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Research Article

High Levels of Depression Among Healthcare Workers Four Years After the COVID-19 Pandemic: A Cross-Sectional Survey from a High-Workload, Deteriorating Healthcare System

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Abstract

Background: Healthcare workers (HCWs) in Iraq have endured significant psychological burdens throughout the COVID-19 pandemic. Despite the prolonged impact of the pandemic, studies evaluating the long-term mental health consequences among HCWs remain scarce. To our knowledge. ***Objective***: To assess the psychological impact of the COVID-19 pandemic on HCWs four years after the pandemic. ***Methods***: A cross-sectional study was conducted between May and December 2024. The Patient Health Questionnaire-9 (PHQ-9) was utilized to evaluate depression. Multiple logistic regressions were performed to identify factors independently associated with depression. ***Results***: 948 HCWs were included in this study. 60.3% of them were female, with a mean age of 28.81 years. We found a high level of depression, with 69.4% of HCWs being affected. Younger and single HCWs had a higher depression rate, with a prevalence of 67.4% and 74.3%, respectively. Higher levels of depression were associated with lower educational attainment (84.1%). Also, those with a history of medical, psychological, or family psychological conditions were strongly associated with higher depression levels. Depression affected 72.9% of individuals who had experienced COVID-19 infection before. Medical staff working on the frontlines showed particularly high depression rates at 80.3%. The mild and moderate depression symptoms were most common, since they affected 28.9% and 28.1%, respectively. ***Conclusions***: For the first time in Iraq, this study revealed that 69.4% of healthcare workers (HCWs) suffered from depression four years after the COVID-19 pandemic. Depression was more prevalent among doctors or nurses and those with lower educational attainment.

Keywords: COVID-19, Depression, Healthcare workers, Iraq, mental health, Occupational stress, PHQ-9.

ارتفاع مستويات الاكتئاب بين العاملين في مجال الرعاية الصحية بعد أربع سنوات من جائحة COVID-19: مسح مقطعي من نظام رعاية صحية متدهور عبء عمل مرتفع

الخلاصة

الخلفية: عانى العاملون في مجال الرعاية الصحية في العراق من أعباء نفسية كبيرة طوال جائحة كوفيد-19. على الرغم من التأثير المطول للجائحة، لا تزال الدراسات التي تقيم العواقب طويلة المدى على الصحة النفسية بين العاملين في مجال الرعاية الصحية نادرة. على حد علمنا. **الهدف**: تقييم الأثر النفسي لجائحة كوفيد-19 على العاملين في مجال الرعاية الصحية بعد أربع سنوات من الجائحة. **الطرائق**: أجريت دراسة مقطعية بين مايو وديسمبر 2024. تم استخدام استبيان صحة المريض -9 (PHQ-9) لتقييم الاكتئاب. تم إجراء انحدارات لوجستية متعددة لتحديد العوامل المرتبطة بشكل مستقل بالاكتئاب. **النتائج**: تم تضمين 948 من العاملين في مجال الرعاية الصحية في هذه الدراسة. 60.3٪ منهم من الإناث، بمتوسط عمر 28.81 سنة. وجدنا مستوى عال من الاكتئاب، حيث تأثر 69.4٪ من العاملين بالرعاية الصحية. كان لدى العاملين في مجال الرعاية الصحية الأصغر سنا والأفراد معدل اكتئاب أعلى، حيث بلغ معدل انتشاره 67.4٪ و 74.3٪ على التوالي. ارتبطت المستويات الأعلى من الاكتئاب بانخفاض التحصيل العلمي (84.1٪). أيضا، ارتبط أولئك الذين لديهم تاريخ من الحالات النفسية الطبية أو النفسية أو العائلية ارتباطا وثيقا بمستويات الاكتئاب المرتفعة. أثر الاكتئاب على 72.9٪ من الأفراد الذين عانوا من عدوى COVID-19 من قبل. أظهر الطاقم الطبي الذي يعمل في الخطوط الأمامية معدلات اكتئاب مرتفعة بشكل خاص بنسبة 80.3٪. كانت أعراض الاكتئاب الخفيفة والمعتدلة أكثر شيوعا، حيث أثرت على 28.9٪ و 28.1٪ على التوالي. **الاستنتاجات**: لأول مرة في العراق، كشفت هذه الدراسة أن 69.4٪ من العاملين في مجال الرعاية الصحية عانوا من الاكتئاب بعد أربع سنوات من جائحة COVID-19. كان الاكتئاب أكثر انتشارا بين الأطباء أو الممرضات وأولئك الذين لديهم تحصيل تعليمي أقل.

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INTRODUCTION

The COVID-19 pandemic, which began in China, remains a threat to global health [1]. On January 30, 2020, the World Health Organization declared the COVID-19 outbreak to be a global public health emergency [2]. Over 768 million cases were confirmed, and approximately 6.9 million deaths were reported worldwide [3]. Iraq, which ranks second in the Eastern Mediterranean region after Iran in terms of cases but lower than Pakistan and Tunisia in terms of mortality, with 2.45 million cases and 25,343 deaths as of August

27, 2022 [4]. This rate equates to 5,798 confirmed cases and 627 deaths per 100,000, with male patients accounting for two-thirds of all recorded deaths [5]. People around the world have experienced different levels of fear, sorrow, and anxiety as a result of this pandemic [6]. Despite the extraordinary circumstances, healthcare professionals have worked tirelessly to provide medical care and treatment in order to rapidly control the COVID-19 pandemic. They were overworked for long periods, lacked motivation to continue working, and had restricted access to personal protection equipment [7,8]. Furthermore, they experienced violence. And marginalization because of the stigmatization of healthcare workers [9]. As a result, a significant number of workers are facing psychological problems. They have been at a higher risk of mental health disorders than other occupational groups [10-12]. Moreover, about one-third of healthcare workers experienced worry and depression [13]. According to studies, health care workers who work in emergency rooms, intensive care units (ICUs), and isolation rooms are more prone to suffer from psychological problems [14]. Furthermore, inadequate coping, insufficient training, a lack of social support, and a communication breakdown are all substantial risk factors for psychiatric illness [15]. A study conducted in Singapore discovered that mental symptoms are more common in doctors and single people than in nurses and married people [16]. According to other studies, nurses had the highest prevalence of anxiety and depression among healthcare workers [17]. Despite improvements in social and health conditions, the pandemic has had significant negative effects on the psychological health of healthcare workers [18], with symptoms including exhaustion, anxiety, stress, and depression. A meta-analysis of 97,333 HCWs from 21 countries shows a significant prevalence of moderate depression (21.7%) and anxiety (22.1%) in this population [19]. This finding was consistent with previous research, which found a significant correlation between these manifestations and the incidence of physical symptoms such as headaches [20]. Furthermore, depression impairs psychosocial functioning, particularly interactions with friends and family [21], making it critical to investigate this phenomenon. Despite the profound global impact of the COVID-19 pandemic, there remains a significant gap in the literature regarding the long-term mental health consequences among healthcare workers (HCWs), particularly in low- and middle-income countries like Iraq. While many studies have assessed acute psychological effects during the early phases of the pandemic, few have investigated the persistence of mental health disorders, such as depression, several years after the crisis. To our knowledge, this is the first study in Iraq to evaluate the mental health status of HCWs, specifically four years after the pandemic. This study fills this critical gap by assessing the prevalence and severity of depression among HCWs following COVID-19 infection in Iraq while also identifying key contributing factors such as occupational stressors, workload, and access to psychological support. By addressing long-term outcomes, this research provides valuable insights into the enduring burden on frontline professionals. The findings may inform future mental health interventions, policy planning, and resource allocation aimed at supporting HCWs in post-pandemic recovery phases, both in Iraq and similar settings worldwide.

Primary Objective

Determine the prevalence and severity of depression among healthcare workers in a high-workload and resource-constrained healthcare system in Iraq using the Patient Health Questionnaire-9 (PHQ-9), and find out sociodemographic, occupational, and COVID-19-related factors contributing to depressive symptoms.

Secondary Objectives

Evaluate the association between depression and sociodemographic variables. Examine the relationship between work-related factors (e.g., occupation type, workload, job satisfaction, and resource shortages) and depression. Assess the impact of COVID-19 exposure, including prior infection, frontline work, and pandemic-related stressors, on long-term mental health outcomes.

METHODS

Study design and sampling

This cross-sectional study was conducted at our Hospital between May and December 2024. According to the Roasoft online sample size calculator, the calculated sample size is 948 participants, based on a total population of 7,550 healthcare workers, with a 5% margin of error, a 99.9% confidence level, and a 50% population proportion. A Roasoft online calculator estimated that 948 participants would be sufficient for the study. A representative proportionate participation of doctors, nurses, pharmacists, dentists, and technicians was selected using stratified random sampling from different hospital departments. Eligible participants for this study included healthcare workers (HCWs) who had worked during the COVID-19 pandemic and continued working in healthcare settings at the time of data collection. Both clinical (physicians, nurses, paramedics) and non-clinical staff (administrative personnel, technicians) were considered eligible, provided they were engaged in direct or indirect patient care responsibilities. Additional criteria for study admission are age requirements of 22 years and older, the ability to understand questions in Arabic or English, and voluntary consent to participate. HCWs with a documented history of major psychiatric disorders diagnosed before the onset of the COVID-19 pandemic, such as major depressive disorder, bipolar disorder, or

schizophrenia, were excluded from participation. Similarly, individuals currently receiving psychiatric treatment for pre-existing mental health conditions were not eligible. Those diagnosed with severe cognitive impairment or neurocognitive disorder could have interference with their ability to understand or accurately complete the survey.

Data collection

Eight data collectors underwent training at Al-Nahrain College of Medicine over three days to conduct the study. A faculty member from the psychiatry department provided training for three days, along with supervision from professors in psychiatry and community and family medicine. The primary purpose of the training program was to ensure the data collectors' proficiency in research methods, ethical guidelines, and communication techniques when interacting with participants. A pre-test involving 50 healthcare workers from our hospital (5.27% of the total sample) preceded the full-scale data collection phase. This pre-test allowed for the evaluation of weaknesses in the data collection instruments and potential solutions, and the verification of comprehension of the questionnaire items among the 50 healthcare workers. The pretest assessment resulted in minimal modifications to survey questions, thus advancing the effectiveness of data collection. During the data collection phase, data collectors received continuous guidance from the study supervisor and principal investigator. An oversight system was set to protect the data collection procedures from diverging from study-established levels of precision and consistency requirements. Principal investigators and supervisors reviewed the data collected daily to verify its consistency, quality, completeness, and accuracy. The pilot study results guided the final data collection stage because both datasets matched their fundamental aspects. The close monitoring and rigorous quality control procedures ensured the dependability and accuracy of the data gathered, which supported the analysis phase.

Outcome variables

This study considered one primary outcome variable: the presence and severity of depressive symptoms among healthcare workers. Patient Health Questionnaire-9 (PHQ-9) was utilized to evaluate depression, a well-established and widely used tool for screening depressive symptoms among clinical and general populations. The PHQ-9 consists of nine questions. Patients rate each question on a scale starting at zero (not at all) and ending at three (almost daily). The PHQ-9 produces scores ranging from 0 to 27, with different depression severity classifications defined by these numerical categories; minimal depression occurs when the score is 0 to 4, while mild depression spans scores from 5 to 9, moderate depression resides between 10 and 14, scores between 15 and 19 mean moderately severe depression, and severe depression starts at 20 or higher (22-24). All participants assessed the frequency of depressive symptoms by referencing their recent two-week experience during the survey execution. The classification system enabled researchers to evaluate different depression severity levels within the healthcare community, which enhanced comprehension of depression impacts in demanding medical environments. A binary outcome variable was generated for statistical analysis: moderate-to-severe depression was coded as 1 (corresponding to PHQ-9 scores of 10 or higher). In contrast, minimal-to-mild depression was coded as 0 (corresponding to PHQ-9 scores below 10). This cut-off of 10 or higher has been recommended for identifying clinically significant depression in population-based studies (22). These categories allowed researchers to separate workers with major depressive symptoms from those showing less severe depressive symptoms for evaluating mental health outcomes through regression analysis of post-pandemic healthcare worker data.

Independent variables

A set of co-variables, guided by program theory and existing literature, was selected as the independent variables for this study. Sociodemographic characteristics included gender (male, female), age category (below 30 years, 30–40 years, and more than 40 years), marital status (single, married, divorced, widowed), and educational qualifications (non-university education, vocational and technical education, higher education, and advanced education). Other individual-level factors encompassed smoking status (yes, no), past medical history (yes, no), past psychological history (yes, no), and family history of psychological conditions (yes, no). Work-related characteristics included occupation title (doctor, nurse, pharmacist, dentist, technician), monthly earnings (below 500,000 IQD, 500,000–1,000,000 IQD, more than 1,000,000 IQD), years of experience (below 5 years, 5–10 years, more than 10 years), and total hours worked per week (below 40 hours, 40–60 hours, more than 60 hours). Additional work factors involved night shift work (yes, no), job satisfaction (very dissatisfied, dissatisfied, neutral, satisfied, delighted), shortage of essential medical supplies (never, rarely, sometimes, often, always), extent of problems with malfunctioning medical equipment (never, rarely, sometimes, often, always), availability of basic healthcare resources (never, rarely, sometimes, often, constantly), shortage of medical staff (never, rarely, sometimes, often, always), number of patients per shift (below 40, 40–70, more than 70), extra shifts (yes, no), unsafe work environment (yes, no), lack of support (yes, no), and consideration of leaving the job (yes, no). Furthermore, variables related to the impact of COVID-19 exposure during the pandemic were incorporated. These included previous COVID-19 infection (yes/no), severity of disease (mild,

moderate, or severe), loss of a family member or colleague due to COVID-19 (yes/no), being a frontline medical worker (yes/no), weekly work hours during the COVID-19 pandemic (below 40 hours, 40–60 hours, or more than 60 hours), availability of personal protective equipment (never, rarely, sometimes, often, or always), receipt of psychological support (yes/no), exposure to COVID-19 (yes/no), and increased levels of anxiety, stress, and fear (yes/no).

Ethical considerations

The study was approved by the Institutional Review Board (IRB) of the College of Medicine, Al-Nahrain University, under approval ID: UNCOMIRB20240521, serial number: I.R.B/141. It was conducted in accordance with the ethical principles of the Declaration of Helsinki and local ethical guidelines. All participants gave informed verbal consent prior to their inclusion in the study. The data collected does not contain any personal information that could identify individuals, ensuring confidentiality and privacy throughout the research process.

Data analysis

The collected data were coded and cleaned to ensure accuracy before formal analysis. The data analysis utilized SPSS Version 26 (IBM Corporation, Armonk, New York, USA) for statistical testing, while OriginLab 2025 was used to produce graphical displays. Descriptive statistics were first conducted to summarize the characteristics of the study participants, along with the prevalence of the outcome variables. Cross-tabulation was used to examine the distribution of outcome variables across the independent variables considered in this study. Pearson's chi-square (χ^2) test was used to assess the relationships between categorical variables. Multiple logistic regression tests evaluated the associations between depression and (1) sociodemographic factors, (2) work-related factors, and (3) COVID-19-related factors. Each model included the variables within the respective category to estimate adjusted odds ratios (AORs) and 95% confidence intervals (CIs). The final regression models included covariates that demonstrated a p-value of less than 0.25 in the bivariate analysis. All associations were deemed statistically significant at the 5% level. Data were graphically represented using OriginLab 2025 for visualization purposes, which provided precise and informative charts to supplement the statistical analyses.

RESULTS

Based on a precalculated sample size, 948 healthcare workers were included. All participants were assessed for eligibility using predefined inclusion and exclusion criteria. Eligible individuals who met the criteria and were available during the data collection period were enrolled. Since the study was cross-sectional with a single data collection point, all eligible participants completed the questionnaire and were included in the analysis. Participants excluded were those who met any of the exclusion criteria. No further refusals or dropouts occurred during data collection, as the study relied on a one-time questionnaire administration. Recruitment continued until the required sample size of 948 participants was achieved. Overall, healthcare workers had a mean age of 28.81 years (SD: 6.954), with a depression prevalence of 69.4% (Table 1).

Table 1: Sociodemographic characteristics and their correlation with depression among healthcare professionals in Iraq

Variables	Total	Depression	*p*-value*
Total	948(100)	658(69.4)	
Gender			
Male	376(39.7)	262(69.7)	0.883
Female	572(60.3)	396(69.2)	
Age category (year)			
<30	760 (80.2)	512(67.4)	
30 to 40	106(11.2)	80(75.5)	0.018
> 40	82(8.6)	66(80.5)	
Marital Status			
Single	592(62.4)	440(74.3)	
Married	334(35.2)	198(59.3)	<0.001
Divorced	14(1.5)	12(85.7)	
Widower	8(0.8)	8 (100.0)	
Qualifications			
Non-University Education	165(17.4)	122(73.9)	
Vocational & Technical Education	164(17.3)	138(84.1)	<0.001
Higher Education	573(60.4)	366(63.9)	
Advanced Education	46(4.9)	32(69.6)	
Smoking	232(24.5)	168(72.4)	0.253
Past medical history	234(24.7)	196(83.8)	<0.001
Past psychological history	148(15.6)	130(87.8)	<0.001
Psychological family history	142 (15.0)	124 (87.3)	<0.001

Values were expressed as frequency and percentage.* Chi-square test at $p<0.05$.

The majority of HCWs (74.3%) who were single reported higher depression rates compared to married individuals (59.3%). Younger participants under 30 years had a lower depression rate (67.4%) compared to those over 40 years, who had a higher depression rate of 80.5%. Higher levels of depression were associated with lower educational attainment, especially vocational and technical education (84.1%). Also, those with a history

of medical, psychological, or family psychological conditions were strongly associated with higher depression levels among participants. Table 1 presents an overview of participant characteristics. Doctors and nurses demonstrated the greatest incidence of depression, with rates reaching 92.3% and 86.3%, respectively. The depression rate reached 91.7% among workers who brought home less than 500,000 IQD per month. The depression rates increased to 78.6% when workers exceeded 60 hours of weekly work. Job dissatisfaction created a substantial negative impact on mental health since very dissatisfied workers reached 87.1% depression (Table 2).

Table 2: Work-related characteristics and their association with depression

Variable	Total	Depression	*p*-value *
Occupation title			
Doctor	234(24.7)	216(92.3)	
Nursing	292(30.8)	252(86.3)	
Pharmacist	178(18.8)	58(32.6)	<0.001
Dentist	30(3.2)	12(40.0)	
Technicians	214(22.6)	120(56.1)	
Monthly income (ID)			
Below 500,000	144(15.2)	132(91.7)	
from 500,000 - 1000,000	652(68.8)	416(63.8)	<0.001
more than 1000,000	152(16.0)	110(72.4)	
Years of experience			
< 5	652(68.8)	520(79.8)	
5 to 10	103(10.9)	70(68.0)	<0.001
> 10	193(20.4)	68(35.2)	
Total hours worked per week			
< 40	335(35.3)	200(59.7)	
40 to 60	379(40.0)	274(72.3)	<0.001
> 60	234(24.7)	184(78.6)	
Night shift	360(38.0)	296(82.2)	<0.001
Job satisfaction			
Very Dissatisfied	287(30.3)	250(87.1)	
Dissatisfied	122(12.9)	102(83.6)	
Neutral	204(21.5)	160(78.4)	<0.001
Satisfied	193(20.4)	90(46.6)	
Very Satisfied	142(15.0)	56(39.4)	
Shortage of essential medical supplies	576(60.8)	480(83.3)	<0.001
Extent of problems with malfunctioning medical equipment			
Never	215(22.7)	112(52.1)	
Rarely	313(33.0)	228(72.8)	
Sometimes	215(22.7)	144(67.0)	<0.001
Often	167(17.6)	142(85.0)	
Always	38(4.0)	32(84.2)	
Availability of basic healthcare resources			
Never	40(4.2)	34(85.0)	
Rarely	58(6.1)	58(100)	
Sometimes	160(16.9)	144(90.0)	<0.001
Often	432(45.6)	310(71.8)	
Always	258(27.2)	112(43.4)	
Shortage of medical staff			
Never	107(11.3)	52(48.6)	
Rarely	163(17.2)	112(68.7)	
Sometimes	160(16.9)	104(65.0)	<0.001
Often	230(24.3)	164(71.3)	
Always	288(30.4)	226(78.5)	
Number of patients per shift			
< 40	138(14.6)	96(69.6)	
f40 to 70	527(55.6)	316(60.0)	<0.001
> 70	283(29.9)	246(86.9)	
Extra shifts	142(15.0)	98(69.0)	0.912
unsafe work environment	550(58.0)	464(84.4)	<0.001
not receiving support	456(48.1)	382(83.8)	<0.001
considered leaving your job	329(34.7)	282(85.7)	<0.001

Values were expressed as frequency and percentage.* Chi-square test at $p<0.05$.

Depression affected 72.9% of individuals who had experienced COVID-19 infection before. Medical staff working on the frontlines showed particularly high depression rates at 80.3%. The death of a family member or colleague from COVID-19 during the pandemic increased depression prevalence to 74.7%, which demonstrated the emotional impact of the pandemic. Medical staff faced very high depression rates when protective equipment remained unavailable to them for extended periods (87.4%) (Table 3).

Table 3: The Influence of COVID-19 exposure during the pandemic on depression four years later

Variable	Total	Depression	*p*-value*
Previous COVID infection	472(49.8)	344(72.9)	0.021
Severity of infection			
Mild	320(33.8)	217(67.8)	
Moderate	362(38.2)	263(72.7)	0.228
Severe	266(28.1)	178(66.9)	
Loss of family members or colleague	490(51.7)	366(74.7)	<0.001
Medical frontline workers	628(66.2)	504(80.3)	<0.001
Weekly work hours during COVID-19 pandemic			
< 60	217(22.9)	160(73.7)	
40-60	310(32.7)	190(61.3)	0.001
> 60	421(44.4)	308(73.2)	
Available personal protective equipment (PPE)			
Never	103(10.9)	90(87.4)	
Rarely	222(23.4)	194(87.4)	
Sometimes	198(20.9)	144(70.7)	<0.001
Often	188(19.8)	128(68.1)	
Always	237(25.0)	106(44.7)	
Received psychological support	228(24.1)	58(25.4)	<0.001
Exposure to COVID-19	574(60.5)	418(72.8)	0.005
Increased anxiety, stress, and fear	656(69.2)	516(78.7)	<0.001

Values were expressed as frequency and percentage.* Chi-square test at $p<0.05$.

The mild and moderate depression symptoms were most common, since they affected 28.9% and 28.1% of participants, respectively. The data showed that 21.9% of HCWs experienced moderately severe depression, and severe depression affected 8.4% of them. This revealed that minimal or no depressive symptoms existed in 12.7% of HCW (Figure 1).

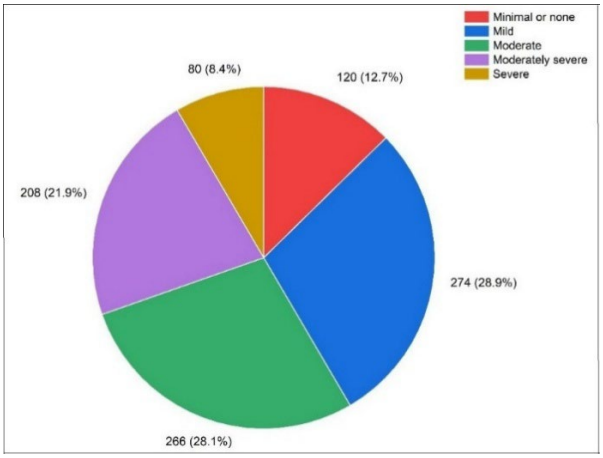

Figure 1: Severity of depression among healthcare workers. The figure illustrates the distribution of depression levels, ranging from minimal to severe, among healthcare workers, as assessed using the PHQ-9 tool.

Factors such as being a doctor or nurse, earning less than 500,000 IQD per month, working fewer than five years, or reporting very low job satisfaction independently increased the risk of depression for healthcare workers. The occupation of being a doctor (AOR = 72.077, 95% CI: 18.431–281.867, $p< 0.001$) or a nurse (AOR = 26.277, 95% CI: 6.668–103.546, $p< 0.001$) created a substantial risk for developing depression. Workers with monthly earnings below 500,000 IQD (AOR = 33.142, 95% CI: 5.923–185.450, $p< 0.001$) together with fewer than five years of experience (AOR = 27.040, 95% CI: 8.221–88.945, $p< 0.001$) and very dissatisfied workers (AOR = 35.422, 95% CI: 10.961–114.464, $p< 00.001$), demonstrated strong associations with depression. Workers in unsafe environments faced an eleven times higher depression risk (AOR = 11.579, 95% CI: 4.603–29.128, $p< 0.001$) alongside previous COVID-19 infections (AOR = 1.691, 95% CI: 1.178–2.428, $p= 0.004$). No COVID-19 exposure (AOR = 0.503, 95% CI: 0.354–0.716, $p< 0.001$) was associated with lower risk (Table 4).

DISCUSSION

This study examined depression levels among HCWs four years following COVID-19 infection, emphasizing the significant influence of sociodemographic and occupational factors on depression levels. This study provides a more comprehensive evaluation of the long-term psychological impacts of COVID-19 infection. This study found that participants who were doctors or nurses, HCWs with low educational attainment, had a history of medical or psychological disorders, had family psychological disorders, reported a family member or colleague dying during the pandemic, contracted COVID-19 during the pandemic, reported a higher workload, lacked necessary medical personnel and equipment, and worked on the front lines during the COVID-19 epidemic were more likely to experience depression. This study also confirmed that participants were less likely to suffer depression if they were younger, married, had a greater monthly income, had fewer years of experience, or had previously used mental health services. As evidenced by earlier studies, the COVID-19 health crisis has had a substantial effect on healthcare workers' mental health [25]. This study revealed that over two-thirds of healthcare workers (69.4%) are probably depressed, regardless of their position. This is a concerning finding. The prevalence was greater than that reported in other studies that also utilized the PHQ-9 scale [26-28].

Table 4: Multiple logistic regression analysis of factors associated with depression among healthcare workers

Variables	Crude OR (95% CI)	Adjusted OR (95% CI)	*p*-value
Sociodemographic Factors			
Gender (Ref: male)			
Female	0.979 (0.738 to 1.299)	1.138 (0.793 to 1.633)	0.482
Age category (Ref: More than 40 years)			
Below 30 years	0.500 (0.284 to 0.882)	0.527 (.293 to 0.946)	0.032
30-40 years	0.746 (0.369 to 1.506)	0.885 (0.431 to 1.820)	0.740
Smoking (Ref: yes)			
No	0.826 (0.595 to 1.147)	0.737 (0.486 to 1.117)	0.150
Past medical history (Ref: yes)			
No	0.355 (0.243 to 0.520)	0.533 (0.352 to 0.807)	0.003
Past psychological history (Ref: yes)			
No	0.269 (0.161 to 0.449)	0.434 (0.248 to 0.760)	0.003
Psychological family history (Ref: yes)			
No	0.285 (0.170 to 0.477)	0.497 (0.280 to 0.882)	0.017
Work-Related Factors			
Occupation Title (Ref: Technicians)			
Doctor	9.400 (5.416 to 16.316)	72.077 (18.431 to 281.867)	0.000
Nursing	4.935 (3.213 to 7.580)	26.277 (6.668 to 103.546)	0.000
Pharmacist	0.379 (0.250 to 0.573)	0.016 (0.004 to 0.061)	0.000
Dentist	0.522 (0.240 to 1.138)	1.157 (0.208 to 6.442)	0.868
Qualifications (Ref: Advanced Education)			
Non-University Education	1.241 (0.606 to 2.545)	0.309 (0.037 to 2.576)	0.278
Vocational & Technical Education	2.322 (1.091 to 4.941)	0.402 (0.044 to 3.623)	0.416
Higher Education	0.774 (.404 to 1.483)	0.700 (0.120 to 4.077)	0.691
Monthly Earnings (Ref: more than 1000,000)			
Below 500,000	4.200 (2.107 to 8.371)	33.142 (5.923 to 185.450)	<0.001
from 500,000 - 1000,000	0.673 (0.456 to 0.994)	1.005 (0.262 to 3.853)	0.994
Years of Experience (Ref: more than 10)			
Below 5	7.242 (5.094 to 10.294)	27.040 (8.221 to 88.945)	<0.001
from 5 to 10	3.899 (2.345 to 6.483)	4.031 (1.145 to 14.195)	0.030
Total Hours Worked per Week (Ref: more than 60)			
Below 40	0.403 (0.275 to 0.589)	0.159 (0.054 to 0.463)	0.001
from 40 to 60	0.709 (.482 to 1.042)	0.078 (0.024 to 0.259)	<0.001
Night shift (Ref: yes)			
No	0.346 (0.252 to 0.476)	0.048 (0.018 to 0.125)	<0.001
Job Satisfaction (Ref: Very Satisfied)			
Very Dissatisfied	10.376 (6.407 to 16.805)	35.422 (10.961 to 114.464)	<0.001
Dissatisfied	7.832 (4.360 to 14.068)	39.181 (7.536 to 203.723)	< 0.001
Neutral	5.584 (3.477 to 8.970)	12.368 (3.698 to 41.369)	<0.001
Satisfied	1.342 (.865 to 2.083)	1.490 (.593 to 3.747)	0.397
Shortage of Essential Medical Supplies (Ref: yes)			
No	0.184 (0.136 to 0.247)	0.208 (0.080 to 0.540)	0.001
Extent of Problems with Malfunctioning Medical Equipment (Ref: Always)			
Never	0.204 (0.082 to 0.508)	0.156 (0.005 to 4.527)	0.280
Rarely	0.503 (0.203 to 1.246)	0.146 (0.005 to 4.145)	0.260
Sometimes	0.380 (0.152 to 0.951)	0.197 (0.007 to 5.832)	0.347
Often	1.065 (0.404 to 2.810)	0.099 (0.004 to 2.475)	0.159
shortage of medical staff (Ref: Always)			
Never	0.259 (.162 to 0.416)	0.219 (0.040 to 1.192)	0.079
Rarely	0.602 (.390 to 0.930)	2.335 (0.656 to 8.310)	0.190
Sometimes	0.509 (.332 to 0.783)	0.329 (0.087 to 1.240)	0.101
Often	0.682 (.457 to 1.018)	0.499 (0.162 to 1.537)	0.226
Number of Patients per Shift (Ref: more than 70)			
Below 40	0.344 (0.208 to 0.567)	16.101 (4.131 to 62.759)	<0.001
from 40 to 70	0.225 (0.153 to 0.332)	0.575 (0.222 to 1.488)	0.254
Extra shifts (Ref: yes)			
No	1.022 (.695 to 1.504)	1.564 (0.610 to 4.012)	0.352
Safe work environment (Ref: yes)			
No	5.673 (4.192 to 7.678)	11.579 (4.603 to 29.128)	<0.001
Considered leaving your job (Ref: yes)			
No	0.258 (0.182 to 0.365)	0.414 (0.187 to 0.914)	0.029
COVID-19 Related Factors			
Previous COVID Infection (Ref: yes)			
No	0.721 (0.546 to 0.952)	1.691 (1.178 to 2.428)	0.004
Severity of Infection (Ref: Severe)			
Mild	1.042 (0.736 to 1.473)	0.912 (0.610 to 1.363)	0.653
Moderate	1.313 (0.931 to 1.853)	1.235 (0.830 to 1.839)	0.299
Medical Frontline Workers (Ref: yes)			
No	0.228 (0.170 to 0.306)	0.129 (0.089 to 0.186)	<0.001
Weekly Work Hours During COVID-19 (Ref: More than 60)			
Below 60	1.030 (0.710 to 1.493)	1.455 (0.932 to 2.273)	0.099
40-60	0.581 (0.424 to 0.795)	0.956 (0.659 to 1.386)	0.811
Exposure to COVID-19 (Ref: yes)			
No	0.668 (0.505 to 0.885)	0.503 (0.354 to 0.716)	< 0.001
Increased Anxiety, Stress, and Fear (Ref: yes)			
No	0.257 (0.191 to 0.345)	0.162 (0.110 to 0.238)	< 0.001

A nationwide AMADEUS survey found that the prevalence of depression was 30.2% [29].In the initial phases of the pandemic (January and February 2020), a Chinese survey discovered that 60.5% of professionals

in Wuhan and 41.5% of those on the front lines of COVID-19 had depression [10]. In a different study conducted in southeast Ireland, 42.6% of healthcare workers employed in acute hospital settings had positive depression [30]. These variations in prevalence can be attributed to the pandemic condition, cultural variations among nations, and the various cutoff points used. Nevertheless, none of these studies examined the prevalence and severity of depression in HCWs after a more extended period, as our study did. The importance of healthcare workers' mental health has long been recognized, but the crucial role that these employees played in handling the COVID-19 pandemic has further highlighted this requirement [19]. Our findings raise concerns because the epidemic is far from over, and high rates of depression are expected to continue to affect healthcare workers' capacity to provide quality care. Depression is known to have a significant effect on patient care quality, productivity, and absenteeism [31]. A US population-based study from 2014 has already shown that 6% of doctors had suicidal thoughts, and 10% of major medical blunders [32]. According to our findings, participants under 30 years old had a lower depression rate (67.4%) than those over 40 years old (80.5%). Additionally, in this study, those with past medical and psychological histories were found to have greater depression scores, and both groups' rates of depression were shown to have sharply increased. This may be explained by the fact that chronic disease becomes more common as people grow older. There was no correlation found with chronic disorders in the Uz *et al*. study [33]. However, this study revealed no significant relationship between depression and gender, which is in contrast to other studies [34] and similar to a prior study conducted in Korea [35]. Despite the fact that men and women are approximately equally likely to encounter most stressors, women are more likely to suffer particular interpersonal life events that raise their chance of developing depression [36]. Women's vulnerability to chronic stress may also be heightened by biological processes, such as the impact of sex hormones on stress regulation [37]. This study showed that depression scores were greater among health professionals who were single or divorced/widowed. This finding is consistent with earlier studies following the COVID-19 pandemic [34,38]. This could be clarified by the reality that at the start of an unfamiliar and unexpected stressful event, people typically seem more anxious and cautious and show higher levels of dread of COVID-19 for themselves and their family [39]. According to Bjelland *et al*. [40]. Having a higher level of education may have a protective impact against depression. According to the current study, there was a correlation between lower educational attainment and greater levels of depression, particularly in vocational and technical education (84.1%). Our study also revealed that depression is significantly predicted by occupational category. Studies have indicated that frontline nurses who encounter direct patient contact, emotional labor burdens, and prolonged high-intensity workloads are more likely to feel psychological discomfort and substantially higher anxiety levels than physicians [40,41]. This study found that depression was prevalent among all HCW groups, with the highest rates of depression occurring among physicians and nurses (92.3% and 86.3%, respectively). This finding emphasizes how depression levels can range substantially based on various career stages, even within the particular occupational group of HCWs. In parallel, we confirmed that frontline healthcare professionals had considerably higher depression cutoff scores and depression scale scores than non-frontline healthcare workers. Numerous earlier studies in the literature have demonstrated that frontline HCWs are more likely to suffer from depressive disorders [42]. Higher staffing positions and increased workload during the epidemic have been linked to higher stress levels among nurses [43]. In the current study, it was also found that the more hours worked and the more patients there were on a shift, the higher the depressed symptoms. It seems that the increased effort had the anticipated dysphoric effect. Additionally, following the pandemic, women were shown to have a higher prevalence of depressive disorder symptoms than men. Furthermore, according to this study, health care workers who were less satisfied with the institution's readiness to handle COVID-19 patients were more likely to experience depression. A previous study that used binary logistic regression to assess the mental health of healthcare workers in two groups between the start of the pandemic and a year later indicated that low satisfaction significantly increased the risk for depression [44]. A significant risk factor for depression, according to our research, is having a lower monthly income. Regardless of when a health crisis occurs, this observation suggests that low income is a consistent risk factor for depression. Numerous studies have demonstrated that adults' psychological resilience to stressful situations during the COVID-19 pandemic was negatively impacted by low socioeconomic status, financial difficulties, and job loss [40,45]. Conversely, it has been demonstrated that financial assistance, such as the government's tax-free salary relief, can offset these negative psychological effects [46]. We found that depression was present in 72.9% of people who had previously been infected with COVID-19, confirming that direct exposure to COVID-19 was associated with a lower depression score. This may be due to the increased perception of risk for contracting and spreading COVID-19 infection at the start of the pandemic, which gradually decreased. Emiral et al. found that frontline medical workers who had previously been infected by COVID-19 patients had higher depression scores than other staff [47]. Importantly, during the COVID-19 pandemic, protective factors for preserving psychological health have been found to include having access to adequate medical resources (including

personal protective equipment, or PPE), new and precise information, and taking up preventative efforts to decrease the chance of infection [39,48,49]. Similarly, our findings indicated that healthcare workers who had inadequate medical resources, broken medical equipment, and inadequate medical supplies were more likely to experience depression. Finally, our study confirms that HCWs with psychological support scored lower on the depression scale. Depression risk factors included a lack of such assistance. This result suggests that the psychology of healthcare workers is negatively impacted over time by a lack of psychological support during pandemics.

Study limitations

This study is not without limitations. First, it is more challenging to make conclusions about causality due to the cross-sectional design, highlighting the necessity of longitudinal research to outline the course of changes in mental health over time. Second, self-reported evaluations might be prone to social desirability bias, especially in societies where stigma around mental illness is strong. Participants may underreport or hide symptoms as a result, which could compromise the accuracy of the measurement. Furthermore, because this study was carried out among medical professionals in Iraq, occupational and regional characteristics may limit how broadly the results may be applied. In addition to further investigating the impact of cultural factors on mental health evaluation and psychological health in professional groups, future research should expand the study population to include a variety of geographic locations and healthcare systems. Such initiatives would enhance the external validity and applicability of the findings.

Conclusion

This study found that factors such as occupation (doctors or nurses), low educational attainment, a history of medical or psychological disorders, family psychological issues, and the loss of a family member or colleague significantly contributed to increased levels of depression. Additionally, those who contracted COVID-19, worked on the front lines with higher workloads, and faced shortages of necessary medical personnel and equipment were also negatively impacted. However, those with fewer years of experience, marital status, larger monthly salaries, younger professionals, and those who had previously sought mental health services were all protected against depression. Especially in times of crisis, our findings underscore the need for targeted resources and specialized mental health support tailored to the unique challenges faced by healthcare professionals.

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Conflict of interests

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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