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Research Article

Stress-related factors and their correlation among Air Traffic Controllers of Kathmandu, Nepal

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ABSTRACT

Background & Objectives: Air traffic controllers are responsible for smooth flow of aircrafts and their primary responsibilities are to prevent mishaps of aircrafts in air or on the ground. However, due frequent aircraft collision, their job is considered stressful. The objective of the study was to find the prevalence of stress and its associated factors among Nepalese air traffic controllers.

Materials and Methods: A descriptive cross-sectional study was conducted on the air traffic controllers who were stationed in the airport and were routinely engaged in controlling the aircrafts. A total of 63 traffic controllers were recruited for the study using systematic random sampling from Tribhuvan International Airport, Kathmandu from November 2020 to October 2021. Bivariate Analysis was performed to measure the association between socio-demographic characteristics and stress using Pearson's chi-squared test and t-test.

Results: The study found that 70 percent of air traffic controllers were suffering from stress. This study showed significant association between day and night shift, sleep hours and alcohol with stress (P< 0.05). Moderate stress was found among air traffic controllers with less day shift (12.8 Vs 12.2) and more night shift. Air traffic controllers with sleep deprivation and alcohol consumption were associated with high stress.

Conclusion: Higher prevalence of moderate stress were depicted among air traffic controllers of Kathmandu, Nepal and highlights the need of further extensive research in this area so as to suggest appropriate strategies to reduce stress among professionals working for national aviation industry.

Keywords: Air traffic control, aviation, stress

INTRODUCTION

Stress is a feeling of emotional strain and pressure. Small amounts of stress may sometimes be beneficial, as it can improve athletic performance or motivate to get something done [1]. However moderate or severe stress can have harmful consequences on physical, mental and social well-being [2]. Air traffic controllers (ATCs) are professionals responsible for the safe and orderly flow of aircrafts in the global air traffic control system [3]. Their primary

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duties are to prevent mishaps of aircrafts in air or on the ground. ATCs' professional activity is often considered stressful [4].

Specific to this profession, there are some notable factors as stressors like the number of aircraft in control, peak traffic hours, time constraint, psychological and occupational pressure, loss of control and fear of consequences of errors, etc. Some other stressors like continuous duty periods, shift duty, authenticity of equipment, and working ambiance of the tower, noise, continuous air conditioning and lack of a good posture may also produce stress among ATCs [3].

The country has witnessed a series of air collisions and accidents over the past few years as there have been numerous incidents involving both domestic and international flights, often attributed to factors such as difficult terrain, rapidly changing weather conditions, and limited infrastructure. These accidents have not only resulted in tragic loss of life but have also brought to light the critical issue of stress among air ATCs.

ATCs work in a high-stakes setting, therefore it's critical to comprehend and reduce the stressors they encounter.Consequently, a comprehensive study is necessary to measure the levels of stress among ATCs in Nepal. Such a study should aim to identify the primary sources of stress, evaluate their effects on job performance, and propose effective strategies to alleviate these pressures. . The objective of the study was to find the prevalence of stress and its associated factors among Nepalese air traffic controllers.

MATERIALS AND METHODS

A descriptive cross sectional study was conducted on the ATCs who were stationed in the airport tower and were routinely engaged in controlling the aircrafts. The ones who had taken the training of air traffic controlling while commencing the jobs but are currently involved in job tasks other than controlling the aircrafts, were excluded from this study. The study was conducted in Tribhuvan International Airport (TIA), Kathmandu. This site was selected for this study as most of the ATCs of Nepal are working here. Additionally, TIA was the only international airport of Nepal suggesting that ATCs working here not only controlled the domestic flights but also all the international flights. With this fact it becomes evident that the ATCs working in TIA are very busy handling excessive flights within a limited frame of time.

Out of overall 90 ATCs of Nepal, 63 (52 males, 11 females) ATCs worked in TIA and all the ATCs in TIA were recruited and included in the study. The participants were explained about the purpose of the study and written informed consent was obtained. Suitable time and locations for the interview were selected based on the convenience of the study participants. All shifts (morning, day and evening) were covered during data collection. Confidentiality of the data was maintained. Before the data collection, tools were pretested. Data was collected by the interviewer using the self-administered tools. Anthropometric characteristics, blood pressure of ATCs were measured. History of past mishaps (past experience of air collision), suffering from any disease/s (ailments), history of any familial disease/s (Hypertension and Diabetes Mellitus), details about their job tenure and shifts, sleep duration, physical activity, habit of nicotine and alcohol consumption (off duty) were also recorded Smoking was assessed based on whether ATCs were current smokers. Alcohol

consumption was evaluated based on whether ATCs had consumed alcohol in the past 30 days. Physical activity was measured by identifying the types of physical activities ATCs participated in over the past month, such as walking, running, or gym workouts. Information on past and present diseases was collected. Family disease history included information on whether any family member of an ATC was suffering from hypertension or diabetes mellitus. Blood pressure was measured using a calibrated sphygmomanometer, with readings taken after participants rested for five minutes. Blood pressure was classified into normal (<120/80 mmHg), elevated (120-129/<80 mmHg), hypertension stage 1 (130-139/80-89 mmHg), and hypertension stage 2 (≥140/90 mmHg). Sleep deprivation was assessed based on self-reported sleep duration (less than or more than 5 hours per night) over the past month.

The variables included in the data collection tool were self-perceived stress and degree of stress was further assessed using Cohen's Perceived Stress Scale (PSS). The Perceived Stress Scale (PSS) used in the study consists of 10 items designed to measure the perception of stress. ATCs rate each item on a 5-point scale ranging from 0 (never) to 4 (very often). Reverse Scoring were performed on items 4, 5, 7, and 8 are reverse-scored. For these items, the scores are reversed (i.e., 0 becomes 4, 1 becomes 3, 2 remains 2, 3 becomes 1, and 4 becomes 0). The total score was obtained by summing the scores of all 10 items, with possible scores ranging from 0 to 40. Based on the total PSS score, degree of stress for each study participant was categorized as 'low', 'moderate' and 'high' with PSS scores of 0-13, 14-26 and 27-40, respectively [5]. All the ATCs were either categorized under low stress or moderate stress. None of the ATCs in the current study presented with high stress. Pearson's chi-squared test was used to measure the association between socio demographic characteristics, history of past mishaps, details about their job tenure and shifts, sleep duration, physical activity, habit of smoking and alcohol consumption and perceived stress. A two-tailed P-value of <0.05 was considered to be statistically significant. R-studio, version 4.5.1 was used for statistical analysis. Ethical clearance and approval was obtained from the Institutional Review Committee (IRC) of Kathmandu Medical College (Reference number: 02082017). The study was started in November 2020 and completed in October 2021.

RESULTS

A total of 63 ATCs participated in the study. Majority of ATCs had moderate stress (69.8%) and 30.2 percent of ATCs had low stress. Table 1 shows the association between socio demographic characteristics, anthropogenic measurement, alcohol consumption and smoking, sleep deprivation with stress levels among ATCs. In the bivariate analysis, night shift in days, sleep deprivation and alcohol consumption were associated with perceived stress. ATCs who worked more days on night shifts reported significantly higher stress compared to those with fewer night shifts (P = 0.019). Secondly, alcohol consumption was significantly associated with stress levels (P < 0.001). Among ATCs who did not consume alcohol, 51.7% experienced low stress, whereas 48.3% experienced moderate stress. In contrast, among those who consumed alcohol, only 11.8% had low stress, while a substantial 88.2% had moderate stress. Sleep duration was another significant variable related to stress levels (P = 0.04). who slept

Table 1: Association between determinants with perceived stress among ATCs

Characteristics	Stress			P value
	Low	Moderate	Total	
	(n=19, 30.2%)	(n=44, 69.8%)	(N=63)	
Age				0.285
Mean (SD)	35.3 (6.5)	37.3 (7)	36.7 (6.8)	
Sex				
Male	16 (30.8)	36 (69.2)	52 (82.5)	
Female	3 (27.3)	8 (72.7)	11 (17.5)	
Height				0.15
Mean (SD)	168.1 (8.4)	165.2 (6.7)	166.1 (7.3)	
Weight				0.587
Mean (SD)	68.6 (7.3)	69.7 (7.8)	69.4 (7.6)	
Systolic pressure				0.259
Mean (SD)	120.9 (7.7)	124 (10.3)	123 (9.6)	
Diastolic pressure				0.966
Mean (SD)	83.4 (6.8)	83.3 (8.6)	83.3 (8)	
Past disease				0.153
No	14 (26.4)	39 (73.6)	53 (84.1)	
Yes	5 (50)	5 (50)	10 (15.9)	
Mishaps				
No	16 (31.4)	35 (68.6)	51 (81)	
Yes	3 (25)	9 (75)	12 (19)	
Family disease				0.094
No	13 (39.4)	20 (60.6)	33 (52.4)	
Yes	6 (20)	24 (80)	30 (47.6)	
Occupational tenure in years				0.852
Mean (SD)	10.8 (6.6)	11.1 (7.1)	11 (6.9)	
Duty Shift Morning in days				0.106
Mean (SD)	12.8 (0.9)	12.1 (1.7)	12.3 (1.6)	
Duty Shift Day in days				0.041
Mean (SD)	12.8 (0.9)	12.2 (1.3)	12.4 (1.2)	
Duty Shift Night in days				0.019
Mean (SD)	4.4 (1.8)	5.8 (2.2)	5.3 (2.2)	
Physical activity				0.759
<1 hour	10 (28.6)	25 (71.4)	35 (55.6)	
>1 hour	9 (32.1)	19 (67.9)	28 (44.4)	
Current Smoking				0.578
No	17 (28.8)	42 (71.2)	59 (93.7)	
Yes	2 (50)	2 (50)	4 (6.3)	
Alcohol Consumption				< 0.001
No	15 (51.7)	14 (48.3)	29 (46)	

Characteristics	Stress			P value
	Low	Moderate	Total	
	(n=19, 30.2%)	(n=44, 69.8%)	(N=63)	
Yes	4 (11.8)	30 (88.2)	34 (54)	
Sleep Duration				0.04
<5 hours	5 (17.9)	23 (82.1)	28 (44.4)	
>5 hours	14 (40)	21 (60)	35 (55.6)	

less than 5 hours per night were more likely to experience moderate stress, with 82.1% falling into this category, compared to 17.9% experiencing low stress. On the other hand, those who slept more than 5 hours per night had a lower prevalence of moderate stress (60%) and a higher prevalence of low stress (40%).

DISCUSSION

All the ATCs who participated in this study were affiliated to TIA, Kathmandu and all of them worked in shift rotation. Nearly all ATCs adhered to a routine schedule of working 6 hours daily for six days a week. Despite having one designated day off per week, ATCs frequently opted to work on their day off due to compensatory leave or overtime allowances, resulting in 30 working days per month. In a typical month, each ATC completed 12 morning shifts, 12 day shifts, and 6 night shifts. The result obtained from this study highlights significant association between stress and shift-wise duty, especially during night and day. A related study titled "Effects of an Alternating Work Shift on ATCs and the Relationship with Excessive Daytime Sleepiness and Stress" also supports this statement [6]. Shift-wise (night and day) duty was found to be the major cause of stress in the ATCs. Shift duty was part of the ATCs' job. They did not have a fixed week off. As a result of this shift-wise duty, especially night duty, the social and family life of the ATCs remained affected [7]. Research conducted by the National Aeronautics and Space Administration (NASA), unfolded that ATC officers' work schedules often lead to fatigue, making them less alert and risking the safety of the national air traffic system [6].

In the present study, the association between morning shift duty and stress was not found to be statistically significant (P=0.106). This might be due to fresh start commencing morning duty after a good sleep overnight as suggested by a study on sleep and performance [8].

Insufficient sleep was significantly related to stress in the current study. Out of 28 ATCs who slept less than 5 hours/ day, 5 (17.9%) had low stress and 23 (82.1%) had moderate stress. On the contrary, out of 35 ATCs who slept more than 5 hours/day, 14 (40%) had low stress and 21 (60%) had moderate stress. A study conducted on sleep with work performance and quality of life suggested that sleep deprivation is responsible for fatigue in workers and has been linked with work-related mishaps and the development of chronic diseases [9].Hence, studies on sleep, working environments, and health conditions of ATC are fundamental, as these factors are related to workers' adaptations to shiftwork and work performance.

In the present study, the association between smoking with stress was not found to be significant. Similar finding was seen in another study on nicotine and job related stress [10]. Statistical significance (P<0.001) was seen between stress and alcohol consumption. Similar association is seen between stress and alcohol consumption in other studies [11].ATCs may turn to drugs and alcohol to relax or find a break from the stresses of their jobs. They may turn to stimulants to help them stay awake for long periods. Other airline personnel are also subject to high levels of on-the-job stress that can lead to substance abuse [10].

CONCLUSION

The study concludes duty shift patterns, alcohol consumption, and sleep duration are critical factors influencing stress levels in this high-stress occupation. ATCs who worked more night shifts and fewer day shifts exhibited higher stress levels, suggesting that work schedules play a crucial role in stress management. Additionally, alcohol consumption was strongly associated with stress, highlighting the impact of lifestyle choices on mental health. Insufficient sleep, characterized by less than five hours of sleep per night, was also linked to increased stress, emphasizing the importance of adequate rest for stress reduction. These results suggest that interventions aimed at optimizing work schedules, promoting healthier lifestyle choices, and ensuring adequate sleep could be effective in reducing stress among ATCs. Implementing such measures may enhance the well-being and job performance of these professionals, ultimately contributing to safer and more efficient air traffic management. Future research should explore the long-term effects of these interventions and examine additional factors that may influence stress in this critical workforce.

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