



Association Between Urban Air Pollution Exposure, Respiratory Morbidity, and Health-Related Quality of Life Among Adults

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Article Info	ABSTRACT
Article type: Research Article	Air pollution is a major environmental and public health challenge, particularly in urban areas of developing countries where pollutant levels frequently exceed international safety standards. This study aimed to evaluate the association between air pollution exposure, respiratory symptoms, and health-related quality of life among adults residing in urban areas of Al-Diwaniyah City, Iraq. A cross-sectional study was conducted in 24 primary healthcare centers from January to March 2026. A total of 400 adults were recruited using a convenience sampling technique. Data were collected using the Air Quality Perception (AQP) scale, the European Community Respiratory Health Survey (ECRHS), and the WHOQOL-BREF questionnaire.
Article history: Received: 06 Jun 2026 Revised: 27 Jul 2026 Accepted: 08 Oct 2026	The mean age of participants was 38 ± 10.3 years, and 52.0% were males. Overall, 81.0% of participants reported a moderate perception of air pollution, whereas 39.0% had chronic respiratory diseases. Poor health-related quality of life was identified in 57.3% of participants. Perceived air pollution was significantly associated with chronic respiratory diseases, respiratory health indicators and overall quality of life (all $P < 0.001$). In addition, perceived air pollution showed significant negative correlations with the physical ($r = -0.440$), psychological ($r = -0.332$), social ($r = -0.362$), and environmental ($r = -0.307$) domains of quality of life (all $P < 0.001$). The findings indicate that air pollution exposure has a substantial adverse effect on respiratory health and quality of life among adults living in urban areas and emphasize the need for effective environmental and public health interventions to reduce pollution-related health risks.
Keywords: <i>Ambient Air Environmental Exposure Respiratory Symptoms Asthma Environmental Health</i>	

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INTRODUCTION

Air pollution is one of the most important environmental and public health challenges worldwide. It is caused by the presence of harmful substances in ambient air, including particulate matter, nitrogen dioxide, sulfur dioxide, ozone, and carbon monoxide, which originate from both natural and anthropogenic sources (World Health Organization, 2024). Exposure to these pollutants has been associated with increased morbidity and mortality, particularly from respiratory and cardiovascular diseases, and remains a major concern in urban areas where rapid industrialization, urbanization, and increased traffic contribute to deteriorating air quality (Royal College of Physicians, 2025).

Exposure to air pollutants adversely affects nearly every organ system, with the respiratory system being among the most vulnerable (Schraufnagel et al., 2019). The adverse health effects extend beyond respiratory irritation and acute symptoms to include chronic diseases and impaired quality of life (Wallbanks et al., 2024). Numerous epidemiological studies have demonstrated that exposure to air pollutants is associated with cough, wheezing, chest tightness, shortness

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of breath, asthma exacerbations, and chronic obstructive pulmonary disease (Mohammed & Namburu, 2024). In addition, oxidative stress and inflammatory responses induced by pollutants contribute to long-term respiratory damage and increased susceptibility to disease (Newman & Bhatt, 2020; Sierra-Vargas et al., 2023; Rodríguez-Pérez et al., 2025). Ambient air pollution remains among the leading risk factors for morbidity and mortality worldwide (GBD 2019 Risk Factors Collaborators, 2020). It is responsible for millions of premature deaths worldwide and represents one of the greatest environmental threats to human health (Fuller et al., 2022). Oxidative stress is considered one of the principal mechanisms by which air pollution exerts its harmful health effects (Sierra-Vargas et al., 2023).

Urban populations are particularly vulnerable to the harmful effects of air pollution because of continuous exposure to emissions from transportation, industry, electricity generation, and other human activities (Maji et al., 2023). Source apportionment studies in urban regions have shown that particulate matter originates from multiple sources and varies considerably according to local environmental and socioeconomic conditions, making urban air quality a complex and multifactorial issue (Almeida & Manousakas, 2020). Consequently, air pollution not only affects physical health but also influences psychological well-being, social functioning, and overall quality of life (Zundel et al., 2022).

In the Middle East, air pollution represents a growing public health challenge. Countries in the region frequently experience pollutant concentrations that exceed international guidelines due to industrial emissions, traffic congestion, and natural phenomena such as dust storms. In Iran, exposure to air pollution has been associated with a wide range of adverse health outcomes, particularly respiratory disorders, highlighting the need for preventive measures and effective environmental policies (Ghorani-Azam et al., 2016). Similarly, studies conducted in Iraq have demonstrated considerable health impacts of ambient air pollutants, with increased morbidity and disease burden reported in several urban centers (Abbas & Abbas, 2021).

Despite growing evidence regarding the health effects of air pollution, limited studies in Iraq have simultaneously investigated respiratory symptoms and quality of life among adults living in urban environments. Furthermore, data from Al-Diwaniyah City remain scarce. Therefore, the present study aimed to evaluate the association between air pollution exposure, respiratory symptoms, and quality of life among adults residing in urban areas of Al-Diwaniyah City, Iraq.

MATERIAL & METHODS

A cross-sectional study was conducted from January to March 2026 in 24 primary healthcare centers located in Al-Diwaniyah City, Iraq. The selected centers were equally distributed between Al-Diwaniyah First and Second Health Sectors. A total of 400 adults aged 18 years and above were recruited using a convenience sampling technique. Eligible participants were urban residents who reported current or recurrent respiratory symptoms, such as cough, wheezing, or shortness of breath. Individuals younger than 18 years, those with acute respiratory infections, illiterate participants, and residents of rural areas were excluded from the study.

Data were collected using a structured questionnaire consisting of four sections. The first section included socio-demographic and clinical characteristics, including age, sex, marital status, educational level, occupation, smoking status, duration of residence, family income, and history of chronic respiratory diseases. The second section included the Air Quality Perception (AQP) scale developed by Deguen et al., which assesses individuals' perception of air pollution and its health-related effects using 22 items scored on a four-point Likert scale ranging from "Never" to "Always" (Deguen et al., 2012). Respiratory symptoms were assessed using the Arabic version of the European Community Respiratory Health Survey (ECRHS) questionnaire, a validated instrument widely used for epidemiological studies of respiratory health (Burney et al., 1994). Quality of life was evaluated using the Arabic version of the World

Health Organization Quality of Life questionnaire (WHOQOL-BREF), which consists of 26 items covering physical, psychological, social, and environmental domains (WHOQOL Group, 1998).

The questionnaire was reviewed by eight experts to establish face validity. A pilot study involving 30 participants was conducted to assess clarity and reliability of the study instrument. The Cronbach's alpha coefficients were 0.84 for the AQP scale, 0.81 for the respiratory symptoms scale, and 0.87 for the WHOQOL-BREF, indicating good internal consistency. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data. Chi-square and Fisher's exact tests were used to assess associations between categorical variables, whereas Pearson's correlation coefficient was used to examine correlations between continuous variables. Receiver operating characteristic (ROC) curve analysis was performed to determine the optimal cut-off point for quality of life scores. A p-value of less than 0.05 was considered statistically significant. Ethical approval was obtained from the relevant authorities, and informed consent was obtained from all participants prior to data collection.

RESULTS AND DISCUSSION

Table 1 presents the sociodemographic characteristics of the study participants. The mean age was 38 ± 10.3 years, and the largest proportion of participants was aged 28–37 years (31.0%). Males constituted 52.0% of the study population. Most participants were unskilled workers (64.5%) and belonged to the medium socioeconomic group (40.5%). In addition, 43.5% of the participants had lived in the study area for more than 10 years, while 82.0% had resided there for at least six years, indicating prolonged exposure to local environmental conditions. These findings indicate that a considerable proportion of the participants may be more vulnerable to the adverse effects of air pollution due to occupational exposure, long-term residence, and limited socioeconomic resources (Kaufman et al., 2020; Boogaard et al., 2024; Pope et al., 2018). Lower socioeconomic status may also reduce awareness of pollution-related health risks and hinder the adoption of preventive measures, thereby increasing susceptibility to environmental hazards. Furthermore, long-term residence combined with a high proportion of unskilled workers may increase vulnerability to the chronic health effects of environmental pollution (Li et al., 2024; Strak et al., 2021).

Table 1. The distribution of respondents according to sociodemographic characteristics of the study population in in Al-Diwaniyah City, Iraq:

variables	Categories	percent
Age	18-27 years	18.3
	28-37 years	31.0
	38-47 years	27.2
	≥ 48 years	23.5
Sex	Male	52.0
	Female	48.0
Occupation	Unskilled workers	64.5
	Lower professionals, skilled and semiskilled workers	19.7
	High professional and managerial jobs	15.8
	Less than 1 years	3.5
Duration of the residence in this area	1 to less than 6 years	14.5
	6 to less than 10 years	38.5
	More than 10 years	43.5
Socio-economic status	Low	22.7
	Medium	40.5
	High	36.8

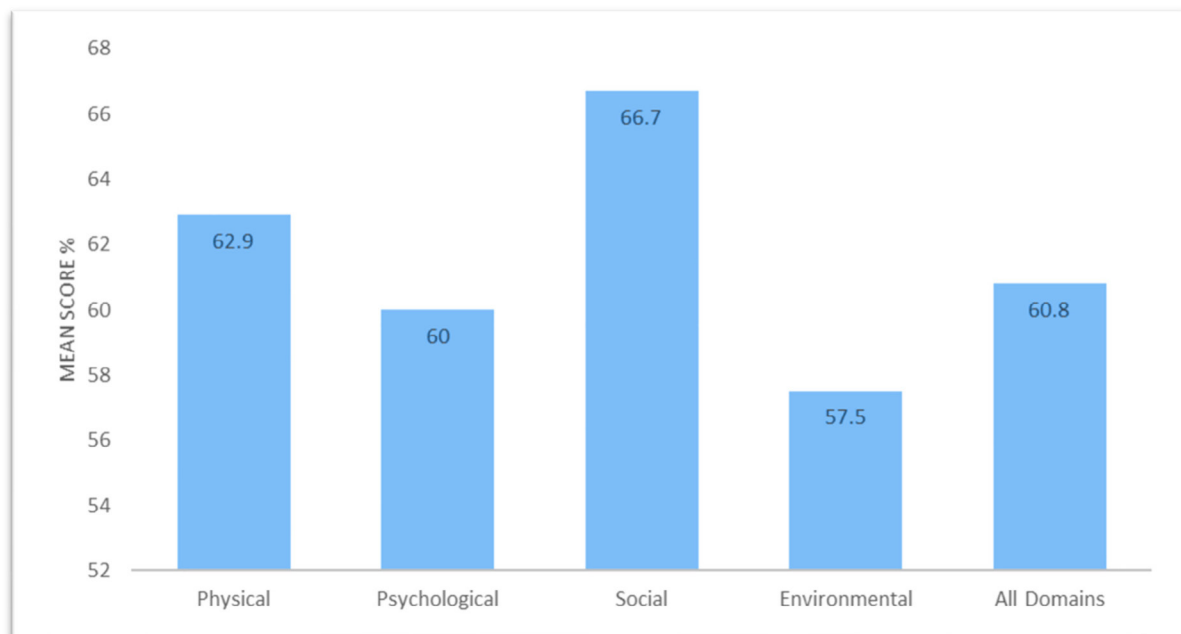


Fig. 1. Mean scores of the physical, psychological, social, environmental, and overall quality of life domains among the study participants.

Table 2. The relationship between total perceived score with life style and respiratory disease of participants

Variables and categories		Total perceived score						X ²	P-value
		Good air quality		Moderate air quality		Poor air quality			
		No.	%	No.	%	No.	%		
Smoking	Smoker	17	11.5	123	83.1	8	5.4	4.903	0.297
	Non-smoker	26	12.0	170	78.7	20	9.3		
	Ex-smoker	1	2.8	31	86.1	4	11.1		
Do you suffer from chronic respiratory disease?	No	41	16.8	196	80.3	7	2.9	39.780	<0.001
	Yes	3	1.9	128	82.1	25	16.0		
If yes, specify	COPD	0	.0	5	50.0	5	50.0	12.321	0.125
	Asthma	1	1.7	51	85.0	8	13.3		
	Chronic bronchitis	1	3.1	29	90.6	2	6.3		
	Chest allergy	1	2.5	31	77.5	8	20.0		
	Other	0	.0	12	85.7	2	14.3		

Figure 1. Illustrates the assessment of the main domains of quality of life among the study participants. The social domain had the highest mean score (66.7%), followed by the physical (62.9%), all domains combined (60.8%), and psychological domains (60.0%), whereas the environmental domain had the lowest mean score (57.5%). These findings indicate that environmental conditions had the greatest negative impact on participants' quality of life, while social relationships appeared to be relatively less affected (Nakao et al., 2019).

Result of this study measure the distribution of participants according to the total perceived air quality score. The majority of participants perceived air quality as moderate (81.0%), whereas 11.0% and 8.0% perceived it as good and poor, respectively as in Figure 2. These findings indicate that most participants considered the surrounding air quality to be acceptable but not optimal, reflecting a moderate level of concern regarding environmental conditions and their potential health effects (Doiron et al., 2017).

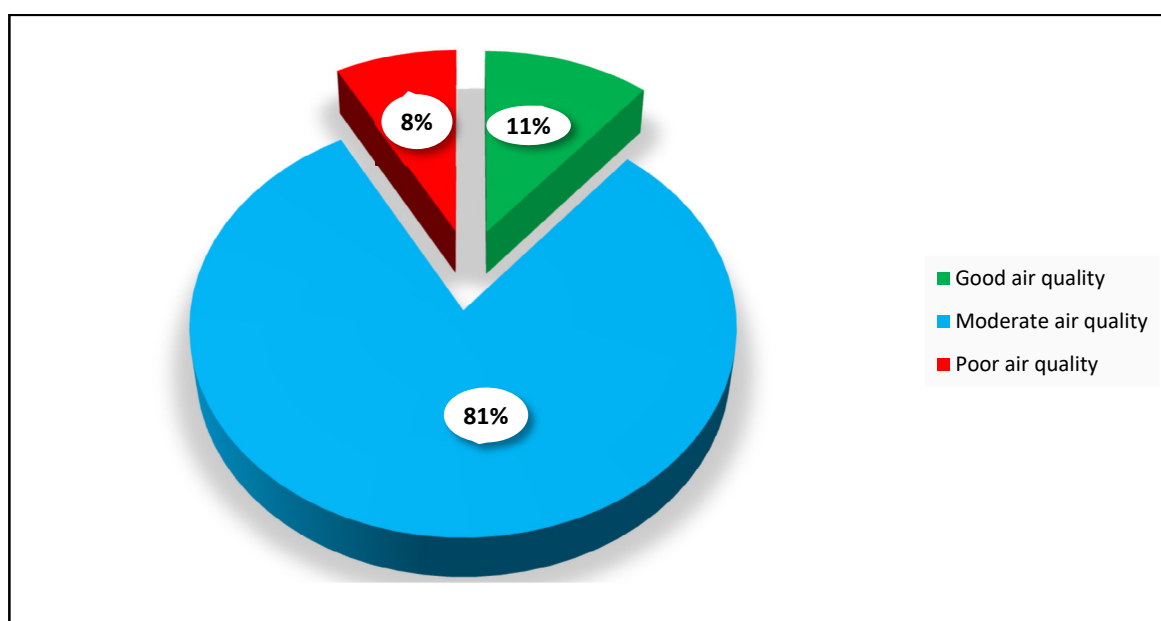


Fig. 2. Distribution of participants according to the total perceived air quality score.

The present study demonstrated a highly significant association between chronic respiratory diseases and poor perceived air quality ($P < 0.001$). Individuals with chronic respiratory diseases may exhibit increased sensitivity to environmental pollutants, making them more likely to perceive deterioration in air quality even with minor fluctuations in pollution levels. Thus, air quality perception may reflect physiological sensitivity rather than general environmental awareness (Sinharay et al., 2018). Asthma was the most common chronic respiratory disease among participants. This finding is consistent with the study conducted among Iraqi patients, which reported a considerable burden of asthma and allergic respiratory disorders in the Iraqi population (Turki et al., 2020). In contrast, no significant association was found between smoking status and perceived air quality. However, smoking remains an important additional source of respiratory burden and may interact with environmental exposure to aggravate respiratory symptoms and diseases through a process of double exposure (Liu et al., 2020; Schraufnagel et al., 2019). Chronic respiratory conditions may impose a considerable burden on affected individuals and require continuous medical care and monitoring (Najm et al., 2020). Furthermore, the prevalence of chronic respiratory diseases in the study population reached 39.0%, with asthma being the most common condition (38.5%), followed by chest allergy (25.6%), chronic bronchitis (20.5%), and COPD (6.4%). These findings indicate a substantial burden of respiratory morbidity among the participants, likely resulting from prolonged environmental exposure together with unfavorable social and occupational conditions (Rice & Thurston, 2019; Doiron et al., 2021).

Table 3 found significant associations between perceived air quality and several respiratory health indicators, including wheezing, breathlessness associated with wheezing, wheezing without a cold, chest tightness, nocturnal shortness of breath, and asthma attacks ($P < 0.05$). However, no significant associations were observed with nocturnal cough, asthma medication use, or nasal allergy. These findings suggest that air quality perception is closely linked to participants' physical respiratory experiences rather than abstract environmental awareness. Individuals experiencing respiratory symptoms are more likely to perceive air quality as poor, whereas poor air quality may in turn increase susceptibility to respiratory

Table 3. The relationship between total perceived score and respiratory health indicators:

		Total air quality score						X ²	P-value
		Good air quality		Moderate air quality		Poor air quality			
		No.	%	No.	%	No.	%		
Have you had wheezing or whistling in your chest last 12 months?	No	33	17.7	150	80.6	3	1.6	32.10 0	<0.001
	Yes	11	5.1	174	81.3	29	13.6		
If yes, have you been breathless when the wheezing noise present?	No	34	16.6	168	82.0	3	1.5	34.43 2	<0.001
	Yes	10	5.1	156	80.0	29	14.9		
Have you had wheezing, whistling when did not have a cold?	No	32	16.8	151	79.5	7	3.7	19.75 9	<0.001
	Yes	12	5.7	173	82.4	25	11.9		
Have you been woken up with a feeling of tightness in chest last 12 months?	No	23	23.7	72	74.2	2	2.1	25.17 9	<0.001
	Yes	21	6.9	252	83.2	30	9.9		
Have you been woken up by an attack of shortness of breath last 12 months?	No	21	23.9	64	72.7	3	3.4	20.89 7	<0.001
	Yes	23	7.4	260	83.3	29	9.3		
Have you been woken up by an attack of coughing in the last 12 months?	No	9	10.3	76	87.4	2	2.3	5.115	0.077
	Yes	35	11.2	248	79.2	30	9.6		
Have you had an attack of asthma in the last 12 months?	No	40	14.2	221	78.6	20	7.1	10.55 0	0.005
	Yes	4	3.4	103	86.6	12	10.1		
Are you currently taking any medicine (including inhalers, aerosols, and tablets) for asthma?	No	37	11.4	262	80.9	25	7.7	0.449	0.799
	Yes	7	9.2	62	81.6	7	9.2		
Do you have any nasal allergies including hay fever?	No	27	10.7	202	80.2	23	9.1	1.191	0.551
	Yes	17	11.5	122	82.4	9	6.1		

Table 4. The relationship between total perceived score and the overall QoL WHO Score:

variables		Total Perceived score						X ²	P-value
		Good air quality		Moderate air quality		Poor air quality			
		No.	%	No.	%	No.	%		
The overall QoL WHO Score	Poor Quality of Life (<75 score)	14	6.1	190	83.0	25	10.9	17.58 2	<0.0 01
	Good Quality of Life (≥75 score)	30	17.5	134	78.4	7	4.1		

problems, indicating a bidirectional relationship between respiratory symptoms and perceived air quality (Doiron et al., 2017). The high prevalence of respiratory symptoms and chronic respiratory diseases in the study population further supports the substantial respiratory burden associated with prolonged environmental exposure (Xu et al., 2024).

A significant association between perceived air quality and overall quality of life ($P < 0.001$) was shown in Table 4. Participants with poorer perceived air quality were more likely to report poor quality of life. These findings suggest that air quality perception plays an important role in overall well-being, as poorer air quality is associated with lower quality of life across physical, psychological, social, and environmental domains (Nakao et al., 2019). Furthermore, more than half of the participants (57.3%) had poor quality of life, indicating the substantial impact of environmental conditions on their well-being (Boudier et al., 2020). Quality of life is a multidimensional concept that reflects physical, psychological, social, and environmental well-being and can be influenced by various health and environmental factors (Al-Hadithi et al., 2017).

Table 5. The Correlation between total perceived score and main domains of QoL

		Correlations			
		Physical	Psychological	Social	Environmental
Total Perceived score	<i>r</i>	-0.440**	-0.332**	-0.362**	-0.307**
	<i>P-value</i>	<0.001	<0.001	<0.001	<0.001
Physical	<i>r</i>	1	0.704**	0.636**	0.666**
	<i>P-value</i>		<0.001	<0.001	<0.001
Psychological	<i>r</i>		1	.634**	0.797**
	<i>P-value</i>			<0.001	<0.001
Social	<i>r</i>			1	0.615**
	<i>P-value</i>				<0.001

** . Correlation is significant at the 0.01 level (2-tailed).

Table 5 showed significant negative correlations between perceived air quality and all domains of quality of life, including physical ($r = -0.440$), psychological ($r = -0.332$), social ($r = -0.362$), and environmental ($r = -0.307$) domains ($P < 0.001$). These findings indicate that poorer perceived air quality is associated with lower quality of life across all domains. The strongest correlation was observed with the physical domain, suggesting that respiratory symptoms and physical health problems may substantially influence individuals' perception of air quality and overall well-being (Nakao et al., 2019).

CONCLUSION

The study demonstrated significant associations between perceived air quality, respiratory health, and quality of life among adults in Al-Diwaniyah City. Poor perceived air quality was associated with respiratory symptoms, chronic respiratory diseases, and lower quality of life. These findings emphasize the need for effective environmental and public health measures to reduce the adverse effects of air pollution and improve population well-being.

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CONFLICT OF INTEREST

The authors declare that there is not any conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been completely observed by the authors.

LIFE SCIENCE REPORTING

No life science threat was practiced in this research.

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