Sahelian Journal of Responsible One Health
Sahelian Journal of Responsible One Health 2026; 2:630
doi:10.4081/sjroh.630

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Association between environmental exposure in hospital settings and anxiety and depressive symptoms among healthcare workers in Cameroon: an analytical cross-sectional study

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Abstract

Healthcare workers operate in work environments characterized by multiple exposures that may affect their mental health. This study aimed to analyze the association between environmental exposure in hospital settings and anxiety and depressive symptoms among healthcare workers in Yaoundé, Cameroon. A descriptive and analytical cross-sectional study was conducted among 172 healthcare professionals working in first-level public health facilities. Data were collected between March 24 and June 3, 2023, using a self-administered questionnaire distributed both online and in paper format. Mental health was assessed using the Hospital Anxiety and Depression Scale (HADS) and the Mental Health Continuum - Short Form (MHC-SF). Data analysis included descriptive statistics, Pearson's chi-square test, and the estimation of prevalence ratios (PR) with 95% confidence intervals (CIs). Most participants (84.9%) reported regular exposure to at least one environmental factor, predominantly biological (76.2%). The overall prevalence of anxiety and depressive symptoms was 28.0% (95% CI: 21.3-34.7), with specific prevalence of 37.2% for anxiety and 29.6% for depression. Exposed individuals showed a higher frequency of anxiety and/or depressive symptoms compared to non-exposed individuals (29.0% *vs* 22.2%); however, this association was not statistically significant (PR=1.30; 95% CI: 0.61-2.75; p=0.47). In contrast, significant differences were observed across professional groups for both anxiety (p=0.017) and depression (p=0.022). These findings highlight the need to strengthen occupational risk prevention strategies and mental health promotion in hospital settings.

Key words: mental health; healthcare workers; environmental exposure; anxiety; depression; hospital setting; Cameroon.

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Introduction

Environmental exposures – whether physical, chemical, or biological – are major determinants of human health. In occupational settings, particularly in hospital environments, these exposures occur within complex systems characterized by a combination of organizational constraints, high workload intensity, and repeated contact with potentially harmful agents. Together, these factors may significantly influence workers' overall health, including their mental health.[1]

Mental health is a fundamental component of public health. The World Health Organization defines it as a state of well-being in which individuals can cope with the normal stresses of life and contribute to society, while the Centers for Disease Control and Prevention conceptualize it as encompassing emotional, psychological, and social components that influence behaviors, cognition, and social interactions.[2,3] Globally, anxiety and depressive disorders are among the most prevalent causes of morbidity. In 2021, an estimated 359 million people, including 72 million children and adolescents, were living with an anxiety disorder.[4] This burden has increased substantially following the COVID-19 pandemic, which led to a global rise in the prevalence of anxiety and depressive symptoms estimated at 26% and 28%, respectively.[5] Healthcare workers represent a particularly vulnerable population. Their work environment exposes them to multiple stressors, including infectious agents, chemical substances, physical hazards (such as noise, radiation, and light), and significant organizational pressures. Several studies have shown that these conditions are associated with increased anxiety and depressive symptoms among healthcare professionals.[6]

In low- and middle-income countries, particularly in Sub-Saharan Africa, mental health remains insufficiently integrated into health system priorities. Limited resources, persistent stigma, and weak epidemiological surveillance contribute to an underestimation of the burden of mental disorders. This situation is further exacerbated by the fact that healthcare professionals often work under materially and organizationally constrained conditions.

Contemporary public health approaches, particularly the concept of the exposome, emphasize the importance of considering the totality of environmental exposures an individual experiences throughout life as potential determinants of health.[7] In hospital settings, this framework provides a useful lens for understanding how environmental factors and working conditions interact in the development of mental health outcomes. Despite these advances,

few studies have comprehensively examined the association between environmental exposures and anxiety and depressive symptoms among healthcare workers, particularly in African contexts. This gap limits the understanding of environmental determinants of mental health and hinders the development of context-appropriate interventions. In this context, the present study aims to analyze the association between exposure to physical, chemical, and biological environmental factors and the presence of anxiety and depressive symptoms among healthcare workers in hospital settings in Cameroon. The research question is as follows: What environmental exposure factors are associated with anxiety and depressive symptoms among healthcare workers in hospital settings in Cameroon? We hypothesize that exposure to biological agents is the predominant factor associated with anxiety and depressive symptoms in this population.

Materials and Methods

Study design and setting

A cross-sectional study was conducted among healthcare professionals working in first-level public health facilities in Yaoundé, Cameroon.

A non-probability sampling strategy was used, combining purposive sampling and snowball sampling. Initially, identified participants were invited to share the questionnaire with their colleagues. Data collection took place from March 24 to June 3, 2023, using a self-administered questionnaire distributed both electronically (*via* Google Forms through WhatsApp and e-mail) and in paper format within healthcare facilities. A total of 172 healthcare professionals participated in the study. Ethical principles were strictly respected in accordance with the Declaration of Helsinki. Anonymity and confidentiality of the data were ensured. Informed consent was obtained from all participants prior to their inclusion, after providing information about the study objectives, potential risks, and participation constraints.

Measurement of mental health

Mental health was assessed using two standardized instruments:

i) Mental Health Continuum - Short Form (MHC-SF). The MHC-SF consists of 14 items assessing emotional, psychological, and social well-being on a 6-point frequency scale. Based on their scores, participants were classified into three categories: flourishing, moderate, or languishing mental health.

ii) Hospital Anxiety and Depression Scale (HADS). The HADS includes 14 items divided into two subscales measuring anxiety (HADS-A) and depression (HADS-D). Each item is scored from 0 to 3, resulting in subscale scores ranging from 0 to 21. Standardized cut-off values were used to classify the absence, moderate presence, or severe presence of anxiety and depressive symptoms.

Statistical analysis

Data were processed and analyzed using Microsoft Excel and Epi Info software. A descriptive analysis was conducted to characterize the study population. Sociodemographic and professional variables were summarized using absolute and relative frequencies. The prevalence of anxiety and depressive symptoms was estimated based on HADS scores, according to the classification thresholds used in the study. A 95% confidence interval (CI) was calculated for the overall prevalence estimate. Bivariate analysis was performed to examine the association between environmental exposure and the presence of anxiety and/or depressive symptoms. Comparisons of proportions were conducted using Pearson's chi-square test. The strength of the association was estimated using prevalence ratios (PR), along with their 95% CIs. In addition, the attributable fraction (AF) among exposed individuals was calculated using the following formula:

$$AF = \frac{PR - 1}{PR}$$

The AF among exposed individuals was estimated to assess the proportion of cases potentially attributable to exposure under the assumption of causality. This estimate should be interpreted with caution, given the observational nature of the study. Comparative analyses were also conducted across professional groups to explore variations in the prevalence of anxiety and depression among different categories of healthcare workers. The level of statistical significance was set at $p<0.05$.

Results

Sociodemographic characteristics of participants

The study included 172 healthcare workers, of whom 120 were women (69.8%) and 52 were men (30.2%), corresponding to a sex ratio of 0.43. Participants' ages ranged from 20 to 59 years, with a predominance of the 40-49 age group (38.9%), followed by those aged 30-39 years (25.9%), 50-59 years (18.5%), and 20-29 years (16.7%). Regarding institutional distribution, 50.6% of participants were recruited from the Yaoundé Gyneco-Obstetric and Pediatric Hospital, while 49.4% were from the Yaoundé University Teaching Hospital. In terms of professional categories, the most represented groups were nurses (47.7%) and environmental health technicians (47.7%) (Table 1).

Environmental exposure in hospital settings

Most participants (84.9%) reported regular exposure to at least one environmental factor. The most frequently reported exposures were predominantly biological (76.2%), followed by physical (37.2%) and chemical factors (24.4%). These findings indicate a predominance of biological exposures in the studied hospital setting.

Prevalence of anxiety and depressive symptoms

The overall prevalence of anxiety and depressive symptoms, assessed using the HADS, was estimated at 28.0% (95% CI: 21.3-34.7). Specific analyses revealed a prevalence of 37.2% for anxiety symptoms and 29.6% for depressive symptoms. These results highlight a substantial burden of anxiety and depressive symptoms among healthcare workers.

Association between environmental exposure and anxiety and depressive symptoms

The comparative analysis between exposed and non-exposed healthcare workers is presented in Table 2. PR was 1.30 (95% CI: 0.61-2.75). Pearson's chi-square test showed no statistically significant association between environmental exposure and anxiety and depressive symptoms ($\chi^2=0.51$; $p=0.47$). Although the prevalence was higher among exposed individuals, the observed difference did not reach statistical significance. The AF among exposed individuals was estimated as follows: AF = (1.30−1)/1.30 = 23%. This estimate should, however, be interpreted cautiously, as the under-

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lying association was not statistically significant. Accordingly, the AF should be regarded as exploratory only and not as evidence of a causal relationship.

Anxiety according to professional groups

The distribution of anxiety across professional groups is presented in Table 3. Pearson's chi-square test revealed a statistically significant difference in anxiety prevalence across professional groups (χ^2=10.2; df=3; p=0.017), with higher prevalence observed among paramedical and administrative staff.

Depression according to professional groups

The distribution of depression across professional groups is presented in Table 4. A statistically significant difference in depression prevalence was also observed across professional groups (χ^2=9.6; df=3; p=0.022), with higher prevalence among technical and administrative staff.

Table 1. Sociodemographic characteristics of the study population.

Characteristics	Gender					
	Male		Female		Total	
	n	%	n	%	n	%
Age group (years)						
20-29	10	19.23	17	14.16	27	16.69
30-39	17	32.69	25	20.83	42	25.92
40-49	16	30.76	47	39.16	63	38.88
50-59	09	17.30	21	17.50	30	18.51
Health facilities						
Yaounde Gyneco-Obstetric and Pediatric Hospital	25	28.70	62	71.30	87	50.58
Yaoundé University Teaching Hospital	27	32.00	58	68.00	85	49.42
Professional categories						
Physicians	09	17.30	12	10.00	21	12.20
Dentists	01	02.00	03	02.50	04	02.32
Pharmacists	02	04.00	05	04.00	07	04.06
Nurses	19	37.00	63	52.50	82	47.67
Environmental health technicians	02	04.00	06	05.00	08	47.67
Medical laboratory technicians	10	19.23	18	15.00	28	16.27
Biomedical technicians	03	06.00	05	04.00	08	04.65
Public health administration staff	06	12.00	08	07.00	14	09.88
Total[a]	52	30.00	120	70.00	172	100

[a]The total applies independently to each sociodemographic characteristic.

Table 2. Association between environmental exposure and anxiety and depressive symptoms.

Exposure status	Anxiety and/or depressive symptoms, n (%)	No anxiety and/or depressive symptoms, n (%)	Total (n)
Exposed	42 (29.0)	103 (71.0)	145
Not exposed	6 (22.2)	21 (77.8)	27

Table 3. Anxiety according to professional groups.

Professional group	Anxiety, n (%)	No anxiety, n (%)	Total (n)
Medical	6 (18.8)	26 (81.2)	32
Paramedical	41 (50.0)	41 (50.0)	82
Technical	11 (25.0)	33 (75.0)	44
Public health administration staff	6 (42.9)	8 (57.1)	14
Total	64 (37.2)	108 (62.8)	172

Table 4. Depression according to professional groups.

Professional group	Depression, n (%)	No depression, n (%)	Total (n))
Medical	4 (12.5)	28 (87.5)	32
Paramedical	23 (28.0)	59 (72.0)	82
Technical	19 (43.2)	25 (56.8)	44
Public health administration staff	5 (35.7)	9 (64.3)	14
Total	51 (29.6)	121 (70.4)	172

Discussion

The present study suggests a trend toward an association between environmental exposure in hospital settings and the presence of anxiety and depressive symptoms among healthcare workers, although this association did not reach statistical significance. These findings are consistent with a growing body of literature highlighting the psychological vulnerability of this population, particularly in work environments characterized by multiple constraints.

The substantial prevalence of anxiety and depressive symptoms observed in our study is consistent with international evidence. A meta-analysis conducted by Pappa *et al.* estimated the prevalence of anxiety and depression among healthcare workers at 23.2% and 22.8%, respectively, in the context of the COVID-19 pandemic.[6] These findings support the view that healthcare professionals constitute a population at increased risk of mental health disorders. Beyond the observed prevalence, our results point to the potential role of environmental exposures in shaping mental health risk. In hospital settings, healthcare workers are exposed to a range of biological, chemical, and physical factors embedded within often demanding organizational environments. The exposome approach, proposed by Wild (2005), provides a useful framework for conceptualizing these exposures as a cumulative set of determinants that may influence mental health outcomes.[7] In resource-limited settings, these exposures occur within health systems characterized by major structural constraints, particularly with regard to human, material, and organizational resources. Such conditions may amplify the effects of environmental exposures and increase the psychological vulnerability of healthcare professionals. The interpretation of these findings should also take into account the two-continua model of mental health, which distinguishes positive mental well-being from psychopathological symptomatology. The combined use of the MHC-SF and HADS, therefore, made it possible to capture these complementary dimensions of mental health more comprehensively.[8]

Limitations

Several methodological limitations should be acknowledged. First, the use of a non-probability sampling approach limits the representativeness of the findings and may have introduced selection bias. Second, the cross-sectional design precludes any inference of causality, allowing only the identification of associations. Finally, the use of self-administered instruments may have resulted in information bias.

Conclusions

Despite these limitations, this study provides empirical evidence from a relatively underexplored context and highlights the potential role of environmental exposures in shaping the mental health of healthcare workers. It emphasizes the importance of adopting an integrated approach that accounts for both environmental and organizational determinants. These findings support the need to strengthen hospital-based interventions by combining occupational risk prevention with mental health promotion strategies. Such an approach may contribute to the sustainable improvement of healthcare workers' well-being.

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Received: 13 April 2026; Accepted: 1 May 2026.

Conflict of interest: the authors have no conflict of interest to declare.

Ethics approval and consent to participate: ethics approval was not required. Ethical principles were strictly respected in accordance with the Declaration of Helsinki. Anonymity and confidentiality of the data were ensured. Informed consent was obtained from all participants prior to their inclusion, after providing information about the study objectives, potential risks, and participation constraints.

Availability of data and materials: the datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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