Research article

High prevalence and sociodemographic correlates of burnout syndrome amongst bacteriologists in Colombia

Alta prevalencia y factores sociodemográficos asociados al síndrome de burnout en bacteriólogos de Colombia

Magally Escobar Martínez[1], Marlene Vélez De la Vega[2], Eva Blanco Molinares[3], Sebastián de la Hoz-Pedraza[4], Bertilda Pedraza-Claros[5]

Abstract

Burnout syndrome is a psychological condition resulting from long-term stress at work given personal factors. This study aimed to determine the prevalence of high risk for burnout syndrome and its associated factors among bacteriologists and their counterparts in Colombia. Using a cross-sectional design, the study included 830 participants. The results indicate that the prevalence of burnout syndrome was 59.7% as per its standard definition. Using alternative definitions, prevalence was 28% under a restrictive definition and 68% under its most inclusive definition. Age and marital status were factors associated with a high prevalence of burnout across the three definitions. Most participants reported high risk for burnout syndrome, highlighting the importance of recognizing this psychological syndrome and implementing strategies to mitigate its occurrence and prevent more serious health problems, both mental and physical.

Keywords: burnout, bacteriologists, stress, risk, mental health.

1 Universidad Antonio Nariño, School of Medicine, Cundinamarca, Bogotá, Colombia.
ORCID: http://orcid.org/0000-0002-8082-3407

2 Colegio Nacional de Bacteriología, Valle del Cauca, Cali, Colombia.
ORCID: https://orcid.org/0009-0000-6172-633X

3 Colegio Nacional de Bacteriología, Cesar, Valledupar, Colombia.
ORCID: https://orcid.org/0009-0000-8841-1709

4 Universidad del Magdalena, School of Basic Sciences, Cesar, Valledupar, Colombia.
ORCID: https://orcid.org/0009-0005-9234-6571

5 Bertilda Pedraza-Claros, Universidad de Santander, School of Health and Medical Sciences, Cesar, Valledupar, Colombia
ORCID: https://orcid.org/0000-0003-2200-7951

Corresponding author: ber.pedraza@mail.udes.edu.co

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Resumen

El síndrome de burnout es una condición psicológica resultante del estrés laboral a largo plazo debido a factores personales. Este estudio tuvo como objetivo determinar la prevalencia de alto riesgo de síndrome de burnout y sus factores asociados en bacteriólogos y sus homólogos en Colombia. Utilizando un diseño transversal, el estudio incluyó a 830 participantes. Los resultados indican que la prevalencia del síndrome de burnout fue del 59,7 % según su definición estándar. Utilizando definiciones alternativas, la prevalencia fue del 28 % bajo una definición restrictiva y del 68 % bajo su definición más inclusiva. La edad y el estado civil fueron factores asociados con una alta prevalencia de burnout en las tres definiciones. La mayoría de los participantes reportaron un alto riesgo de síndrome de burnout, lo que destaca la importancia de reconocer este síndrome psicológico e implementar estrategias para mitigar su aparición y prevenir problemas de salud más graves, tanto mentales como físicos.

Palabras clave: burnout, bacteriólogos, estrés, riesgo, salud mental.

Introduction

Stress generated by long working hours in healthcare professions has increased and can trigger mental and physical health problems that interfere with performance, occupational safety, and well-being, with significant consequences for institutions and their economies (1). Previous research shows that professionals often experience problems with their mental and physical health due to excessive workloads and job demands (1–3). Healthcare professionals are particularly vulnerable to depression and anxiety resulting from excessive workplace stress (4–6). Meta-analyses indicate that work-related factors, including workload and interpersonal relationships, significantly affect healthcare professionals—exposed to some of the most stressful working environments (7,8). Furthermore, long-term stress factors can lead to reduced job performance, sleep deprivation, and increased risks for both mental and physical health (9). These factors not only affect healthcare professionals, but also individuals in other occupations who perceive that the demands of their work and personal lives exceed their internal and external resources. This imbalance can cause elevated chronic stress, resulting in detrimental impacts on both individual well-being and job performance (10–12).

Burnout syndrome (BS) is a psychological condition resulting from prolonged stress, characterized by high levels of emotional and mental exhaustion, and associated with both demands of their personal lives and adverse working conditions (13,14). The Maslach Burnout Inventory-Human Services Survey (MBI-HSS) is used to measure BS in professionals working in health and social services (15). BS is a three-dimensional concept that includes: (1) Emotional Exhaustion (EE), which refers to being emotionally depleted; (2) Depersonalization (DP), a lack of feelings or cynical attitude toward others; and (3) a reduced sense of Personal Accomplishment (PA), defined as a negative self-assessment of one's achievements (16).

The prevalence of this syndrome is a major concern among professionals and students worldwide, and it has been demonstrated that the majority of people working in health care are vulnerable to experiencing high rates of burnout (17,18). In addition, stress from excessive workloads can result in gastric disorders, ulcers, diabetes, coronary disease, and an increased risk of mental disorders, anxiety, and suicidal behavior (19,20). Burnout may develop progressively, beginning with signs of EE, followed by DP, and finally resulting in a reduced sense of PA; however, this progression may not be easily noticeable (21). For this reason, it is important to ensure early and timely detection through preventive programs and the implementation of therapeutic strategies (22,23).

A variety of sociodemographic factors, workload, work environment, and social interactions are correlated with increased levels of depression, stress, and anxiety (24). Researchers have demonstrated that sociodemographic factors play an important role in the development of BS (25–27). However, studies exploring the association between gender and BS prevalence have inconsistent findings. Two meta-analyses on the influence of gender on burnout reported: 1) a review of 183 studies revealed that women are slightly more emotionally exhausted than men, while men are somewhat more depersonalized than women (28); and 2) no significant gender differences were found regarding the prevalence of physician burnout (29). This inconsistency in the relationship between gender and burnout is important because it highlights that both genders require support in dealing with burnout. Age has been most consistently associated with burnout, with younger workers being particularly susceptible to higher risk of BS (30). In contrast, older workers' experience tends to translate into more stable, mature, and balanced perspectives on work and life (31,32). Understanding BS prevalence and related factors such as age, marital status, and working conditions is crucial to develop targeted occupational health policies.

Despite the growing evidence regarding burnout amongst medical staff, there is a lack of data regarding clinical laboratory professionals, particularly bacteriologists in Colombia. These professionals often experience high levels of burnout as a response to high workloads, the pressure to report reliable results, and lower recognition compared to other health professionals. They may feel isolated, perceive a lack of visibility, and experience dissatisfaction. This contributes to feelings of frustration and low personal accomplishment, which can trigger burnout syndrome or other illnesses not associated with the syndrome (33). Given this context and the lack of local research in the field, this study aims to determine the prevalence of burnout syndrome and explore the relationship between certain sociodemographic variables and burnout in Colombian bacteriologists.

Methods

Study design

This study was conducted using a descriptive cross-sectional design to assess the prevalence of high burnout risk and its sociodemographic and job-related factors (age, gender, marital status, working schedule, and undergraduate degree) among bacteriologists. The inclusion criteria in the study were: (1) being 18 years or older; and (2) providing voluntary written consent to participate in this study. The exclusion criteria were incomplete responses and degrees outside the field of bacteriology. Participation was voluntary and responses kept anonymous.

Participants and data collection

Data collection was carried out between August and November 2024. An online survey was sent through multiple digital channels to professionals across different Colombian regions (known as departments). These included an email invitation to participate in the survey, announcements from the *Colegio Nacional de Bacteriología*, and massive social media messages. Of the 5,164 bacteriologists who received an invitation, 830 professionals from 21 regions of Colombia were included (from 837 responses received in total). The response rate was 16.2%. The complete survey was administered through Tally, an online form builder. All participants were asked to provide sociodemographic information and complete the MBI-HSS questionnaire.

Limitations

A higher response rate from bacteriologists was expected, however, most did not respond to the study's invitation to complete the survey. No incentives were offered to enhance participation (34). The 16.2% response rate may have introduced a non-response bias; however, previous cross-sectional studies with low response rates have

reported significant and consistent findings regarding burnout risk by assessing sample representativeness through comparisons between early and late responders (35,36). In this study, logistic regression models did not show significant differences ($p > 0.05$) between the early and late responders across burnout definitions. Furthermore, the inverse probability weighting sampling adjustments resulted in a similar burnout rate (66.6%) to the crude rate (68.1%). This suggests that survey respondents may constitute a representative sample.

MBI-HSS instrument

For this study, the dependent variables were the levels of risk for each of the three-dimensional concepts of BS, measured using the validated Spanish version of the MBI-HSS (37). The validated 22-item MBI-HSS instrument categorizes three subscales: emotional exhaustion (9 items), depersonalization (5 items), and personal accomplishment (8 items). Scores on each subscale were classified as low, moderate, or high according to established cutoff ranges (Table 1). Each item was scored on a 7-point Likert scale, ranging from 0 (never) to 6 (always).

Table 1. Cutoff ranges for each MBI-HSS subscale.

Subscale	Low	Moderate	High
Emotional exhaustion (EE)	≤ 18	19 – 26	≥ 27
Depersonalization (DP)	≤ 5	6 – 9	≥ 10
Personal accomplisment (PA)	≤ 33	34 – 39	≥ 40

The prevalence of BS, measured as the proportion of burned-out bacteriologist, was assessed using the criteria defined by Lin et al. (36), which consider high EE or DP scores, hereafter "standard" definition (SB). Since the definition of BS varies in the literature, the prevalence of BS was also calculated using alternative criteria proposed by the MBI-HSS instrument: (1) the restrictive definition (RB), high EE and high DP and low PA scores; and (2) the inclusive (IB), high EE or high DP or low PA scores. Table 1 shows the threshold scores to be classified as high for EE and DP, and low for PA.

Procedure

Data was collected pursuant to ethical and confidentiality regulations of the Civil Service in Colombia under law 1581 (2012) . This study was considered low risk based on Resolution number 8430 (1993). All participants provided informed consent. The project was reviewed and approved by the Ethics Committee of the School of Medicine at *Universidad Antonio Nariño* (Bogota, Colombia).

Statistical analysis

Survey data was exported to Excel (version 2412) spreadsheets. The reliability of the MBI-HSS instrument was estimated by means of Cronbach's α coefficient for each dimension of BS. The dependent variable was the presence of risk for burnout (categorized as Yes/No) to compare burned-out and non burned-out groups. Confounding variables included sociodemographic factors (age, gender, marital status), work schedule, and undergraduate degree. The chi-square test was used to compare the burned-out and non-burned-out groups. Data was analyzed using descriptive statistics to calculate frequencies and means of sociodemographic characteristics, as well as BS prevalence rates with 95% confidence intervals (CI). The non-overlapping 95% CI indicate significant differences (40).

Confounding variables were analyzed in relation to the prevalence of BS using both univariate and multivariate, binary logistic regression models. First, univariate binary logistic regression analyses were used to evaluate variables that could correlate with the prevalence of BS, using crude Odds Ratio (OR) with 95% CI. Subsequently, a multivariate logistic regression analysis included variables that showed significant associations ($p < 0.05$) in the univariate models to assess the relationship between the prevalence of burnout and selected variables through adjusted OR with 95% CI. The Hosmer-Lemeshow goodness-of-fit test and the Likelihood ratio test were used to assess the goodness-of-the-fit of the regression models. All statistical analyses were performed using R version 4.2.2 (41).

Results

The internal reliability of each dimension of the MBI-HSS instrument was 0.92 for EE, 0.8 for DP, and 0.79 for PA, which is greater than the generally accepted threshold of 0.7, indicating high reliability among the items within each dimension of the questionnaire. Of the 830 respondents, 748 (90.12%) were women and 82 (9.88%) were men. Participants' age ranged from 22 to 78 years old, with an average age of 43 ± 11.57 years. More detailed sociodemographic and job-related information about participants is shown in Table 2.

Table 2. Socio-demographic characteristics of participants (n = 830).

Variables	Criteria	No. (%)
Sex	Women	748 (90.12)
	Men	82 (9,88)
Marital status	Single	326 (39,27)
	Married	285 (34,33)
	Consensual union	141 (16,98)
	Divorced	66 (7,95)
	Widowed	12 (1,47)
Age	20-29	127 (15,30)
	30-39	207 (24,93)
	40-49	246 (29,63)
	50-59	177 (21,32)
	>60	73 (8,82)
Working schedule	Day work	587 (70,72)
	Day and night work	228 (27,46)
	Night work	15 (1,82)
Bachelor's degree	Bacteriologist and clinical laboratory scientist	444 (53,49)
	Bacteriologist	332 (40,0)
	Microbiologist and bioanalyst	54 (6,51)

The prevalence of BS amongst respondents was 59.7% (95% CI: 56.4 to 63.1%) according to the standard definition. Using the restrictive and inclusive definitions, the prevalence of BS was 28% (95% CI: 25 to 31.1%) and 68% (95% CI: 64.9 to 71.2%), respectively. There was no overlap among the three BS definitions, according to their 95% CI (Figure 1), indicating significant differences among the definitions in detecting BS. Table 3 reports the stratification of BS subscales for all participants, where BS prevalence was 51.4% for high EE, 46% for high DP, and 45.7% for low PA.

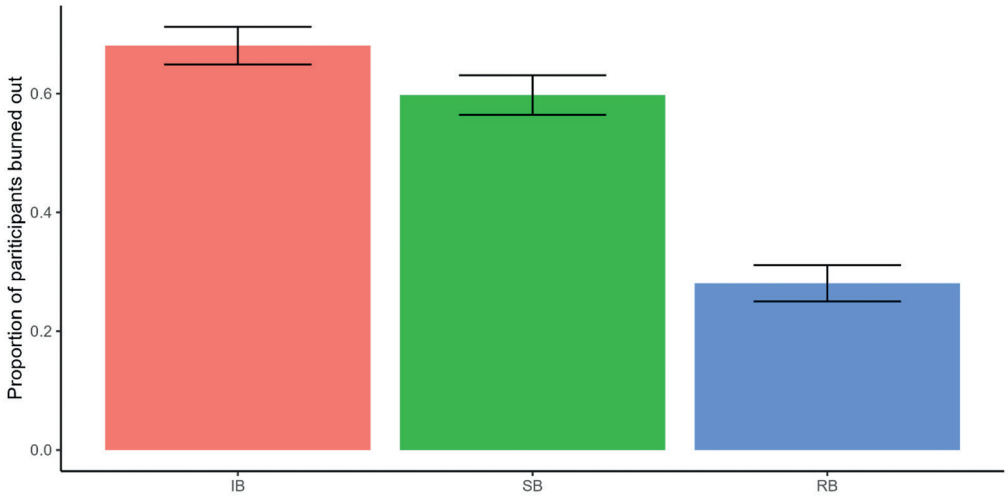

Figure 1. Prevalence of burnout under three definitions of burnout. Inclusive definition (IB); Standard definition (SB); Restrictive definition (RB).

Table 3. Prevalence of burnout syndrome among bacteriologists according to MBI-HSS. 95% CI Confidence Interval. The asterisk symbol (*) indicates high risk for burnout.

Subscale	Burnout severity	No. (%)	CI lower	CI upper
Emotional exhaustion	High*	427 (51,4)	0,480	0,548
	Moderate	142 (17,1)	0,145	0,197
	Low	261 (31,5)	0,283	0,346
Depersonalization	High*	382 (46)	0,426	0,494
	Moderate	166 (20)	0,173	0,227
	Low	282 (34)	0,308	0,372
Personal accomplisment	High	251 (30,2)	0,271	0,334
	Moderate	200 (24,1)	0,212	0,270
	Low*	379 (45,7)	0,423	0,491

Burnout was most frequent among bacteriologists in the youngest age group (20–29 years) across all burnout definitions (Figure 2), with younger groups showing the highest proportion of BS compared to older age groups. A high proportion of burnout was observed across most socio-demographic characteristics under both standard and inclusive definitions, except among older age groups (50–59 and >60 years) and widowed bacteriologists, who showed a higher proportion of non-burnout cases. The chi-squared test revealed significant differences between burnout and non-burnout groups in terms of age, marital status, working schedule, and undergraduate degree (all $p < 0.05$). Table S1 shows the numbers of bacteriologists with burnout and without burnout.

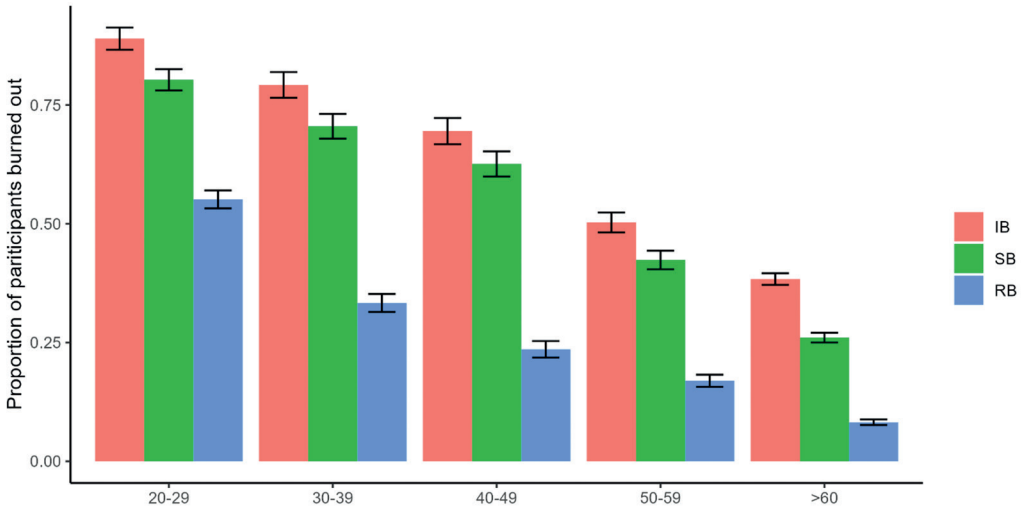

Figure 2. Prevalence of burnout across ages groups under three definitions of burnout. Inclusive definition (IB); Standard definition (SB); Restrictive definition (RB).

Univariate logistic regression revealed that age and undergraduate degree variables were associated with a high risk for burnout across all definitions, with statistical significance ($p < 0.05$) (Table S1). Specifically, older age groups were less likely to report burnout compared to younger groups. Regarding undergraduate degree, microbiologists and bioanalysts showed significantly higher odds of burnout for all definitions ($OR_{IB} = 3.6$, 95% CI = 1.76 – 8.58, $p < 0.001$; $OR_{SB} = 2.17$, 95% CI = 1.17 – 4.2, $p < 0.05$; $OR_{RB} = 3.41$, 95% CI = 1.86 – 6.2, $p < 0.001$). As for marital status, single participants and those in a consensual union were more frequently observed with a high risk of burnout. Day and night working schedules were significantly associated with a high risk of burnout. Participant gender was not associated with a high risk of BS consistently for all burnout definitions. The variables that were significantly associated with a high risk of BS in the univariate regression model ($p < 0.05$): age, marital status, working schedule, and bachelor's degree were included in the multivariate logistic regression model (Table 4).

Table 4. Multivariate logistic regression analysis. OR Odds Ratio; 95% CI Confidence Interval; *p* Probability; ref Reference category.

Variables	Inclusive definition		Standard definition		Restrictive definition	
	OR (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*p*
Age (years)						
20-29	ref		ref		ref	
30-39	0.526 (0.261-0.98)	0.059	0.641 (0.366-1.1)	0.122	0.459 (0.285-0.736)	<0.001
40-49	0.385 (0.193-0.728)	0.004	0.503 (0.286-0.865)	0.014	0.303 (0.182-0.5)	<0.001
50-59	0.179 (0.088-0.347)	<0.001	0.226 (0.124-0.401)	<0.001	0.2 (0.11-0.357)	<0.001
≥60	0.118 (0.052-0.252)	<0.001	0.111 (0.052-0.228)	<0.001	0.084 (0.03-0.204)	<0.001
Marital status						
Married	ref		ref		ref	
Divorced	0.977 (0.556-1.721)	0.934	1.180 (0.669-2.08)	0.566	1.741 (0.867-3.369)	0.096
Single	1.561 (1.053-2.320)	0.027	1.482 (1.018-2.160)	0.04	1.726 (1.124-2.664)	0.013
Consensual union	1.505 (0.935-2.458)	0.095	1.389 (0.888-2.186)	0.152	1.376 (0.829-2.276)	0.210
Widowed	0.524 (0.133-1.771)	0.311	0.797 (0.2-2.742)	0.726	1.443 (0.212-5.991)	0.667
Working schedule						
Day work	ref		ref		ref	
Day and night work	1.051 (0.720-1.542)	0.801	1.019 (0.719-1.448)	0.914	0.936 (0.648-1.343)	0.717
Night work	1.332 (0.372-6.369)	0.683	1.332 (0.42-5.121)	0.645	0.522 (0.133-1.7)	0.304
Bachelor's degree						
Bacteriologist	ref		ref		ref	
Bacteriologist and clinical laboratory scientist	1.434 (1.038-1.983)	0.028	1.229 (0.901-1.674)	0.192	1.737 (1.225-2.48)	0.002
Microbiologist and bioanalyst	1.675 (0.758-4.140)	0.227	1.06 (0.546-2.140)	0.867	1.902 (0.997-3.614)	0.051

In the multivariate logistic regression analysis, older age groups were significantly less likely to report burnout across all definitions. Compared with the 20–29 years reference group, participants aged 50–59 years showed lower odds of burnout (OR_{IB} = 0.179, 95% CI = 0.088 – 0.347; OR_{SB} = 0.226, 95% CI = 0.124 – 0.401; OR_{RB} = 0.2,

95% CI = 0.11 – 0.357, $p < 0.001$). Likewise, those aged ≥60 years had lower odds of burnout (OR_{IB} = 0.118, 95% CI = 0.052 – 0.252; OR_{SB} = 0.111, 95% CI = 0.052 – 0.228; OR_{RB} = 0.084, 95% CI = 0.03 – 0.204, all $p < 0.001$). In contrast, the 30–39 age group showed no significant differences compared with the 20–29 age group (for 30 – 39 aged: OR_{IB} = 0.526, 95% CI = 0.261 – 0.98, $p = 0.059$; OR_{SB} = 0.641, 95% CI = 0.366 – 1.1, $p = 0.122$), except under the restrictive definition (for 30-39 aged: OR_{RB} = 0.459, 95% CI = 0.285 – 0.736, p =0.001).

The main significant factors associated with a high risk of BS in bacteriologists were marital status and undergraduate degree. Specifically, being single was associated with higher odds across all definitions (OR_{IB} = 1.561, 95% CI = 1.053 – 2.32; OR_{SB} = 1.482, 95% CI = 1.018 – 2.16; OR_{RB} = 1.726, 95% CI = 1.124 – 2.664, all $p < 0.05$). As for undergraduate degree, being bacteriologist and clinical laboratory scientist was associated with higher odds under the inclusive definition (OR_{IB} = 1.434, 95% CI = 1.038 – 1.983; OR_{RB} = 1.737, 95% CI = 1.225 – 2.48, both $p < 0.05$), except under the standard definition (OR_{SB} = 1.229, 95% CI = 0.901 – 1.674, $p = 0.192$). In contrast, the association with high risk observed for microbiologists and bioanalysts in the univariate analysis was not confirmed in the multivariate analysis. Finally, the results of multivariate logistic regression showed that working schedule was not significantly associated with a high risk of BS.

Discussion

Burnout is a widespread global problem due to its associations with mental illness among workers exposed to stressful situations and bad working conditions (42,43). BS is particularly prevalent in health care and education professionals (44). However, the findings suggest a high risk of BS among bacteriologists. This may be associated with high workload and certain personal factors (e.g., age and marital status, young and single), which can potentially contribute to anxiety. More than half of the bacteriologists who participated in the survey showed at high risk of BS using the MBI-HSS instrument. A systematic review in Colombia of instruments to measure BS found that the MBI-HSS has been the most widely used; it assesses a greater number of burnout dimensions and is the only instrument validated in Colombia to estimate it (45,46).

Previous studies in Colombia showed that the prevalence of burnout was higher for professional nurses (24.4%) compared to nurse aides (19.5%) in a hospital in the city of Ibague (47). Also, a study conducted with 373 medical students at *Universidad de Cartagena* showed that 30.8% were at high risk of BS (48). This study recorded the highest

BS risk for standard (59.7%) and inclusive (68%) definitions, although for the restrictive definition the risk was still high (28%). Some possible differences among burnout rates could be related to socioeconomic status and the population study; differences in assessment for burnout rates and sample size may contribute to differences in prevalence of burnout. Some studies have revealed that medical staff are particularly prone to a high risk of BS (1,35,49). However, the findings show that burnout can also affect workers in fields such as education, social work, and security. In this study, bacteriologists reported high rates of emotional exhaustion (54%), high depersonalization (46%), and low personal accomplishment (45,7%). These values are higher than those reported by O'Connor et al. (8) for mental health professionals and Gómez-Urquiza et al. (50) for emergency nurses. This is the first national, cross-sectional survey on burnout and the first to report the highest prevalence of BS in Colombia (47,48,51–53).

In this study, gender was not associated with a high risk of burnout among bacteriologists. This finding may be explained by the greater influence of individual and work–family conflict rather than by gender itself. However, further research is needed to better understand the mechanisms underlying this relationship. Previous gender and burnout studies have shown inconsistent results. Besides, burnout symptoms may vary according to different life stages, experiences, work stressors, and demands on workers (25,30,54). Age was significantly associated with burnout, with a greater prevalence observed in younger groups. In recent studies, older groups were associated with higher levels of skills, decision-making authority, and social support at work to cope with adverse events; for this reason, they are more resilient with lower odds to have burnout (55,56). Similarly, being single was associated with a higher risk of becoming burnout. The relationship between being single, divorced, or widowed and higher levels of burnout has been demonstrated (27). In contrast, social support associated with marital status (consensual union or marriage) has been reported as a protective factor for health and well-being at work (57,58). This result suggests that the existence of social support may reduce the risk of burnout in bacteriologists.

Although these associations are theoretically supported by literature, the cross-sectional design of this study prevents establishing causal directions. Therefore, to better understand the correlation between the sociodemographic factors and high burnout risk, it is important to conduct longitudinal studies to confirm these findings. These results show that BS determinants are numerous and involve a complex interplay of factors related to both the individual and their environment. The risk factors for burnout may vary across groups because burnout has no binding diagnostic criteria

and clinically valid cut-offs (59). Therefore, effective intervention measures in health policies are necessary to support actions leading to prevent burnout syndrome that may affect workers' mental health.

Conclusions

The prevalence of burnout among bacteriologists in Colombia is high and constitutes a challenge that society and organizations should address with a range of workplace mental health programs. In this study, the multivariate analysis identified that the risk of burnout is not uniformly distributed, but is significantly higher among younger professionals and those who are single. Factors such as gender and working schedules were not associated with burnout, suggesting that the risk is more closely related to individual life stages and social support structures.

It is imperative to recognize this syndrome as a critical occupational health issue that triggers psychological and physical distress. Therefore, different programs and properly designed interventions are required to prevent and mitigate these risks. In Colombia, this need is aligned with the new legal mandates established under Law No. 2460 of 2025. Measures implemented based on these findings would positively influence the mental health and well-being of bacteriologists, both in their personal and professional lives.

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Conflict of Interest and Financial Disclosure

Authors declared no conflict of interest and no financial support.

Supplementary material

Table S1. https://doi.org/10.6084/m9.figshare.31333555

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