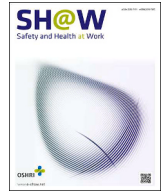




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Original article

Association of Concurrent Clusters of Physical Inactivity and Unhealthy Lifestyle Habits with Common Mental Disorders among Primary Healthcare Workers: Insights from a large sample cross-sectional analysis in Brazil



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ABSTRACT

Background: Common mental disorders (CMDs) are highly prevalent worldwide. Leisure time physical inactivity (LTPI) is a key modifiable behavior increasingly recognized for its contribution to CMD risk, alongside tobacco use, alcohol consumption, and nonparticipation in social activities (NPSA). Despite this, most studies examine these lifestyle factors individually rather than investigating their concurrent clustering and combined impact on mental health.

Objective: To examine the association between clusters of unhealthy lifestyle habits centered on LTPI and CMDs among primary healthcare workers (PHCWs) in the state of Bahia, Brazil.

Methods: A cross-sectional analysis of 3,343 PHCWs was conducted. CMDs were screened with the Self-Report Questionnaire-20. Unhealthy behaviors (LTPI, tobacco use, alcohol use, and NPSA) were analyzed individually and as clusters (observed/expected ratios). Associations with CMDs were estimated via logistic regression.

Results: Participants were predominantly female (78.9%); 57.1% were ≤ 40 years. Prevalences were as follows: LTPI: 56.6%, tobacco: 6.2%, alcohol: 37.3%, NPSA: 61.3%; and CMDs: 22.6%. LTPI [odds ratio (OR) = 1.56; 95% confidence interval (CI): 1.23–1.99], and NPSA (OR = 1.60; 95% CI: 1.27–2.03) were independently associated with CMDs. The LTPI + NPSA cluster showed higher odds of CMDs (OR = 1.73; 95% CI: 1.29–2.31). Clustering patterns also revealed combinations involving LTPI and tobacco use.

Conclusion: CMDs among PHCWs are linked not only to single behaviors but to clusters centered on LTPI, particularly when combined with social isolation. Mental health strategies in primary care settings should prioritize increasing leisure time physical activity and social engagement alongside broader lifestyle risk reduction.

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1. Introduction

The promotion of physical activity (PA) and healthy lifestyles within the workplace has evolved into a cornerstone of global public health initiatives [1]. As highlighted by the American College of Sports Medicine (ACSM) in 2024, workplace PA programs have ascended as a leading (top#2) trend, garnering recognition for their profound potential to elevate employee health and well-being on a holistic level [2]. This paradigm shift underscores the acknowledgment of workplaces as a fertile ground for fostering healthy lifestyles and reducing leisure time physical inactivity (LTPI), cultivating environments conducive to physical movement and well-being [3].

The LTPI refers to insufficient engagement in PA during non-working hours, including activities that promote cardiovascular fitness, strength, and flexibility [4]. The LTPI has been increasingly implicated as a modifiable risk factor for mental health disorders, including depression and anxiety, particularly among populations exposed to chronic occupational stressors such as primary healthcare workers (PHCWs). Interventions targeting reduction of LTPI have demonstrated benefits in improving psychological well-being, mood, self-esteem, and overall quality of life, highlighting their potential role in preventing or mitigating common mental disorders (CMDs) among high-risk occupational groups such as PHCWs.

Defined as a set of symptoms including irritability, insomnia, fatigue, forgetfulness, difficulty concentrating, and somatic complaints, CMDs may or may not be accompanied by episodes of anxiety or depression [5]. Epidemiological studies conducted in the last decade have revealed high prevalence of CMDs among PHCWs, ranging from 16% to 46.1% [6,7]. CMDs are more prevalent among female individuals [6–8], with a negative perception of health status [9,10], and those with low income and education level [9,11].

The PHCWs have occupational characteristics in their work processes with a differentiated model guided by teamwork, intersectoral collaboration, focused on the collective, proximity to the community, compliance with productivity, and goals that require skills and competencies to manage demands that often go beyond their governance [12]. In this way, feelings of incapacity, as well as exposure to work situations with overload, intense pace, hierarchical management, devaluation, precarious bonds, and especially precarious working conditions, lead to psychological distress [13,14].

Among the coping strategies for mental health problems, the promotion of healthy lifestyle behaviors—particularly addressing LTPI, tobacco consumption, alcohol consumption, and social isolation—stands out as an important non-pharmacological approach [15]. The adoption and maintenance of these habits, such as reducing LTPI through regular PA during leisure time, participating in social and leisure activities, and limiting alcohol and tobacco use, can produce positive neurobiological and psychosocial effects [16,17]. These changes are associated with improved mood, enhanced self-image, increased self-esteem, and an overall greater sense of well-being [18,19].

Previous research has extensively documented the prevalence of CMDs among PHCWs, underscoring the multifactorial nature of these conditions. While individual associations between high LTPI and other unhealthy lifestyle habits with CMDs have been observed in both the general population and among healthcare professionals [20,21], comprehensive understanding of the collective impact of clustered unhealthy behaviors on mental health outcomes remains limited. For example, a recent study reported a CMD's prevalence rate of 16% among healthcare professionals, highlighting the significant burden within this occupational group

[22]. Similarly, previous research documented a prevalence range of 16% to 46.1% among PHCWs in Brazil, further emphasizing the widespread occurrence of CMDs in this population [23].

Gaps persist in elucidating the clustering of unhealthy lifestyle habits and their specific association with mental health outcomes, particularly within primary healthcare settings. Among modifiable behaviors, LTPI has emerged as a key determinant of poor mental health outcomes, exerting a particularly strong influence on psychological well-being [24,25]. Other behaviors, including tobacco consumption, alcohol intake, and low participation in social activities, may exacerbate vulnerability to common mental disorders. However, there remains a notable gap in understanding how LTPI co-occurs with these other unhealthy behaviors and how their simultaneous presence may compound the risk of developing mental disorders, particularly among healthcare workers exposed to chronic occupational stress. While cluster analysis cannot establish causality, it offers valuable insights into behavioral patterns that tend to co-occur [26], highlighting potential synergistic effects and providing an evidence-based foundation for designing interventions that focus on reducing LTPI as a primary target while also addressing other unhealthy lifestyle habits.

Therefore, there is a clear need for research that comprehensively examines the aggregation of unhealthy lifestyle habits and their association with CMDs among PHCWs. Such studies would not only address this critical gap in the literature but also inform targeted interventions to promote mental well-being in this population. Healthcare organizations may create specialized plans based on behavioral change strategies to encourage an active lifestyle [27], with particular emphasis on reducing LTPI and simultaneously addressing other behaviors such as alcohol consumption, tobacco use, and social isolation. Implementing more effective workplace regulations that promote job performance, improve employees' mental health, and ultimately improve patient care outcomes is made possible by a knowledge of how these practices collectively affect CMDs.

It is also relevant to highlight that the simultaneous occurrence of these lifestyle habits may substantially increase the risk of developing mental disorders. In this sense, cluster analysis represents a valuable methodological approach for exploring how these behaviors co-occur and interact, offering insights that go beyond isolated risk factors [28]. Based on this rationale, the objective of this study was to investigate the association between concurrent clusters of unhealthy lifestyle habits—with emphasis on LTPI—and CMDs among PHCWs in Brazil.

2. Material and methods

2.1. Study design

This is a quantitative, descriptive, and cross-sectional and analytical study, guided by the Strengthening the Reporting of Observational Studies in Epidemiology tool [29]. This cross-sectional study was conducted as part of the larger research project titled “Working conditions, employment, and health of healthcare workers in state of Bahia”.

2.2. Participants and settings

The PHCWs from several primary healthcare facilities in the mentioned municipalities were included as study participants. The sampling of healthcare workers was conducted using a stratified approach based on geographical and administrative units within the state of Bahia [30]. First, the state was divided into macro-regions according to health administrative boundaries to ensure representation across areas with varying socioeconomic and

healthcare infrastructure characteristics. Within each macro-region, municipalities—including Salvador, Jequié, Feira de Santana, and Vitória da Conquista—were randomly selected, followed by the identification of healthcare facilities within these municipalities. Healthcare workers from the selected facilities were then invited to participate, ensuring proportional representation according to occupational categories (e.g., physicians, nurses, community health agents) and level of care (primary, secondary, and tertiary) within each stratum.

2.3. Sample size calculation and enrollment

A nominal list of all active workers in public primary healthcare services and medium-complexity services in the six participating municipalities was obtained, totaling 6,693 workers. The sample size was estimated based on the total population and different health outcomes, considering estimates of larger sample sizes. The sample was stratified at three levels of geographic area and level of care. The sample size was then estimated in each stratum, considering parameters such as the estimated prevalence of CMDs among healthcare workers (16.0%), a sampling error of 3.0%, and a confidence level of 95.0%. Individuals were chosen at random from a list of random numbers created by Epi Info™ 6.04d [31]. In this study, aiming to enable the analysis of gender and race strata, 3,343 participating workers were included, meeting the required sample size. The EpiInfo 6.04 program was utilized for this purpose, with further details on the sampling process documented in previous studies.

2.4. Ethical considerations

The research adhered to ethical guidelines outlined in Resolutions 466/2012 and 510/2016 of the National Health Council. Approval was obtained from the Research Ethics Committee with human participants of the State University of Feira de Santana (Protocol No. 267/20090, CAAE: 0086.0.0059.000-09). Informed written consent was obtained from all participants prior to data collection, ensuring voluntary participation and confidentiality, in compliance with the guidelines of the Brazilian National Research Ethics Committee [32].

2.5. Measurement of dependent variables

The CMDs were evaluated using the Brazilian version of Self-Report Questionnaire (SRQ-20), which is a widely used screening tool for mental health disorders [33]. The SRQ-20 consists of 20 questions designed to assess various symptoms associated with CMDs, such as irritability, insomnia, fatigue, and difficulty concentrating [34]. For the purpose of this study, a cut-off point of seven positive responses was used for women, while men were considered positive for CMD if they endorsed five or more items on the questionnaire [33]. This cut-off threshold helps identify individuals who may be experiencing significant psychological distress and is commonly employed in epidemiological research to screen for CMDs in different populations [35].

2.6. Measurement of independent variables

To gather sociodemographic and lifestyle information, a structured questionnaire was meticulously designed, pretested in a pilot study, and based on guidelines from the Brazilian Institute of Geography and Statistics for health research. This questionnaire elicited detailed responses regarding participants' sociodemographic profiles, including age, sex, marital status, and education level, as well as occupational characteristics such as employment

Table 1

Sociodemographic characteristics, occupational factors, lifestyle habits, and mental health of primary healthcare workers (n = 3343)

Variables	N	%
Sex		
Female	2,191	78.9
Male	1,152	21.9
Age		
≤40 years old	1,556	57.1
>40 years old	1,787	42.9
Marital status		
Without partner	1,408	42
With partner	1,935	58
Education level		
Primary/secondary	2,025	60.3
College	1,318	39.7
Occupational characteristics		
Public worker	2,192	70.9
Nonpublic worker	1,151	29.1
Length of employment		
≤5 years	1,316	39.3
>5 years	2,027	60.7
LTPI		
No	1,456	43.4
Yes	1,887	56.6
Tobacco consumption		
No	3,132	93.8
Yes	211	6.2
Alcohol consumption		
No	2,097	62.7
Yes	1,246	37.3
NPSA		
No	2,050	61.3
Yes	1,293	38.7
CMD		
No	2,587	77.4
Yes	756	22.6

Notes: CMD, common mental disorders; LTPI, leisure time physical inactivity; NPS, nonparticipation in social activities.

status and length of employment. Lifestyle habits were also assessed, with a particular focus on LTPI, nonparticipation in leisure social activities, tobacco consumption, and alcohol consumption. LTPI was specifically highlighted as a key variable due to its central role in clustering analyses and its well-established association with mental health outcomes.

2.7. Statistical methods

The presence of aggregation of unhealthy lifestyle habits in PHCWs was determined by assessing the ratio of observed-to-expected (O/E) frequencies. An O/E ratio greater than 1.0 indicated aggregation, suggesting a tendency for these habits to co-occur. Logistic regression analysis was employed to investigate the association between the aggregation of unhealthy lifestyle habits and the presence of CMDs. Odds ratios (ORs) and their corresponding 95% confidence intervals (CIs) were estimated to quantify the strength of this association. Adjusted analyses were conducted to control for all relevant independent variables, including sex, age, marital status, education level, occupational characteristics, length of employment, LTPI, tobacco consumption, alcohol consumption, and NPSA. Statistical analyses were conducted using SPSS® version 22.0 to ensure robustness and reliability in the interpretation of findings.

3. Results

The final sample comprised 3,343 PHCWs, with a predominant representation of female workers (78.9%). Among the participants, 57.1% were aged 40 years or younger and 60.3% had completed up

Table 2

Association of unhealthy lifestyle habits and CMDs among primary health care workers (n = 3343)

ULSH indicators	OR gross score (IC95%)	OR adjusted (IC95%) ^a
LTPI	1,73 (1,39–2,14)*	1,56 (1,23–1,99)*
TC	0,93 (0,65–1,38)	0,78 (0,47–1,28)
AC	0,91 (0,74–1,11)	1,03 (0,81–1,32)
NPSA	1,63 (1,33–2,01)*	1,60 (1,27–2,03)*

Notes: *Statistically significant at 0.05; AC, alcohol consumption; CMDs, common mental disorders; E, expected prevalence; IC95%, interval of confidence of 95%; LTPI, leisure time physical inactivity; O, observed prevalence; NPSA, nonparticipation in social activities; O/E, observed/expected; OR, odds ratio; TC, tobacco consumption; ULSH, unhealthy lifestyle habits. The model was adjusted for the following variables: sex, age, education level, marital status, employment status, and length of employment.

to high school education. The majority of workers were civil servants (70.9%), and a significant portion had been employed in the healthcare sector for more than 5 years (60.7%). In terms of lifestyle habits, a notable proportion reported LTPI (56.6%), while smaller percentages engaged in tobacco use (6.2%), alcohol consumption (37.3%), and nonparticipation in leisure social activities (61.3%). The prevalence of CMD among the participants was recorded at 22.6% (Table 1).

The results from the analysis examining the association between unhealthy lifestyle habits indicators and common mental disorders CMDs are summarized in Table 2. Significant findings were observed for LTPI and nonparticipation in social activities. The LTPI showed a substantial association with CMDs, with a gross score OR of 1.73 (95% CI: 1.39–2.14), which remained significant after adjustment (OR: 1.56, 95% CI: 1.23–1.99). Similarly, nonparticipation in social activities demonstrated a significant association with CMD, with a gross score OR of 1.63 (95% CI: 1.33–2.01), maintaining significance even after adjustment (OR: 1.60, 95% CI: 1.27–2.03). However, no significant associations were found between CMD and tobacco consumption or alcohol consumption after adjustment. The adjusted OR for tobacco consumption was 0.78 (95% CI: 0.47–1.28), and for alcohol consumption, it was 1.03 (95% CI: 0.81–1.32).

Table 3 presents both the observed and expected prevalence rates for the 16 possible combinations of assessed lifestyle habits among the study participants. Of note, when analyzing the presence of three simultaneous unhealthy habits, a notable clustering was observed for LTPI, smoking, and alcohol consumption, with an O/E of 1.40. Additionally, for combinations involving two factors, the highest scores were identified for the combination of tobacco use and nonparticipation in social activities (O/E = 11.5) and LTPI and tobacco use (O/E = 4.4) (Table 3).

Significant associations were identified between certain combinations of lifestyle habits and CMDs. Specifically, associations were found for the combinations of LTPI and nonparticipation in social activities (OR = 1.73; 95% CI = 1.29–2.31), absence of unhealthy lifestyle habits (OR = 0.53; 95% CI = 0.37–0.76), and presence of alcohol consumption with the absence of other unhealthy habits (OR = 0.53; 95% CI = 0.34–0.81), in relation to CMDs.

4. Discussion

This study examined the association between clusters of unhealthy lifestyle habits, including LTPI and CMDs among PHCWs. The findings indicate that specific combinations—such as LTPI with social isolation or smoking with social inactivity—were linked to higher CMD prevalence. Overall, 22.0% of PHCWs reported CMD, with the highest rates observed among those with

both LTPI and social isolation. In contrast, participants who reported alcohol consumption without other unhealthy habits or no unhealthy habits at all showed lower CMD prevalence. These results highlight the relevance of considering concurrent lifestyle behaviors, particularly LTPI, in mental health strategies for PHCWs.

It is well-established in the literature that CMDs represent a public health issue [36], with significant implications for workforce productivity and well-being. Among PHCWs, these mental health disorders are highly prevalent [8], resulting in absenteeism, medical leaves, and reduced quality of life [35]. In this study, approximately a quarter of the participants presented this condition, consistent with studies conducted among healthcare workers in other regions of Brazil [37,38].

However, in the assessment of individual lifestyle habits, it became evident that LTPI and nonparticipation in social activities were most strongly associated with CMD presence. Previous surveys conducted with healthcare workers have similarly highlighted LTPI as a central risk factor for mental health problems [39]. This finding can be justified by evidence that participation in PA during leisure time promotes benefits for both physical and mental health, thus serving as a protective factor against CMD symptoms, based on neurobiological and psychological explanations [40]. Regular PA promotes increased cerebral vascularization with enhanced nutrient supply, stimulating neurogenesis and the release of serotonin and dopamine [41].

From a behavioral perspective, engaging in leisure time PA enhances stress coping mechanisms, improves concentration, creativity, memory, and readiness for daily tasks [42]. Participation in social activities, such as community or voluntary engagement, promotes social interaction, fosters bonds, and provides opportunities for knowledge exchange, further contributing to mental well-being [43,44]. Notably, LTPI can amplify the negative effects of social isolation on mental health, suggesting a synergistic interaction between inactivity and lack of social engagement [18].

Among all the combinations analyzed, it was observed that four combinations had cluster scores (O/E > 1.0). As of the present moment, no literature has been found investigating similar variables. However, in a study conducted by healthcare workers, the authors identified that the combination composed of participation in PA during leisure time and social activities (O/E = 12.3 and 24.6 for men and women, respectively) had the highest score. Previous studies confirm that the presence of two or more unhealthy habits is associated with a worsening health status compared to those who have only one or none of these factors. Additionally, it is understood that lifestyle habits can act synergistically, with one influencing the other.

Among all combinations analyzed, four combinations had cluster scores (O/E > 1.0). While literature on identical clusters is limited, a study involving PHCWs identified that the combination of participation in leisure time PA and social activities had the highest cluster score (O/E = 12.3 and 24.6 for men and women, respectively) [45]. Prior studies confirm that the presence of two or more unhealthy habits is associated with worsening health status compared to individuals with one or none [46]. Additionally, lifestyle habits may act synergistically, influencing each other [47].

One of the most notable findings is the strong association between LTPI and CMDs, either alone or in combination with nonparticipation in social activities, with a 73% increase in CMD prevalence observed in this cluster. This reinforces the critical role of reducing LTPI in promoting mental health among PHCWs [17,48]. The positive effects of regular PA may also enhance the benefits of social engagement, improving self-image, self-esteem, and overall perception of life [49]. The importance of reducing LTPI is further supported by international studies. For instance, research in New Zealand emphasizes that decreasing LTPI,

Table 3
Prevalence of clusters and association with CMDs (n = 3343)

N	Unhealthy lifestyle habits				Prevalence of clusters			Presence of CMD	
	LTPi	TC	AC	NPSA	O (%)	E (%)	O/E	OR gross (IC95%)	OR adjusted (IC95%)
4	+	+	+	+	0.6	1	0.60	1.73 (0.59–5.87)	2.17 (0.71–6.59)
3	–	+	+	+	0.4	0	0.00	1.48 (0.38–5.74)	1.48 (0.30–7.29)
3	+	–	+	+	3.4	8	0.42	1.39 (0.84–2.30)	1.55 (0.92–2.60)
3	+	+	–	+	0.6	1	0.60	0.80 (0.22–2.82)	0.94 (0.26–3.36)
3	+	+	+	–	1.4	1	1.40	0.29 (0.08–0.95)	0.34 (0.10–1.14)
2	–	–	+	+	0.5	6	0.08	1.07 (0.64–1.60)	1.25 (0.77–2.02)
2	–	+	–	+	11.5	1	11.5	1.15 (0.31–4.29)	1.20 (0.32–4.48)
2	–	+	+	–	0.6	1	0.60	0.93 (0.26–3.36)	1.22 (0.33–4.49)
2	+	–	–	+	12.9	13	0.99	1.68 (1.28–2.22)	1.73 (1.29–2.31)*
2	+	–	+	–	0.5	12	0.04	1.11 (0.82–1.48)	1.30 (0.95–1.76)
2	+	+	–	–	4.4	1	4.40	0.31 (0.04–2.44)	0.35 (0.04–2.77)
1	–	–	–	+	9	10	0.90	0.90 (0.63–1.28)	0.95 (0.65–1.38)
1	–	–	+	–	9.3	10	1.03	0.47 (0.31–0.70)	0.53 (0.34–0.81)*
1	–	+	–	–	0.3	1	0.30	1.15 (0.23–5.72)	1.36 (0.27–6.87)
1	+	–	–	–	16.2	20	0.81	0.96 (0.73–1.26)	0.98 (0.73–1.30)
0	–	–	–	–	13.3	16	0.82	0.48 (0.34–0.68)	0.53 (0.37–0.76)*

AC, alcohol consumption; CMDs, common mental disorders; E, expected prevalence; IC95%, interval of confidence of 95%; LTPi, leisure time physical inactivity; O, observed prevalence; NPSA, nonparticipation in social activities; O/E, observed/expected; OR, odds ratio; TC, tobacco consumption. *Statistically significant at 0.05. The model was adjusted for the following variables: sex, age, education, marital status, employment status, and length of employment.

including both active and passive leisure activities, is an effective strategy for alleviating occupational stress [50]. The synergistic impact of combining reduced LTPi with increased social participation highlights actionable targets for workplace interventions aimed at enhancing mental health resilience among healthcare professionals.

Therefore, it is important to encourage both regular PA and participation in social activities in leisure time, as both share a common aspect: they are usually done with other people, which suggests an additional positive effect on mental health [51]. However, a study conducted with the adult population in Japan suggests that only leisure activities were positively associated with mental health, being important to prevent the deterioration of mental health, especially when done with other people [44]. Thus, leisure time PA enable the building of social relationships, exchange of experiences, sense of belonging, and reinforcement of positive emotions [15]. On the other hand, another study distinguishes social activities focused on people, such as socializing with friends and family, which positively impacts quality of life [52].

Correspondingly, the patterns observed in our study are supported by international research. The AMADEUS study, conducted in France with over 10,000 healthcare professionals, found a high prevalence of LTPi among participants, which was associated with factors such as age, gender, and mental health conditions like burnout and depression [53]. Similarly, a research on Chinese healthcare workers' mental health during the COVID-19 pandemic has reported high prevalence rates of anxiety and depression symptoms, with factors such as social support and individual resilience acting as protective factors [54]. Similarly, the study conducted in Greece, investigating the correlation between PA and quality of life among PHCWs, highlighted that lack of time and work hours were major barriers to PA. This study also found that health problems significantly impacted quality of life, with housekeeping and household chores being the most common physical activities [24].

While alcohol consumption alone showed a negative association with CMDs in this study, the primary focus remains on LTPi, which consistently demonstrates a stronger and more direct link with CMDs than other lifestyle behaviors. This underscores the need for interventions prioritizing the reduction of LTPi, alongside promotion of social activities, as foundational strategies to prevent

CMDs in primary healthcare settings. In general, the patterns observed in our study are consistent with both national and international literature, further confirming the centrality of LTPi in determining mental health outcomes among PHCWs [17,48,49,55].

This study presents several strengths. It included a relatively large, population-based sample of healthcare workers from multiple municipalities in Brazil, enhancing the robustness and generalizability of the findings within the national context. The use of a validated screening instrument (SRQ-20) ensured reliable assessment of common mental disorders. Moreover, the investigation of clusters of unhealthy lifestyle habits—particularly LTPi—represents a novel approach, allowing a deeper understanding of the collective impact of multiple behaviors on mental health outcomes.

However, limitations should be acknowledged. The cross-sectional design limits the ability to establish causality between lifestyle behaviors and CMDs. Self-reported data may introduce recall or social desirability biases. The study focused on specific regions of Brazil, which may limit generalizability to other settings. Additionally, variables such as the quantity and frequency of alcohol consumption, dietary patterns, and sleep habits were not assessed, though these factors likely influence mental health outcomes.

The findings underscore the importance of targeting LTPi in workplace interventions alongside promoting social engagement and other healthy behaviors. Healthcare institutions can develop tailored wellness programs that encourage leisure time PA, facilitate social interaction, and address barriers to healthier lifestyles. By integrating lifestyle factors into mental health strategies, organizations can enhance both individual resilience and overall organizational well-being, ultimately improving patient care outcomes.

Longitudinal studies are needed to explore how changes in lifestyle habits over time affect mental health. Qualitative research could clarify the mechanisms linking LTPi and other behaviors to CMDs. Further studies should evaluate the effectiveness of interventions promoting regular PA and social engagement, while also considering organizational factors such as workplace culture, leadership support, and workload. Incorporating objective measures of PA, dietary intake, and sleep would strengthen future research.

This study highlights the substantial prevalence of common mental disorders among PHCWs and demonstrates that LTPI—alone or clustered with social isolation and tobacco use—is strongly associated with CMDs. The identification of these clusters provides valuable insights for developing targeted interventions aimed at reducing LTPI and promoting holistic well-being. Addressing multiple lifestyle behaviors simultaneously through interdisciplinary, comprehensive strategies is essential for fostering resilience and improving mental health outcomes in healthcare settings.

CRedit authorship contribution statement

Fernanda Queiroz Rego de Sousa Lopes: Conceptualization. **Saulo Vasconcelos Rocha:** Writing – original draft, Supervision, Methodology, Investigation. **Clarice Alves dos Santos:** Validation, Methodology, Investigation, Formal analysis. **Francisco Campos, Jules Ramon Brito Teixeira:** Writing – original draft, Investigation. **Ana Luisa Patrão:** Formal analysis, Data curation. **Sônia Brito-Costa:** Writing – review & editing, Validation, Data curation. **Rafael N. Rodrigues:** Writing – original draft, Formal analysis. **Guilherme Eustáquio Furtado:** Writing – review & editing, Supervision. **Tânia Maria de Araújo:** Validation, Supervision, Methodology, Investigation.

Statement on the use of AI tools

During the preparation of this work, the authors used *ChatGPT (OpenAI)* in order to improve the clarity of language, refine sentence structure, and support the reorganization of sections for coherence. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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