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# BEYOND INDIVIDUAL FACTORS: ASSESSING OCCUPATIONAL HAZARDS AS PREDICTORS OF MENTAL DISORDERS AMONG INDUSTRIES WORKERS

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**SUMMARY:** Work conditions are important factors in health, and unfavorable job factors such as airborne contaminants can negatively impact on mental health. These contaminants can be in the form of chemical vapors, dust, fumes, gases, or combinations thereof. This study aimed to investigate the associations between anxiety and depression with both individual and occupational factors, focusing particularly on airborne contaminants in industrial workplaces in Qom province, Iran. Conducted in 2024, this cross-sectional study randomly selected employees from various accessible industries. Data were collected using self-reported demographic information, and Depression, Anxiety, Stress Scale-21 (DASS-21) questionnaires, and documented measurements of airborne pollutants from the industries. Multiple linear regression analysis was employed to identify predictors of anxiety and depression using SPSS v26. Among the 368 participants, the majority were male (83.7%) with a mean( $\pm$ SD) age of 36.29( $\pm$ 8.14) years. The prevalence of moderate and higher levels were 45.4% for anxiety, 42.4% for depression, and 49.2% for stress. Exposure to unacceptable levels of airborne contaminants was significantly associated with both anxiety and depression ( $P < 0.05$ ). In addition, sleep quality and stress were significant predictors of mental problems. The prevalence of mental disorders was noticeable. Besides individual factors, occupational hazards like unacceptable exposure to airborne contaminants were associated with both depression and anxiety. Collaborative efforts from all stakeholders are essential to enhance mental well-being and manage work-related risks effectively.

**Key words:** workplace, mental health, airborne pollutants, dust, fume

## INTRODUCTION

Work conditions significantly impact health, and unfavorable job factors can negatively

influence mental health (Battams *et al.*, 2014). Mental health is a crucial component of overall health, providing the individual with a sense of value, control, and understanding of internal and external functioning (Bhugra *et al.*, 2013). Given the high prevalence of mental disorders among working populations and potential impacts on workers, organizations, workplace health, and compensation, these disorders have become a growing concern (LaMontagne *et al.*, 2014). Using a human capital approach, the estimated global economic burden of mental illness is projected to increase from \$2.5 trillion in 2010 to \$6.1 trillion by 2030 (De Oliveira *et al.*, 2023). Anxiety and depression are among the most common mental disorders (Kessler, 2012, Zender & Olshansky,

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2009) influenced by complex biological, psychological, social, and environmental factors (Razali et al., 2020). On the other hand, mental disorders are the leading cause of absenteeism due to illness and disability (L. Tan et al., 2014). Previous studies have shown that these disorders can lead to reduced productivity (Dewa et al. 2011, Stander and August Korb, 2015), impaired workplace safety, job performance (Haslam et al., 2005), and decreased job satisfaction (Salma & Hasan, 2020). Moreover, emerging research suggests a link between exposure to environmental pollutants, such as air pollution, and increased prevalence and/or severity of mental health disorders (Zundel et al., 2022). This area is garnering increasing attention to study (Shi et al., 2020).

Given the prevalence of mental disorders (Bateson et al., 2011), developing preventive strategies is crucial for managing these disorders (Fusar-Poli et al., 2020). On the other hand, workplaces are crucial for several reasons, including the employment of a high percentage of the world's population, spending a high portion of hours at work (Tan et al., 2014), and the presence of various parameters affecting mental health, such as individuals of different ages and genders, and especially the presence of a wide range of air pollutants. Previous studies have highlighted non-compliance with air quality standards as a major threat to health, with a wide range of health consequences (Zundel et al., 2022). Rabipour et al. (2023) demonstrated that air pollution significantly impacts mental health, with conditions worsening as pollution levels increase. Workplace air can be contaminated by a variety of airborne pollutants including vapors, particles, fibers, fumes, gases, or a mixture of them (Talty, 1998).

Various studies have established a correlation between anxiety and depression and exposure to various pollutants, including carbon, copper, nickel, zinc, PM2.5 particles (Shi et al., 2020), PM10, elevated ozone levels (Zhao et al., 2020), pesticide poisoning (Zanchi et al. 2023), as well as adverse mental health outcomes in retired workers with a history of occupational exposure to cement, coal, asbestos, and silica dust (Lin et al., 2014).

This highlights the importance of focusing on the workplace for controlling and preventing

mental health disorders. In the context of airborne contaminants in workplaces, it is essential to consider the protection of workers' health from such hazards and the prevention of contamination in the work environment. This responsibility should be shared among individuals involved in the design, organization, and execution of work tasks, as well as those responsible for workers' health and safety (Beres, 1980).

While numerous studies have investigated the relationship between individual factors, and the association of public air pollution with depression and anxiety, examining job-related variables and the workplace environment, especially air pollutants, is limited. Therefore, considering the importance of the issue, this study aimed to investigate the relationship between individual factors, and the association of public air pollution in the workplace with depression and anxiety to increase awareness of the need for rapid expansion of interventions to manage and prevent the negative consequences of mental health disorders in the workplace.

## METHODS

### Study design

The present study is a cross-sectional study conducted among industrial workers in Qom province. Employees from accessible industries were randomly selected and included in the study.

### Participants

A total of 368 employees from six industries were selected using convenience sampling. People with occupations such as casting, welding, metal parts polishing, soldering, painting, washing tools with chemical materials, and repairing and maintaining were exposed to harmful chemical agents. Others like office staff, on the other hand, were not exposed to these agents. The inclusion criteria required individuals to have at least one year of experience in their current job, while exclusion criteria included the use of medications for anxiety and depression control, and any unwillingness to continue participation at any stage of the study.

## Data collection

Data were collected using self-reported methods after providing necessary explanations about the importance of the topic and ensuring full adherence to ethical research guidelines, using standard questionnaires. Furthermore, the questionnaires were administered in a paper-based format, and data collection occurred from March to May 2024.

**Personal and occupational information questionnaire:** Using this questionnaire, demographic information of participants including age, gender, level of education, work experience, shift work, Body Mass Index (BMI), marital status, duration of daily physical activity (in minutes), daily caffeine consumption (in milligrams), and usual sleep duration during a 24-hour period (in hours) were collected. In addition, participants rated their sleep quality on a five-point scale from 1 (Very low) to 5 (Very high). To evaluate individuals' nutrition, as an important factor in lifestyle, the nutrition section of the Health-Promoting Lifestyle Profile (HPLP) questionnaire (Walker et al., 1987) was used, which had been validated in its Persian version with eight approved questions (Mohammadi Zeidi et al., 2011). Responses were provided on a four-point Likert scale (1=Never, 2=Sometimes, 3=Often, and 4=Always), and the average score of the questions formed the nutrition factor score, with higher scores indicating a better dietary pattern and food choices (Walker et al., 1987).

**Exposure to airborne contaminants:** Exposure to this sort of hazard (fumes, dust, chemical vapors) was assessed using measurement results documented in each industry. For exposed participants, the results were classified as acceptable and unacceptable exposure based on Iran's Occupational Exposure Limits (OEL) (Environmental and Occupational Health Center of Iran (EOHCI), 2021).

**Depression Anxiety and Stress Scale-21 (DASS-21):** This questionnaire includes 21 ques-

tions with three subscales; seven questions for each to assess the states of stress, anxiety, and depression. Participants responded to the 21 questions using a four-point Likert scale from 0 to 3, corresponding to never, sometimes, often, and almost always, respectively (Babazadeh et al., 2016) and for better comparison and analysis against the 42-question version, the score is multiplied by 2. The higher the obtained score, the more severe the individual's stress, anxiety, and depression (Asghari, Saed & Dibajnia, 2008). The validity and reliability of the Persian version of the questionnaire were confirmed (Kakemam et al., 2022).

## Data analysis

Mean, standard deviation (SD), frequency, and percentage were utilized to describe data. Multiple linear regression analysis, using a backward elimination approach, was conducted to identify predictors (risk factors) of anxiety and depression, among individual, occupational, and airborne contaminants exposure factors. Model fit was assessed using R-squared, collinearity was checked using Collinearity Statistics by Variance Inflation Factor (VIF), and autocorrelation was evaluated using the Durbin-Watson statistic. Statistical analyses were performed through SPSS version 26. The accepted level of statistical significance was  $p < 0.05$ .

## RESULTS

### Demographics

Among 368 participants, the majority were men (83.7%). The average ( $\pm$ SD) age of the workers was 36.29 ( $\pm$ 8.14) years. Most individuals had a lower diploma education (41.6%). The description of the study variables is presented in Table 1, with frequency and percentage for categorical variables, and mean and standard deviation for quantitative variables, as well as the mean and standard deviation of anxiety and depression in each group.

**Table 1. Variables description (n=368)****Tablica 1. Opis varijabli (n=368)**

Variable	Characteristic	Mean $\pm$ SD* or N(%)	Anxiety Mean $\pm$ SD	Depression Mean $\pm$ SD
Gender	Female	60(16.3)	8.27 $\pm$ 7.42	10.6 $\pm$ 8.91
	Male	308(83.7)	7.31 $\pm$ 5.98	9.05 $\pm$ 7.25
Marital status	Single	77(20.9)	7.71 $\pm$ 7.46	10.19 $\pm$ 9.35
	Married	286(77.7)	7.38 $\pm$ 5.85	9.05 $\pm$ 6.95
	Divorced	5(1.4)	8.0 $\pm$ 8.25	10.0 $\pm$ 10.29
Education level	Lower diploma	124(33.7)	7.76 $\pm$ 6.32	10.62 $\pm$ 7.9
	Diploma	153(41.6)	7.07 $\pm$ 5.96	8.4 $\pm$ 7.01
	Associate degree	23(6.3)	8.09 $\pm$ 7.64	9.57 $\pm$ 8.63
	Bachelor	60(16.3)	7.8 $\pm$ 6.58	9.12 $\pm$ 7.83
	MSc or higher	8(2.2)	6.13 $\pm$ 3.23	6.75 $\pm$ 4.26
BMI** state	Underweight	4(1.1)	7.0 $\pm$ 7.39	20.5 $\pm$ 9.71
	Healthy Weight	140(38)	7.42 $\pm$ 6.68	9.12 $\pm$ 7.27
	Overweight	156(42.4)	6.67 $\pm$ 5.6	8.44 $\pm$ 7.16
	Obesity	68(18.5)	9.38 $\pm$ 6.35	10.99 $\pm$ 8.23
Shift working	No	305(82.9)	7.32 $\pm$ 6.38	9.18 $\pm$ 7.69
	Yes	63(17.1)	8.16 $\pm$ 5.49	9.9 $\pm$ 6.84
Second job	No	317(86.1)	7.29 $\pm$ 6.01	9.48 $\pm$ 7.72
	Yes	51(13.9)	8.55 $\pm$ 7.47	8.22 $\pm$ 6.37
Exposure with airborne contaminants	No	236(64.1)	7.44 $\pm$ 5.98	9.28 $\pm$ 7.39
	Yes_Acceptable	69(18.8)	5.77 $\pm$ 5.0	6.87 $\pm$ 6.21
	Yes_Unacceptable	63(17.1)	9.41 $\pm$ 7.76	12.05 $\pm$ 8.59
Age (year)		36.29 $\pm$ 8.14	-	-
Work experience (year)		11.26 $\pm$ 6.84	-	-
Caffeine consumption (mg/day)		197.04 $\pm$ 31.89	-	-
Physical activity (hrs./day)		21.97 $\pm$ 8.98	-	-
Nutrition		2.83 $\pm$ 0.58	-	-
Sleep quality		3.09 $\pm$ 0.93	-	-
Sleep duration (hrs./day)		6.58 $\pm$ 1.21	-	-
Stress		15.51 $\pm$ 8.75	-	-
Anxiety		7.46 $\pm$ 6.24	-	-
Depression		9.3 $\pm$ 7.55	-	-

\*SD: Standard Deviation

\*\*Body Mass Index

## Depression, Anxiety, and Stress

As shown in Table 2, 201 employees (54.6%) experienced normal anxiety. The corresponding figures for depression and stress were 212 (57.6%) and 187 (50.8%), respectively. It was found that the prevalence of stress (49.2%) among participants was higher than depression (42.4%) and anxiety (45.4%).

**Table 2. Severity levels frequency (%) for Anxiety, Depression, and Stress (n=368)**

**Tablica 2. Učestalost razina jakosti (%) za anksioznost, depresiju i stres (n=368)**

Levels of severity	Anxiety	Depression	Stress
Normal	201(54.6)	212 (57.6)	187 (50.8)
Mild	53 (14.4)	50 (13.6)	60 (16.3)
Moderate	67 (18.2)	71 (19.3)	69 (18.8)
Severe	26 (7.1)	24 (6.5)	35 (9.5)
Extremely severe	21 (5.7)	11 (3.0)	17 (4.6)

The reliability of the applied questionnaires was assessed using the Cronbach's alpha coefficient and was measured as 0.79, 0.72, and 0.76, for stress, anxiety, and depression respectively.

## Relationship between individual factors, and the association of public air pollution with depression and anxiety

A multiple linear regression analysis was conducted to identify predictor factors of anxiety and depression as two dependent variables. The backward method was utilized. It was started with building the full model, including predictors (in-

dependent variables) such as age, work experience, caffeine intake, duration of physical activity, nutrition, sleep quality and duration, stress, gender, BMI status, marital status, education level, chemical airborne pollutant exposure, second job, and shift working.

It is noticeable that categorical variables were entered to model as dummy variables and included in the models with the first category in Table 1 serving as the reference. Notably, variables representing individuals with a Master's degree or higher education level, underweight BMI status, and widowed marital status were excluded from the models due to their low frequencies.

Then, as mentioned, statistical software of SPSS was used to fit the regression model with all the included predictors. The least significant predictor was eliminated at each step from the regression model. The process of evaluating the significance of the predictors, removing the least significant one, and refitting the model was continued until remaining predictors were statistically significant. Finally, a reduced model that best explains the data was found.

The multiple regression model for anxiety, consisting of seven predictors in 14<sup>th</sup> model, yielded an  $R^2$  of 0.396,  $F(7, 360) = 33.704$ ,  $P < 0.001$ . The depression model, with six predictors in 15<sup>th</sup> model, resulted in an  $R^2$  of 0.472,  $F(6, 361) = 53.792$ ,  $P < 0.001$ . Furthermore, the Durbin-Watson statistic was employed to assess autocorrelation in the residuals, yielding values of 1.716 for the anxiety model and 1.850 for the depression model. The model summaries for both models are presented in Table 3.

**Table 3. Model summary for anxiety and depression as dependent variables**

**Tablica 3. Sažetak modela za anksioznost i depresiju kao ovisne varijable**

Dependent Variable	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
Anxiety	.629	.396	.384	4.897	1.716
Depression	.687	.472	.463	5.532	1.850

**Table 4. Multiple linear regression model: Anxiety as dependent variable****Tablica 4. Model višestruke linearne regresije: Anksioznost kao zavisna varijabla**

Predictor variables	B	S.E.	$\beta$	Sig.	VIF
(Constant)	6.926	1.549		.000**	
Caffeine Intake	-.004	.002	-.086	.036*	1.009
Physical Activity Duration	-.017	.008	-.086	.041*	1.039
Nutrition	-.295	.114	-.110	.010*	1.072
Sleep Quality	-.732	.289	-.109	.012*	1.095
Stress	.363	.031	.510	.000**	1.126
BMI(Obesity)	1.529	.661	.095	.021*	1.009
Unacceptable AC exposure	1.432	.691	.087	.039*	1.039

B: Unstandardized regression coefficient, SE: Standard Error,  $\beta$ : Standardized regression coefficient, VIF: Variance Inflation Factor, AC: Airborne Contaminants

\*P<0.05

**Table 5. Multiple linear regression model: Depression as dependent variable****Tablica 5. Model višestruke linearne regresije: Depresija kao zavisna varijabla**

Predictor variables	B	S.E.	$\beta$	Sig.	VIF
(Constant)	3.881	1.340		.004**	
Stress	.534	.035	.620	.000***	1.101
Sleep Quality	-.648	.326	-.079	.048*	1.094
Education (Diploma)	-1.211	.587	-.079	.040*	1.007
Second Job	-2.974	.851	-.136	.001**	1.040
Acceptable AC Exposure	1.900	.763	.098	.013*	1.066
Unacceptable AC exposure	2.397	.795	.120	.003**	1.078

B: Unstandardized regression coefficient, SE: Standard Error,  $\beta$ : Standardized regression coefficient, VIF: Variance Inflation Factor, AC: Airborne Contaminants

\*P<0.05

\*\*P<0.01

\*\*\*P<0.001

### Predictors of Anxiety

Table 4 displays results from a multiple linear regression model with anxiety as the dependent variable. Caffeine intake, physical activity, healthy nutrition, and sleep quality significantly reduce anxiety (P<0.05). However, stress increases anxiety by 0.363 units (P<0.001). Obesity raises vulnerability to anxiety by 1.529 units compared to healthy-weighted workers (P<0.05). Additionally, workers exposed to unacceptable levels of airborne contaminants at work were more likely to experience anxiety, with a 1.432 units increase (P<0.05). The VIF values ranged from 1.009 to 1.26.

### Predictors of Depression

A multiple linear regression analysis was performed to elucidate the variance in depression associated with various characteristics of the employees under study. The results of this analysis are presented in Table 5, with depression serving as the dependent variable. The model identified six variables as significant predictors.

Specifically, stress was found to increase depression by 0.534 units (P<0.001), while better sleep quality reduced depression by 0.648 units (P<0.05). Workers with a diploma level of edu-

cation experienced a 1.211 units decrease in depression compared with workers with a lower diploma ( $P < 0.05$ ). Notably, individuals engaged in a second job experienced a decrease of 2.974 units in depression ( $P < 0.01$ ). Regarding exposure to chemical agents in the air of the workplace, it was noted that workers exposed to such agents were more likely to experience depression compared to their non-exposed counterparts. Exposure to acceptable levels of chemical airborne contaminants was linked to an increase of 1.900 units in depression ( $P < 0.05$ ), while unacceptable exposure was associated with a higher increase of 2.397 units in this mental disorder ( $P < 0.01$ ). The VIF values were between 1.007 and 1.101.

## DISCUSSION

The present study aimed to identify individual and occupational predictors of depression and anxiety among workers, particularly focusing on the role of exposure to airborne pollutants in the workplace. On the other hand, these predictors can serve as significant factors in controlling dependent variables of depression and anxiety. The findings showed that 45.3% of participants experienced moderate to severe stress, while 28.8% reported depression, and 31% reported anxiety. These conditions were somewhat consistent with previous study (Ekhlās et al., 2021). In contrast, another study reported a lower percentage of cases with moderate to severe levels (Saberī et al., 2020).

Linear regression analysis did not reveal significant relationships between variables such as age, work experience, gender, and marital status with anxiety and depression. Similarly, in the study by Taleghani et al., (2018) no significant relationship was reported between age, gender, work experience, and marital status with anxiety and depression. Consistent with the current study, various studies have reported no significant association between age (Talwar et al., 2017), marital status (Jiang et al., 2022), and gender (K. C. Tan et al., 2015) with depression and anxiety. In contrast, the results of some studies depicted significant relationship between work experience (Ghorbani Nia, 2016), age, and gender (Sabbaghi et al., 2022) with depression and anxiety. These varia-

tions in results can be attributed to the potential impact of differences in the studied populations and conditions. In alignment with previous research (Alizadeh et al., 2020), this study also illustrated that shift working made none significant difference in depression and anxiety. A review study indicated that night shift working increases the risk of depression (Angerer et al., 2017). The discrepancy between that study and the findings of the present research can be attributed to the type of shift work, as the employees in this study were not working in night shifts at all.

In terms of education, this study found that workers with a diploma level of education experienced lower rates of depression compared to those with a lower diploma. However, education level did not show a significant relationship with anxiety. While some past studies have indicated that higher levels of education are associated with reduced severity of depression and anxiety (Jiang et al., 2022), others have reported no correlation between education and these psychological issues (Tan et al., 2015). Differences in the results of studies suggest that the relationship between education with depression and anxiety is complex (Östberg et al., 2023). Additionally, in the current research, 75.3% of participants had education levels of a diploma or lower, which might explain the lack of difference among other educational groups.

Our study found that obese individuals experienced higher levels of anxiety compared to those with a normal BMI, although no significant relationship was found between BMI and depression. A systematic review also identified a positive relationship between obesity and anxiety (Gariépy et al., 2010). Another study demonstrated a significant relationship between anxiety and obesity in elderly groups (Eik-Nes et al., 2022). In that study, it was indicated that depression has a direct correlation with BMI, while the study by Choi et al. (2023) suggested a negative correlation between them.

While a negative relationship between physical activity and depression was indicated by Jiang et al. (2022), this study, similar to some previous research, did not find a significant correlation (Harper et al., 2019, Williams et al., 2019). This suggests that physical activity when combined

with other factors, may lead to a reduction in depression. In line with Ghanbarzadeh et al. (2024) the present study demonstrated that maintaining healthy nutrition and diet, such as consuming vegetables and fruits, proteins, and regulated carbohydrates, along with reducing sugar and sugary foods, was significantly and negatively correlated with anxiety, meaning that better nutrition was linked to reduced anxiety. Consistent with previous research (Aucoin et al., 2021; Zhang et al., 2024; Chegini et al., 2022), the present study did not show a significant relationship between nutrition and depression, although Alam et al., (2021) reported a negative correlation between the two. In this study, it was explored that poor sleep quality leads to increased anxiety and depression. Similarly, past research (Zanchi et al., 2023) have shown that sleep disturbances result in increased depression. Demirchi et al. (2015) in a study conducted in Turkey reported a relationship between sleep quality and both depression and anxiety, but in that study, depression and anxiety were considered as predictors of sleep quality.

However, in this study, sleep duration was not significantly related to either depression or anxiety. Liu et al. (2021) found that sleep duration of less than 6 hours is a predictor of both anxiety and depression. Dong et al. (2022) also reported a relationship between sleep duration and depression, indicating that both insufficient and excessive sleep lead to increased depression, suggesting a U-shaped relationship between sleep duration and depression. In our study, the majority of individuals (79.6%) reported sleeping 6-8 hours per day, which might explain the lack of a significant relationship between sleep duration and both depression and anxiety.

Caffeine consumption showed a weak negative relationship with anxiety. Food and Drug Administration (FDA) (2023) has stated that 400 milligrams is the recommended daily limit for caffeine intake. In the present study, the average caffeine consumption was 197.04 ( $\pm 31.89$ ) milligrams. Min et al. (2023), indicated low-dose caffeine intake led to a decrease in both depression and anxiety. Conversely, another study reported no relationship between caffeine consumption with anxiety and depression (Makki et al., 2023), while another study found a positive correlation (Bertasi

et al., 2021). Individual differences in response to caffeine consumption is an important consideration in this context, which can result in varying outcomes among individuals (Yang et al., 2010).

The current study illustrated that participants with a second job experienced significantly lower levels of depression compared to those without a second job; however, this variable did not show a relationship with anxiety. A study focusing on women with multiple jobs indicated that holding multiple jobs increases the risk of depression (Bruns & Pilkauskas, 2019). It is noteworthy that the mentioned study was conducted only among women. In developing countries, taking a second job is often to increase monthly income which can lead to a reduction in psychological problems (Parra-Mujica et al., 2023). The findings of this study indicated that stress is a predictor of both depression and anxiety, a finding that is consistent with previous research (Westfall et al., 2021).

Our study also revealed that individuals exposed to unacceptable levels of harmful airborne contaminants such as dust, fumes, and chemical vapors in the workplace experienced significantly higher levels of depression and anxiety compared to those not exposed. Notably, even participants exposed to permissible levels of these pollutants reported higher severity of depression than those without any exposure. This observation aligns with a previous study on retired Chinese factory workers, which linked occupational **dust exposure** to depressive symptoms and anxiety (Lin et al., 2014). Lee and colleagues (2020) demonstrated that exposure to moderate and high levels of dust, as opposed to low levels, increases the risk of both depression and anxiety. Their research highlighted a dose-response relationship between mental health symptoms and dust exposure, meaning that the longer and more intense the contact with dust, the higher the frequency of mental health symptoms. However, the incidence of depression or anxiety was not influenced by exposure to dust. A systematic study revealed that there is a positive relationship between air pollution and depression, showing that an increase in pollutant levels raises the risk of depression (Zeng et al., 2019). On the other hand, a separate study reported no connection between exposure to chemical agents such as fumes/powders or vapors and men-

tal disorders in the workplace (Russo et al., 2019). Differences in results may be due to variations in methodology, tools, or different permissible limits, which require further studies with similar standard methods. The final point is that standards and exposure limits are not adequate to protect all individuals. Some people may still experience adverse effects even when exposed to levels below the permissible or standard limits (WHS, 2021).

The present study has some limitations. Regarding its cross-sectional design, the results show an association between variables like airborne contaminants and workers' depression and anxiety, but no conclusions can be drawn about causality in the incidence of these mental health issues. We collected data on depression, anxiety, stress, and sleep quality through self-report questionnaires; however, we did not utilize any medical diagnostic criteria to differentiate these issues. Additionally, there is a potential for recall bias in the data collected. We obtained data from different studied industries regarding measures of airborne contaminants but did not assess each type of them individually, which may have distinct health effects. Therefore, prospective studies are necessary to clarify the dose-response phenomenon.

## CONCLUSION

This study identified significant levels of mental health problems, with both individual and occupational factors serving as predictors of depression and anxiety. Among these, sleep quality, stress, and unacceptable exposure to airborne pollutants emerged as common predictors for both mentioned problems. To address these issues effectively, we propose the following preventive strategies. Enhance Ventilation Systems: implement and regularly maintain effective ventilation systems in workplaces to reduce airborne pollutants concentration and improve air quality. Provide Comprehensive Training: offer regular training sessions for employees that include information on mental health awareness, stress management techniques, and the importance of maintaining good sleep hygiene. Establish Monitoring Protocols: develop and enforce monitoring protocols to

regularly assess air quality and employee mental health, ensuring timely interventions when necessary. Facilitate Open Communication: create a culture of open communication where employees feel comfortable discussing mental health concerns and seeking support. Implement Protective Measures: ensure the availability and proper use of personal protective equipment to limit exposure to airborne pollutants. Promote Work-Life Balance: encourage policies that support balancing work and life, such as flexible working hours. It is essential to look beyond individual and obvious factors affecting mental health to include work-related and latent ones. All stakeholders including competent authorities, employers, manufacturers, workers, occupational health officers, and scientific researchers must collaborate to identify and control the underlying causes of mental health issues in various environments. By taking a proactive and comprehensive approach, we can foster healthier workplaces and improve the overall well-being of employees.

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## Conflicts of Interest

The authors declare that they do not have any conflicts of interest.

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## **IZVAN OSOBNIH ČIMBENIKA: PROCJENA PROFESIONALNIH OPASNOSTI KAO PREDIKTORA MENTALNIH POREMEĆAJA KOD INDUSTRIJSKIH RADNIKA**

**SAŽETAK:** Radni uvjeti važni su čimbenici zdravlja, a nepovoljni radni uvjeti poput zagađivača zraka mogu negativno utjecati na mentalno zdravlje. Zagađivači mogu biti u obliku kemijskih para, prašine, dima, plinova ili svega navedenoga. Ovo istraživanje imalo je za cilj istražiti vezu između tjeskobe i depresije s individualnim i profesionalnim čimbenicima, uz poseban fokus na zagađivače zraka na radnim mjestima u industriji, a provedeno je u provinciji Qom u Iranu. Presječno istraživanje provedeno je 2024. godine na nasumičnom uzorku radnika u raznim dostupnim nam industrijama. Podatci su prikupljeni od samih sudionika, iz upitnika o Depresiji, tjeskobi i stresu Skala-21(DASS-21) te iz podataka o mjeranju zagađivača zraka u pojedinim industrijama. Višestruka linearna regresijska analiza korištena je za utvrđivanje prediktora tjeskobe i depresije pomoću SPSS v26. Od 368 sudionika, većinu su činili muškarci (83.7 %) prosječne ( $\pm$ SD) dobi 36.29 godina ( $\pm$ 8.14). Zastupljenost umjerene i povišene razine tjeskobe bila je 45.4 %, za depresiju 42.4 %, a za stress 49.2 %. Izloženost neprihvatljivim razinama zagađivača zraka bila je značajno povezana i s tjeskobom i s depresijom ( $P < 0.05$ ). Nadalje, kvaliteta sna i stres bili su značajni prediktori mentalnih teškoća. Primijećena je prisutnost mentalnih poremećaja. Pored individualnih čimbenika, profesionalne opasnosti poput neprihvatljive izloženosti zagađivačima zraka, utvrđena je veza i s depresijom i s tjeskobom. Zajednički naponi svih zainteresiranih od bitne su važnosti za poboljšanje opće dobrobiti i efikasno upravljanje rizicima na radu.

**Ključne riječi:** radno mjesto, mentalno zdravlje, zagađivači zraka, prašina, dim

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