 reported not having fatigue. (Figure 2)

In determining significant factors related to insomnia using Chi-squared test, age ($p=0.037$), smoking status ($p=0.039$), hours of sleep ($p=0.015$), taking of hypnotics ($p=0.011$), regular physical exercise ($p=0.001$), work position ($p=0.039$) and work experience ($p=0.002$) (Table 1).

Among captains, 93 reported to have moderately severe clinical insomnia, with 56 have subthreshold insomnia and 49 have severe clinical insomnia. Sixty-nine of the first officers reported to have moderately severe clinical insomnia, whereas only 44 have severe clinical insomnia.

Seventy-two of those who have 1-10 years of experience reported to have moderately severe clinical insomnia, while 37 have severe clinical insomnia. Among those having 11-20 years of working experience, 35 reported to have moderately severe clinical insomnia, followed by 28 having severe clinical insomnia. Among those having more than 20 years' experience, 56 reported to have moderately severe clinical insomnia, followed by 44 reported to have subthreshold insomnia.

For the question, "Have you ever committed any cockpit mistakes as a direct consequence of fatigue," 89 respondents of those who answered, "few times" reported to have moderately severe clinical insomnia, with 52 respondents reporting they have severe clinical insomnia. For those who answered never, 40 respondents reported that they have moderately severe clinical insomnia, followed by 35.6% reported that they have subthreshold insomnia.

For the question, "Have you ever reported yourself so tired that you thought you should not be on the controls," 85 of those who answered, "few times" reported to have moderately severe clinical insomnia, while 59 reported to have severe clinical insomnia.

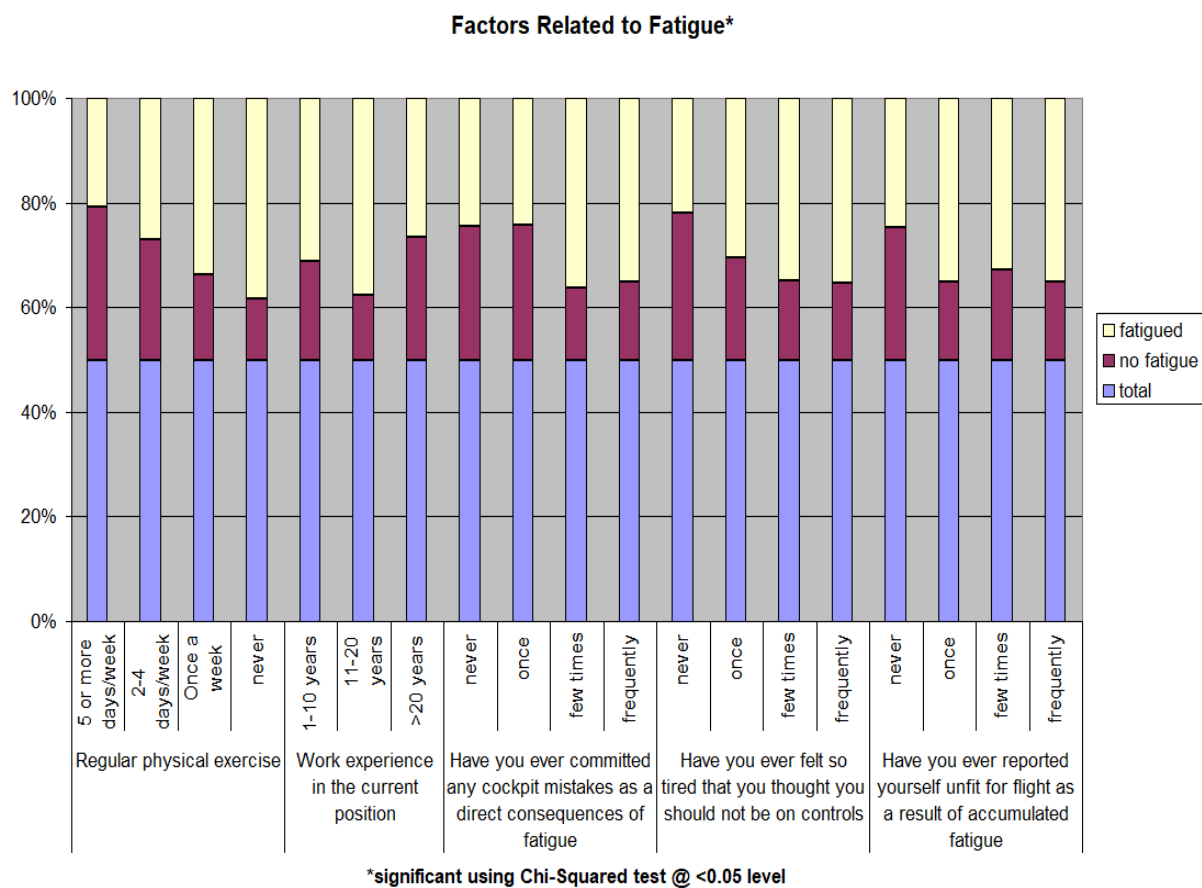


Figure 2. Factors Related to Fatigue

Table 1. Significant Factors Related to Fatigue

Dependent Variable: Fatigue Variables in the Equation		B	Exp(B)	95% C. I. f or		p-value
				EXP(B)		
				Lower	Upper	
Step 1 ^a	Regular physical exercise	0.481	1.617	1.253	2.088	<0.001
	Work experience in the current position	- 0.249	0.78	0.596	1.02	0.069
	Have you ever committed any cockpit mistakes as a direct consequence of fatigue	0.36	1.434	1.107	1.857	0.006
	Have you ever fallen asleep at the controls without agreeing previously with your colleague	0.214	1.239	0.958	1.603	0.103
	Have you ever felt so tired that you thought you should not be on controls	0.335	1.398	1.074	1.821	0.013
	Have you ever reported yourself unfit for flight as a result of accumulated fatigue	0.213	1.237	0.953	1.606	0.110
	Constant	- 2.665	0.07			<0.001
Step 2 ^a	Regular physical exercise	0.482	1.619	1.255	2.089	<0.001
	Work experience in the current position	- 0.243	0.784	0.6	1.025	0.075
	Have you ever committed any cockpit mistakes as a direct consequences of fatigue	0.381	1.464	1.133	1.891	0.004
	Have you ever fallen asleep at the controls without agreeing previously with your colleague	0.21	1.233	0.955	1.593	0.109
	Have you ever felt so tired that you thought you should not be on controls	0.366	1.443	1.111	1.873	0.006
	Constant	- 2.346	0.096			<0.001
Step 3 ^a	Regular physical exercise	0.472	1.603	1.246	2.064	<0.001
	Work experience in the current position	- 0.204	0.815	0.627	1.06	0.127
	Have you ever committed any cockpit mistakes as a direct consequence of fatigue	0.395	1.484	1.151	1.914	0.002
	Have you ever felt so tired that you thought you should not be on controls	0.406	1.501	1.161	1.94	0.002
	Constant	- 2.135	0.118			<0.001
Step 4 ^a	Regular physical exercise	0.472	1.604	1.248	2.061	<0.001
	Work experience in the current position	0.409	1.505	1.169	1.938	0.002
	Have you ever felt so tired that you thought you should not be on controls	0.39	1.477	1.145	1.903	0.003
	Constant	- 2.541	0.079			<0.001

^a-Variable(s) entered on step 1: Regular physical exercise, Work experience in the current position, Have you ever committed any cockpit mistakes as a direct consequences of fatigue, Have you ever fallen asleep at the controls without agreeing previously with your colleague, Have you ever felt so tired that you thought you should not be on controls, Have you ever reported yourself unfit for flight as a result of accumulated fatigue.

For the question, “Did you take any caffeinated drinks to help with alertness during flights,” there are equal instances of subthreshold insomnia and moderately severe insomnia with both 41 respondents each, followed by 20 respondents having severe clinical insomnia. Among those who answered usually, 52 have moderately severe

clinical insomnia, while 24 have severe clinical insomnia. (Figure 2)

In relation to fatigue, 47.9% of those who reported to have fatigue present have moderately severe clinical insomnia, followed by 34.0% having clinical insomnia. Among those who reported they

did not experience fatigue, 43.7% (59%) have moderately severe clinical insomnia, followed by 35.6% having subthreshold insomnia.

Following the same test, the identified significant factors affecting fatigue are regular physical exercise ($p<0.001$), work experience in the current position ($p=0.005$), committing cockpit mistakes as a direct result of fatigue ($p<0.001$), falling asleep at the controls ($p=0.007$), feeling so tired that one should not be at the controls ($p=0.001$) and reporting one's self to be unfit due to accumulated fatigue ($p=0.010$).

In terms of taking regular exercise, 54.2% of those exercising 2-4 times per week reported experiencing fatigue at some point. This also holds similar among those having weekly regular exercise (67.6%). For the question, "Have you felt so tired that you thought you should not be on the controls," 69.8% have fatigue present when they experienced being so tired. (Table 1).

Upon identification of significant factors related to fatigue, linear regression was applied to determine which was the leading factor affecting fatigue (Table 2). The results are as follows:

At the initial iteration of the regression model, it could be said with 95% confidence interval that regular exercise is the leading factor related to fatigue ($\text{Exp}(B)=1.617$; C.I. 1.253, 2.088; $p<0.001$), followed by committing cockpit mistakes as a direct result of fatigue ($\text{Exp}(B)=1.434$; C.I. 1.107, 1.857; $p=0.006$), feeling so tired that one should not be at the controls ($\text{Exp}(B)=1.237$; C.I. 1.074, 1.821; $p=0.013$) and work experience in one's position ($\text{Exp}(B)=0.78$; C.I. 0.596, 1.02; $p=0.069$).

However, at the final iteration of the regression model for fatigue, regular physical exercise remains

to be the leading factor related to fatigue ($\text{Exp}(B)=1.604$; C.I. 1.248, 2.061; $p<0.001$), followed by work experience in the job position ($\text{Exp}(B)=1.505$; C.I. 1.169, 1.938; $p=0.002$) and feeling so tired that one should not be at the controls ($\text{Exp}(B)=1.477$; C.I. 1.145, 1.903; $p=0.003$).

Once significant factors related to insomnia were identified, linear regression was applied to determine the leading factor related to insomnia. The results are shown as follows:

At the initial iteration of the regression model for significant insomnia factors, it could be said with 95% confidence interval that the leading factor related to insomnia would be the feeling of tiredness that one should not be on the controls ($\text{Exp}(B)=2.303$; C.I. 1.643, 3.228; $p<0.001$), followed by taking any caffeinated drinks to help with alertness during flights ($\text{Exp}(B)=1.938$; C.I. 1.414, 2.656; $p<0.001$), and fatigue itself ($\text{Exp}(B)=1.779$; C.I. 0.972, 3.255; $p<0.062$). The weakest significant factor related to insomnia would be the number of hours of sleep per day ($\text{Exp}(B)=0.451$; C.I. 0.253, 0.802; $p=0.007$).

However at the final iteration of the linear regression model, the leading factor related to insomnia would be the feeling of tiredness that one should not be at the controls ($\text{Exp}(B)=2.342$, C.I. 1.681, 3.263; $p<0.001$), followed by the intake of caffeinated drinks to help with alertness during flights ($\text{Exp}(B)=2.019$, C.I. 1.490, 2.736; $p<0.001$), then fatigue ($\text{Exp}(B)=1.906$, C.I. 1.070, 3.393; $p=0.028$), committing mistakes in the cockpit ($\text{Exp}(B)=1.318$, C.I. 0.955, 1.818; $p=0.093$), work experience in the current position ($\text{Exp}(B)=0.538$, C.I. 0.383, 0.756; $p<0.001$) and number of sleeping hours ($\text{Exp}(B)=0.451$, C.I. 0.258, 0.790; $p=0.005$).

Table 2. Significant Factors Related to Insomnia

Table 2: Significant Factors Related to Insomnia						
Dependent Variable: Insomnia Variables in the Equation		B	Exp(B)	95% C.I.for EXP(B)		p-value
				Lower	Upper	
Step 1 ^a	Age	0.015	1.015	0.544	1.894	0.962
	Smoking status	-0.258	0.772	0.413	1.446	0.420
	Hours of sleep per day	-0.797	0.451	0.253	0.802	0.007
	Taking hypnotics to help with sleep	-0.314	0.73	0.301	1.769	0.486
	Regular physical exercise	0.165	1.179	0.85	1.636	0.324
	Work Position	0.556	1.744	0.733	4.152	0.209
	Work experience in the current position	-0.399	0.671	0.416	1.084	0.103
	Have you ever committed any cockpit mistakes as a direct consequence of fatigue	0.275	1.316	0.948	1.826	0.100
	Have you ever felt so tired that you thought you should not be on controls	0.834	2.303	1.643	3.228	<0.001
	Have you ever reported yourself unfit for flight as a result of accumulated fatigue	0.045	1.046	0.747	1.465	0.794

Step 2 ^a	Did you take any caffeinated drinks to help with alertness during flights	0.661	1.938	1.414	2.656	<0.001
	Fatigue	0.576	1.779	0.972	3.255	0.062
	Constant	-1.327	0.265			0.459
	Smoking status	-0.257	0.773	0.413	1.447	0.421
	Hours of sleep per day	-0.797	0.451	0.253	0.801	0.007
	Taking hypnotics to help with sleep	-0.315	0.73	0.301	1.769	0.486
	Regular physical exercise	0.165	1.18	0.851	1.636	0.322
	Work Position	0.548	1.729	0.785	3.81	0.174
	Work experience in the current position	-0.393	0.675	0.44	1.034	0.071
	Have you ever committed any cockpit mistakes as a direct consequences of fatigue	0.274	1.316	0.948	1.825	0.100
	Have you ever felt so tired that you thought you should not be on controls	0.835	2.304	1.644	3.228	<0.001
	Have you ever reported yourself unfit for flight as a result of accumulated fatigue	0.045	1.046	0.747	1.464	0.796
Step 3 ^a	Did you take any caffeinated drinks to help with alertness during flights	0.662	1.939	1.416	2.654	<0.001
	Fatigue	0.576	1.779	0.972	3.255	0.062
	Constant	-1.29	0.275			0.425
	Smoking status	-0.269	0.764	0.411	1.421	0.396
	Hours of sleep per day	-0.797	0.451	0.253	0.802	0.007
	Taking hypnotics to help with sleep	-0.32	0.726	0.3	1.756	0.477
	Regular physical exercise	0.164	1.178	0.85	1.634	0.325
	Work Position	0.547	1.728	0.784	3.805	0.175
	Work experience in the current position	-0.392	0.676	0.441	1.035	0.072
	Have you ever committed any cockpit mistakes as a direct consequence of fatigue	0.278	1.32	0.953	1.829	0.095
	Have you ever felt so tired that you thought you should not be on controls	0.84	2.316	1.655	3.239	<0.001
	Did you take any caffeinated drinks to help with alertness during flights	0.665	1.944	1.421	2.66	<0.001
Step 4 ^a	Fatigue	0.587	1.798	0.989	3.271	0.055
	Constant	-1.202	0.3			0.447
	Smoking status	-0.267	0.766	0.412	1.422	0.398
	Hours of sleep per day	-0.83	0.436	0.247	0.769	0.004
	Regular physical exercise	0.154	1.166	0.842	1.616	0.355
	Work Position	0.574	1.775	0.809	3.897	0.152
	Work experience in the current position	-0.4	0.67	0.438	1.025	0.065
	Have you ever committed any cockpit mistakes as a direct consequence of fatigue	0.29	1.336	0.966	1.849	0.080
	Have you ever felt so tired that you thought you should not be on controls	0.852	2.345	1.678	3.277	<0.001
	Did you take any caffeinated drinks to help with alertness during flights	0.677	1.967	1.442	2.684	<0.001
	Fatigue	0.583	1.791	0.986	3.253	0.056
	Constant	-1.809	0.164			0.172
Step 5 ^a	Hours of sleep per day	-0.848	0.428	0.243	0.756	0.003
	Regular physical exercise	0.183	1.201	0.874	1.651	0.258
	Work Position	0.551	1.735	0.793	3.794	0.168
	Work experience in the current position	-0.435	0.647	0.426	0.982	0.041
	Have you ever committed any cockpit mistakes as a direct consequences of fatigue	0.285	1.33	0.961	1.839	0.085
	Have you ever felt so tired that you thought you should not be on controls	0.847	2.332	1.67	3.256	<0.001
	Did you take any caffeinated drinks to help with alertness during flights	0.7	2.013	1.481	2.737	<0.001
	Fatigue	0.597	1.817	1.003	3.291	0.049

Step 6 ^a	Constant	-2.206	0.11			0.076
	Hours of sleep per day	-0.834	0.434	0.247	0.763	0.004
	Work Position	0.526	1.692	0.775	3.692	0.187
	Work experience in the current position	-0.449	0.639	0.421	0.969	0.035
	Have you ever committed any cockpit mistakes as a direct consequence of fatigue	0.292	1.339	0.969	1.85	0.077
	Have you ever felt so tired that you thought you should not be on controls	0.862	2.367	1.696	3.304	<0.001
	Did you take any caffeinated drinks to help with alertness during flights	0.693	2	1.475	2.711	<0.001
	Fatigue	0.669	1.951	1.091	3.489	0.024
	Constant	-1.782	0.168			0.131
	Hours of sleep per day	-0.796	0.451	0.258	0.79	0.005
Step 7 ^a	Work experience in the current position	-0.619	0.538	0.383	0.756	<0.001
	Have you ever committed any cockpit mistakes as a direct consequence of fatigue	0.276	1.318	0.955	1.818	0.093
	Have you ever felt so tired that you thought you should not be on controls	0.851	2.342	1.681	3.263	<0.001
	Did you take any caffeinated drinks to help with alertness during flights	0.703	2.019	1.49	2.736	<0.001
	Fatigue	0.645	1.906	1.07	3.393	0.028
	Constant	-0.738	0.478			0.404

^a -Variable(s) entered on step 1: Age, Smoking status, Hours of sleep per day, Taking hypnotics to help with sleep, Regular physical exercise, Work Position, Work experience in the current position, Have you ever committed any cockpit mistakes as a direct consequences of fatigue, Have you ever felt so tired that you thought you should not be on controls, Have you ever reported yourself unfit for flight as a result of accumulated fatigue, Did you take any caffeinated drinks to help with alertness during flights, Fatigue

DISCUSSION AND CONCLUSION:

In the study, 61.4% of the respondents were reported to have fatigue present, 7.4% higher compared to the study done by Obaid and Mohammed ⁽¹³⁾ where, only 54% of the respondents have reported fatigue. However, it should be considered that the respondents in this study comprised only of captains and first officers. By contrast, this is lower compared to the study done by Jackson and Earl, where 75% of their respondents reported fatigue ⁽¹⁸⁾. However, it should also be considered that their respondents were comprised of 162 short-haul pilots. This is also lower compared to the study made by Reis, et al ⁽¹⁴⁾, where 90.6% of the respondent Portuguese pilots have fatigue. Also, the respondents in that study contained female pilots as well. Furthermore, there is a greater percentage of long-haul flights (43.10% vs 28.05%) than short and medium haul flights (56.85% vs 71.95%) in this study. By contrast, in a survey of 739 airline pilots, a smaller percentage of short-haul pilots (49%) reported fatigue (vs 68.85% in our study), while the percentage of long-haul pilots under stress is consistent (60% vs 60.26%) in our study ⁽¹⁹⁾. On the other hand, the percentage of pilots with fatigue in this study are relatively lower compared to the recent study among Gulf Cooperation commercial airline pilots ⁽¹²⁾, where 68.3% of the pilot respondents reported having fatigue.

Notably, in answering the questionnaire, the respondent reflected similar answers from other studies. 67.3% of the respondents indicated that there are instances that they thought they should be on the controls due to feeling too exhausted. This is higher compared to the answers given by the Gulf Cooperation commercial pilots (56%) and Portuguese pilots (51%). On the other hand, 67.5% of the respondents in this study reported that they have felt unfit for flight as a result of accumulated exhaustion, substantially higher compared to studies made by Aljurf, et al, (35%) ⁽¹²⁾ and Reis (6%) ⁽¹⁴⁾. In terms of committing mistakes, the percentage of respondents that reported making mistakes in the cockpit as a result of exhaustion is consistent with the Gulf Cooperation commercial pilots (66.67% vs 67.4%) while it is lower compared to the results of the Portuguese pilots (91.4%). Nonetheless, this is lower compared towards the percentage among Swedish commercial airline pilots (80%) ⁽²⁰⁾, though this particular study also conducted this study in consideration of the congested airspace in the region. Lastly 69% of the respondents reported falling asleep on the controls without agreeing with their colleague, which is inconsistent with the percentage among the Gulf Cooperation commercial pilots (45.1%)

Among the 350 respondents, 95.8% of the respondents reported to have insomnia, regardless of severity. This is nearly consistent with Obaid and Mohammed's study ⁽¹³⁾, where 90.8% of their respondents were reported to have insomnia. However, further detailed comparison reveals that there are fewer (22.9%) cases of subthreshold insomnia compared to their study (54%). The percentage of moderate insomnia cases among the 350 respondents (46.3%) are higher compared to the percentage among airline staff (31.5%) as a whole. It should also be noted that the percentage of severe insomnia is higher (26.6% vs 7.4%). It could be suggested that captains and first officers experience much severe types of insomnia as compared to other airline staff.

Physical activity is the leading factor affecting fatigue, while feeling of tiredness by the controls has an impact on both fatigue and insomnia. Insomnia has a relationship with fatigue that can be explored in detail by further studies.

As the focus of the study is in the Middle East and that some of the results vary across regions, studies considering their work conditions across geographical conditions could be developed to better understand factors affecting fatigue. Similar studies could also be conducted in other regions to determine the severity of piloting conditions in the region. As it is consistent among studies that pilots reported feelings of tiredness by the controls, studies exploring that stimulus could be explored in order for pilots to better manage their condition throughout their duty.

Given the limited outcomes of structured questionnaires, it could be worthwhile to conduct quick, ethnographic studies among pilots regarding their work conditions. While it would be improbable to shadow pilots during work due to security reasons, journals could be provided to the pilots in order for them to better articulate their concerns regarding fatigue and insomnia.

Exploring their emotional wellbeing could help better understand what contributes to their fatigue, as it could be influenced by stress and/or anxiety to handle the plane impeccably for safety. There could be situational triggers that could add up towards the pilots' fatigue, and as established by the results, contribute to insomnia. This could also provide a more holistic perspective with regards to their condition in order to discover new solutions that could help address both fatigue and insomnia. Overall, it is imperative that these two conditions be addressed not only for the pilot's welfare but also for the safety and security of the passengers and crew as well.

CONFLICT OF INTEREST

The study was self-funded, with the authors declaring no conflict of interest.

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