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# Prevalence of insomnia, fatigue and symptoms of mental health problems among emergency medical service nurses: a cross-sectional study

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## Abstract

**Background** Emergency medical service nurses worldwide face continuous high-stress situations caused by critical incidents that can overwhelm them emotionally and affect their daily functioning and sustainable employability. Repeated exposure to these incidents negatively impacts their mental health. The COVID-19 pandemic has further exacerbated these issues, with high prevalence rates of insomnia and fatigue among emergency medical service nurses serving as key predictors of mental health problems. Until now little is known about the mental consequences of the COVID-19 pandemic on EMS nurses. This study, the first of its kind in the Netherlands, aims to assess the prevalence of insomnia, fatigue, and symptoms of mental health problems and identify associated risk factors.

**Methods** A national cross-sectional study was conducted in the Netherlands in spring 2022. Data were collected through an online survey among emergency medical service nurses covering personal characteristics as well as validated scales on insomnia, fatigue, anxiety, depression, and Post Traumatic Stress Disorder.

**Results** Prevalence rates were 39.2% for insomnia, 32.5% for fatigue, 18.4% for anxiety, 16.2% for depression and 10% for Post Traumatic Stress Disorder. Not recovering from COVID-19 was linked to higher odds of fatigue, while living alone was associated with insomnia. Working as an emergency medical dispatcher and more work experience were linked to increased fatigue. Regional differences in emergency medical services organizations and full recovery of COVID-19 showed to result in lower odds of insomnia in ambulance professionals.

**Conclusions** Insomnia and fatigue are prevalent among emergency medical service nurses. These conditions heighten the risk of severe mental health problems and potential sickness leave. Further research is needed to explore factors contributing to these issues and to develop targeted interventions supporting professionals sustainability.

**Clinical trial number** Not applicable.

**Keywords** Emergency medical service nurses, Insomnia, Fatigue, Mental health status, Well-being, Anxiety, Depression, PTSD, Pandemic

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## Background

Emergency medical service (EMS) workers are continuously exposed to uncontrolled and unpredictable situations in their work, one of the sources are critical incidents. The current literature describes critical incidents as an incident that overwhelms professionals with intense emotions, interferes with their functioning during the incident, and has impact on their sustainable employability. Critical incidents distinguish itself from normal working circumstances [1–3]. Examples of critical incidents are violence, facing death of patients and abrupt changes in working circumstances as in a pandemic [4]. Frequent exposure to critical incidents may has a negative impact on the mental health [1–3, 5] and increases suicide thoughts among EMS nurses [2, 6]. Mental health problems have negative consequences for the sustainable employability of EMS nurses. Sustainable employability means healthy functioning of professionals in their work and to feel good by their work. Organizations needs to facilitate the professional with their sustainable employability [7].

A 2018 systematic review of EMS nurses reported a prevalence of 15% for anxiety, 15% for depression, and 11% for post-traumatic stress disorder (PTSD) [8]. The prevalence of mental health problems are higher among EMS nurses compared to the general population [2]. The prevalence rates of anxiety and depression in the general population are estimated by the World Health Organization to be 3.6% and 4.4% respectively (2015) and for PTSD, the prevalence ranges between 1.3% and 2.9% [8, 9].

The coronavirus disease 2019 (COVID-19) pandemic has driven a cumulative effect on the mental health of EMS nurses for a number of reasons, including the rapid spread of the disease, the lack of knowledge and ability to effectively treat COVID-19, and the fear becoming infected or infecting others [10–14]. Studies conducted in Spain, Qatar, Germany, and Australia have shown an increase in symptoms of mental health problems among EMS nurses during the COVID-19 pandemic [11–14]. These studies reported prevalence rates of 14-16.1% for anxiety, 12.4-22.5% for depression and 18.5-30.9% for PTSD.

Symptoms of mental health problems rarely arise suddenly. There are some predictors of mental health problems which appear in an earlier stage. Two predictors are fatigue and insomnia. Fatigue, specifically work-related fatigue, is a persistent feeling of physical and mental tiredness that occurs as a result of work-related stress and inadequate recovery opportunities, leading to an increased need for recovery after work. Fatigue is associated with diminished physical and mental resources to meet the work demands [15–17]. Chronic accumulation of fatigue is called exhaustion, which is a major symptom of burnout. Thus, fatigue is typically seen as an early warning sign, whereas exhaustion and burnout occur later in more severe stages and are more difficult to resolve [18–20]. Given its earlier presentation, identifying and promoting interventions to combat fatigue may ultimately help prevent burnout. The prevalence of fatigue before the COVID-19 pandemic varied from between 55 and-65% [28, 29], impacting a majority of the EMS population.

Insomnia and fatigue can lead to mental health problems and are also identified as a significant risk factor for sustainable employability [21–26]. The prevalence of insomnia among EMS nurses before the COVID-19 pandemic varied from 20–27% [27]. There is only one Spanish study who gives insight in the prevalence of insomnia during the COVID-19 pandemic among EMS nurses which is 60.9% [12]. Another study reports higher levels of insomnia among critical societal functions (which included EMS nurses) during the COVID-19 pandemic compared to the situation before the COVID-19 pandemic [21]. The prevalence of fatigue before the COVID-19 pandemic variates from 55–65% [28, 29]. There is a lack of insight into the prevalence of fatigue among EMS nurses during the COVID-19 pandemic. When a person suffers from insomnia and/or fatigue the likelihood of that person developing mental health problems increases. Therefore, it is important to gain insight into the prevalence of insomnia and fatigue.

To the best of our knowledge, this is the first study worldwide to investigate the prevalence of fatigue among EMS nurses during the COVID-19 pandemic [27]. In doing so, this is the first study in the Netherlands investigating the prevalence of insomnia and symptoms of mental health problems. The first aim of this study is to gain insight into these outcomes (insomnia, fatigue, anxiety, depression and PTSD) among Dutch EMS nurses during the COVID-19 pandemic. Based on findings from previous studies, it is hypothesized that insomnia and fatigue will be more prevalent than before COVID-19 and more prevalent than symptoms of other mental health problems. The second aim of this study is to explore potential factors associated with insomnia and fatigue. These are personal characteristics such as gender, work experience, and working hours [11–14, 30]. This will provide information about subgroups at higher risk for developing insomnia and fatigue. The third aim of this study is to identify where the problems lie and set targets for improvement.

## Methods

### Design

This research is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional

studies, and the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [31, 32].

A national cross-sectional study was performed in the spring 2022 (March and April). This study was approved by the ethical research committee of HAN University of Applied Sciences (ECO 334.03/22). Participation was voluntary, and all participants completed the survey anonymously. To inform participants, an information letter was linked on the first page of the online survey. The participants provided their consent on the first page of the survey.

#### Setting and participants

Ambulance care in the Netherlands is provided by 25 different EMSs. Different types of EMS nurses work within EMSs: ambulance nurses, medical care providers, ambulance drivers, physician assistants, nurse practitioners, emergency medical dispatchers, management personnel, and other personnel (e.g. secretary). All professionals working within Dutch ambulance care were targeted for this study. In 2021, 6,863 EMS nurses were active in Dutch EMSs [33]. On 27 February 2020, the first patient with COVID-19 was diagnosed in the Netherlands. Since then, more than 8 million cases have been reported. In the first two years, approximately 40,000 Dutch residents died from COVID-19 [34]. Although this study was undertaken during a peak period [35], it coincided with a transition from public health requirements to recommendations for key interventions (e.g. for social distancing and face masks). This policy change was primarily driven by the high rate of vaccination uptake coupled with the decreasing mortality [36].

The target group of EMS nurses is difficult to engage for participation due to high turnover and irregular working hours; therefore, for this initial exploration, we have opted for an accessible approach to potential participants. Recruitment of EMS nurses took place through two professional associations the Dutch Association for Ambulance Care Nurses (in Dutch: *Verpleging & Verzorging Nederland Ambulance Zorg, V&VN az*) and the Dutch Association for Bachelor of Health (in Dutch: *Nederlandse Vereniging voor Bachelor Medisch Hulpverleners, NVBMH*). Additionally, the Dutch National Sector Organization for Ambulance Care (in Dutch: *Ambulance Zorg Nederland, AZN*) was involved in recruitment. These organizations brought the survey to the attention of EMS nurses in the Netherlands through various communication channels, including social media, newsletters, and websites. In addition, ambulance news groups on social media distributed the survey. They used a link to the open survey on the internet. Data were collected from March 14th until April 15th, 2022. Within this period, two reminders were placed on social media, websites and newsletters.

#### Data collection

An online survey was created in Limesurvey [37]. The online survey consisted of two parts. The English version of this survey is added in the supplementary file. The first part included questions about demographic data (age, gender, household and educational attainment), work-related characteristics (currently employed EMS, work experience in years, occupation and working hours a week) and COVID-19 disease status (fully, partly or not recovered, currently COVID-19 or not having COVID-19). These variables were collected to identify the personal characteristics that were associated with higher odds for develop insomnia and fatigue.

The second part consisted of five validated scales for insomnia, fatigue, anxiety, depression and PTSD. For insomnia, the Insomnia Severity Index (ISI). was used, yielding seven questions. A Likert scale from 0 (no problem) to 4 (severe problem) is used, with a cutoff point of 8. Higher scores indicate more severe the insomnia problems (8–14 subthreshold insomnia, 15–21 moderate insomnia and 22–28 severe insomnia). Previous psychometric evaluations found that the ISI was highly correlated with sleep diary measures, supporting its construct validity, and it further displayed high internal consistency (Cronbach's $\alpha = 0.74$) [38, 39].

Fatigue was measured with the need for recovery after work scale (NFR). This instrument was chosen because it focuses on the short-term effects of work on fatigue. The NFR consists of eleven questions with dichotomized outcomes (yes/no). Positive responses from six or more questions indicates a high risk of future dropout due to work-related fatigue. Given that the NFR has been shown to be highly correlated with other fatigue scales and internally consistent (Cronbach's $\alpha = 0.88$) in other study populations, it has been deemed a robust scale for measuring fatigue [15, 40]. Anxiety and depression were measured with the Hospitality Anxiety and Depression Scale (HADS-A and HADS-D. The HADS consists of 14 questions with a 4-point Likert scale ranging from zero (not at all) to three (usually). The HADS consists of two parts. The HADS-A has seven questions to measure symptoms of anxiety, and the HAD-D has seven questions about symptoms of depression. Scores can vary between 0 and 21 on both parts of the scale. Multiple studies have validated the cutoff point at greater than or equal to eight for both the anxiety and depression components. This cutoff point has been previously validated in several studies and used in studies among healthcare professionals. Internal consistency has been shown to be reasonable for the HADS-A (Cronbach's α ranged from 0.68 to 0.93) and HADS-D (Cronbach's α ranged between 0.67 and 0.90) [30, 41, 42]. Furthermore, validity evaluations have shown that both scales are moderately to strongly correlated to other scales purporting to measure the same

constructs [30, 41, 42], thus supporting the use of the HADS in research. To identify probable PTSD, according to the Diagnostic and Statistical Manual of Mental Health Disorders, 5th edition, the Impact of Event Scale (IES) with six questions (IES-6) was used. A 5-point Likert scale from zero to four points was used, where zero represents 'not at all' and four represents 'extreme extent'. The score is calculated as an average of the scores of all the questions. Various studies have used an average score of 1.75 as a valid cutoff point for symptoms of PTSD. Given its strong correlation with scales measuring similar constructs, the IES is regarding a psychometrically sound instrument for scientific research [43–46].

The participants were not allowed to skip questions in either the first or second part of the questionnaire. However, in accordance with the agreements outlined in the informed consent procedure, participants had the option to prematurely conclude the questionnaire was not completed. This could result in incomplete data for participants on the questionnaire.

According to the FAIR data principles, the de-identified dataset, including the accompanying codebook, was deposited in the DANS digital data repository https://doi.org/10.17026/dans-226-74kt [47].

### Statistical analyses

To examine the potential impact of missingness on our research, we compared the results of participants who completed all five instruments with the data of participants who completed at least one of the five instruments There was no statistically significant difference in the results. Given that there did not appear to be an underlying systematic pattern in non-response, we chose to only include participants who completed the entire questionnaire to ensure that the number of participants was the same for all outcomes and analyses. We also checked for exact duplicates since participants may have completed the questionnaire twice (as we did not use unique codes for the login procedure to the questionnaire). Therefore, we checked all the answers to the questions about demographics, work-related characteristics and COVID-19 disease status. When all responses to these questions were identical, it was flagged as a likely duplicate and removed. Descriptive statistics were calculated for the demographic data, work-related characteristics, COVID-19 disease status and the five outcomes. The data are presented as the standard deviation (SD), median and first and third interquartile (Q1-Q3) for continuous variables or as the number and percentage for categorical variables. The dependent factors are the dichotomized symptoms of the five outcomes (symptoms of insomnia, fatigue, anxiety, depression and PTSD). Furthermore, we calculated merged, dichotomous scores for two separate groups: presence of insomnia and/or fatigue and presence of anxiety, depression, and/or PTSD. We chose these groups given that the clustering of these outcomes would reveal the severity and urgency of the problem as well as provide a basis for intervention strategies. We used demographics, work-related characteristics, and COVID-19 disease status of the professional as independent factors. To explore the associations of these independent influencing factors with insomnia and fatigue, multivariable logistic regression analyses were performed using dichotomized outcomes. This resulted in odds ratios (ORs) with 95% confidence intervals (CIs). Multicollinearity among independent factors was accounted for via the variance influence factor (VIF), excluding variables with VIF ≥ 5 from multivariable analyses [48]. The Hosmer and Lemeshow test was used to evaluate goodness of fit, with a p-value < 0.05 indicating a poor fit [49]. All other statistical tests were 2-sided, and statistical significance was defined as $P < 0.05$. The data were analyzed via IBM SPSS version 27 [50].

## Results

### Characteristics of the study population

In total, 1,082 scales were received, of which 360 participants were excluded because they did not finish the questionnaire completely ($n = 355$) or were potentially duplicate participants ($n = 5$). In total, 722 EMS nurses were included in the analysis. The participants' mean age was 46.9 years (SD ± 9.5), 37.4% were female, and their average work experience was 13.8 years (SD ± 9.5). The three most common occupations of the participants were ambulance nurses (56.5%), ambulance drivers (28.8%), and emergency medical dispatchers (4.6%). Professionals from all 25 EMSs in the Netherlands participated in the sample. A total of 66.1% participants has personally experienced one or more episodes of COVID-19, and 10.3% of the participants had not (fully) recovered from COVID-19. See Table 1.

### Mental health outcomes

The prevalences of insomnia, fatigue, anxiety, depression and PTSD are shown in Table 2. Among the participants, 39.2% ($n = 283$, median 5, Q1-Q3 2–11) of the participants scored positive for insomnia problems (27.8% light problems, 9.8% moderate problems and 1.5% serious problems) and 32.5% ($n = 235$, median 3, Q1-Q3 2–11) scored positive for fatigue. The prevalences of symptoms of anxiety were 18.4% ($n = 133$, median 4, Q1-Q3 2-6.3), 16.2% for depression ($n = 117$, median 3, Q1-Q3 1–6) and 10% for PTSD ($n = 72$, median IES-6 score 0.5, Q1-Q3 0.2–1.2). In the overall sample, 51.5% of participants reported experiencing insomnia and/or fatigue. Additionally, 27.3% of EMS nurses show symptoms of at least one mental health problem, including anxiety, depression, and/or PTSD. All the respondents with symptoms

**Table 1** Characteristics of EMS nurses in percentages

| Characteristics | EMS nurses (*N* = 722) |
|---|---|
| Age in years, mean (SD) | • 46.9 (9.5) |
| Female, n (%) | • 270 (37.4%) |
| Household n (%) | • 69 (9.6%) |
| • Living alone | • 207 (28.7%) |
| • Living with partner | • 385 (53.3%) |
| • Living with partner and child(ren) | • 52 (7.2%) |
| • Living with child(ren) | • 9 (1.2%) |
| • Living with others | |
| EMS, n (%) | • 52 (7.2%) |
| • EMS A | • 45 (6.2%) |
| • EMS B | • 25 (3.5%) |
| • EMS C | • 37 (5.1%) |
| • EMS D | • 15 (2.1%) |
| • EMS E | • 34 (4.7%) |
| • EMS F | • 34 (4.7%) |
| • EMS G | • 47 (6.5%) |
| • EMS H | • 39 (5.4%) |
| • EMS I | • 14 (1.9%) |
| • EMS J | • 8 (1.1%) |
| • EMS K | • 20 (2.8%) |
| • EMS L | • 38 (5.3%) |
| • EMS M | • 8 (1.1%) |
| • EMS N | • 29 (4.0%) |
| • EMS O | • 38 (5.3%) |
| • EMS P | • 40 (5.5%) |
| • EMS Q | • 30 (4.2%) |
| • EMS R | • 19 (2.6%) |
| • EMS S | • 31 (4.3%) |
| • EMS T | • 25 (3.5%) |
| • EMS U | • 22 (3.0%) |
| • EMS V | • 27 (3.7%) |
| • EMS W | • 22 (3.0%) |
| • EMS X | • 23 (3.2%) |
| • EMS Y | |
| Educational level n (%) | • 57 (7.9%) |
| • Pre-vocational education | • 82 (11.4%) |
| • Senior general secondary education | • 7 (1.0%) |
| • Pre-university education | • 238 (33%) |
| • Secondary vocational education | • 264 (36.6%) |
| • Bachelor | • 65 (9%) |
| • Master PA/NP | • 9 (1.2%) |
| • Academic master | • - |
| • PHD | |
| Work experience as an ambulance care professional in years, mean (SD) | • 13.8 (9.5) |
| Occupation (%) | • 408 (56.5%) |
| • Ambulance nurse | • 17 (2.4%) |
| • Medical care provider | • 208 (28.8%) |
| • Ambulance driver | • 18 (2.5%) |
| • Care ambulance attendant | • 7 (1.0%) |
| • Physician Assistant | • 25 (3.5%) |
| • Nurse practitioner | • 33 (4.6%) |
| • Emergency medical dispatcher | • 6 (0.8%) |
| • Management and staff | |
| Normal weekly working hours, mean (SD) | • 33.3 (4.8) |
| COVID-19 disease status n (%) | • 380 (52.6%) |
| • Had COVID-19, fully recovered | • 67 (9.3%) |
| • Had COVID-19, partially recovered | • 7 (1.0%) |
| • Had COVID-19, not recovered | • 23 (3.2%) |
| • On this moment COVID-19 | • 245 (33.9%) |
| • Didn't have COVID-19 | |

**Table 2** Median, first and third Q1-Q3 and prevalences of insomnia, fatigue and symptoms of mental health problems

| Outcome | EMS nurses (*N* = 722) |
|---|---|
| Insomnia | 5 (2–11) |
| • ISI score, median (Q1-Q3) | 283 (39.2%) |
| • Prevalence, n (%) | |
| Fatigue | 3 (2–11) |
| • NFR score, median (Q1-Q3) | 235 (32.5%) |
| • Prevalence, n (%) | |
| Anxiety | 4 (2-6.3) |
| • HADS-anxiety score, median (Q1-Q3) | 133 (18.4%) |
| • Prevalence, n (%) | |
| Depression | 3 (1–6) |
| • HADS-depression score, median (Q1-Q3) | 117 (16.2%) |
| • Prevalence, n (%) | |
| PTSD | 0.5 (0.2–1.2) |
| • Average IES-6 score overall questions, median (Q1-Q3) | 72 (10%) |
| • Prevalence, n (%) | |
| Symptoms of insomnia or fatigue n (%) | 372 (51.5%) |
| Symptoms of anxiety, depression, or PTSD, n (%) | 197 (27.3%) |

on anxiety, depression or PTSD has also symptoms of insomnia and/or fatigue.

### Factors associated with mental health outcomes

All the influencing factors (demographics, work-related and COVID-19 disease status) were entered into the multivariable analyses. For these factors, no multicollinearity was established. The Hosmer and Lemeshow goodness of fit scores for all five outcomes were above 0.05, indicating a good fit of the model to the data.

Table 3 shows the results on the multivariable analyses. Multivariable analyses indicated that participants who lived alone were associated with an increased odds for insomnia. The characteristics working as an emergency medical dispatcher and work experience were associated with an increased odds for fatigue. Not recovering from COVID-19 or partially recovering from COVID-19 was significantly associated with an increased odds for symptoms of fatigue. There were a few EMSs with a protective association with symptoms of fatigue. The recovery of COVID-19 disease status or, at this time, COVID-19 was a protective factor for symptoms of insomnia.

## Discussion

In this study, we observed prevalences of insomnia, fatigue and symptoms of mental health problems among EMS nurses. Specifically, the prevalence of insomnia was 39.2%, while fatigue affected 32.5% of participants. Anxiety was reported by 18.4% and depression by 16.2%. Additionally, 10% of the sample met the criteria for PTSD. Notably, 51.5% of participants experienced either insomnia or fatigue, while 27.3% reported struggling with symptoms of at least one mental health

**Table 3** Factors significantly associated (P-value and oddsratio) with mental health outcomes in a multivariable regression model†

| | **Fatigue ($R^2$ = 0.036)‡** | | **Insomnia ($R^2$ = 0.019)‡** | |
|---|---|---|---|---|
| | **OR (95% C.I.)** | ***P*- value** | **OR (95% C.I.)** | ***P*-value** |
| **Age** | 0.98 (0.95–1.01) | 0.21 | 1.01 (0.98–1.04) | 0.54 |
| **Gender** | | | | |
| Men | 1.0 | | 1.0 | |
| Woman | 0.96 (0.63–1.46) | 0.84 | 1.26 (0.86–1.85) | 0.24 |
| Other | solution did not converge | | solution did not converge | |
| **Household** | | | | |
| Living alone | **3.37 (1.70–6.67)** | **< 0.001** | **1.96 (1.06–3.62)** | **0.03** |
| Living with partner | 1.0 | | 1.0 | |
| Living with partner and child(ren) | 1.01 (0.66–1.57) | 0.95 | 0.83 (0.56–1.22) | 0.34 |
| Living with child(ren) | 1.90 (0.93–3.91) | 0.08 | 1.43 (0.73–2.82) | 0.30 |
| Living with others | 0.49 (0.07–3.24) | 0.46 | 0.74 (0.15–3.67) | 0.71 |
| **Educational level** | | | | |
| Pre-vocational education | 1.43 (0.69–2.97) | 0.34 | 1.47 (0.75–2.89) | 0.26 |
| Senior general secondary education | 0.68 (0.35–1.31) | 0.25 | 0.87 (0.49–1.55) | 0.63 |
| Pre-university education | 0.00 (0.00) | 1.00 | 2.72 (0.52–14.12) | 0.24 |
| Secondary vocational education | 0.74 (0.45–1.22) | 0.23 | 1.03 (0.66–1.62) | 0.88 |
| Medical care provider | 1.0 | | 1.0 | |
| Professional master | 1.48 (0.72–3.05) | 0.29 | 1.90 (0.94–3.82) | 0.07 |
| Academic master | 0.26 (0.03–2.35) | 0.23 | 0.50 (0.09–2.72) | 0.43 |
| **Working hours** | 0.97 (0.93–1.01) | 0.12 | 0.98 (0.95–1.02) | 0.34 |
| **Occupation** | | | | |
| Ambulance nurse | 1.0 | | 1.0 | |
| Medical care provider | 1.25 (0.33–4.73) | 0.74 | 1.74 (0.55–5.54) | 0.35 |
| Ambulance driver | 1.15 (0.71–1.86) | 0.56 | 1.42 (0.92–2.18) | 0.11 |
| Care ambulance attendant | 2.51 (0.81–7.75) | 0.11 | 1.85 (0.65–5.28) | 0.25 |
| Physician assistant | 0.94 (0.14–6.54) | 0.95 | 0.67 (0.10–4.40) | 0.68 |
| Nurse practitioner | 0.43 (0.13–1.37) | 0.15 | 0.45 (0.15–1.31) | 0.14 |
| Emergency medical dispatcher | **5.46 (2.30-12.98)** | **< 0.001** | 1.64 (0.73–3.70) | 0.26 |
| Other | 0.71 (0.07–7.32) | 0.77 | 1.48(0.20-10.89) | 0.70 |
| **Experience in years** | **1.04 (1.01–1.07)** | **0.02** | 1.01 (0.98–1.04) | 0.51 |
| **COVID-19 disease status** | | | | |
| Had COVID-19, fully recovered | 0.92 (0.61–1.38) | 0.68 | **0.65 (0.45–0.93)** | **0.02** |
| Had COVID-19, partially recovered | **4.62 (2.40–8.91)** | **< 0.001** | 1.38 (0.77–2.51) | 0.28 |
| Had COVID-19, not recovered | solution did not converge | | 7.13 (0.81–62.65) | 0.08 |
| On this moment COVID-19 | 0.84 (0.30–2.36) | 0.74 | **0.35 (0.12–0.98)** | **0.05** |
| Didn't have COVID-19 | 1.0 | | 1.0 | 0.49 |
| | **Fatigue ($R^2$ = 0.036)‡** | | **Insomnia ($R^2$ = 0.019)‡** | |
| **EMS** | **OR (95% C.I.)** | **P-value** | **OR (95% C.I.)** | **P-value** |
| EMS A | 1.0 | | 1.0 | |
| EMS B | 1.11 (0.44–2.79) | 0.83 | 1.13 (0.47–2.71) | 0.79 |
| EMS C | 0.56 (0.17–1.79) | 0.33 | 2.02 (0.72–5.66) | 0.18 |
| EMS D | 1.01 (0.38–2.71) | 0.98 | 1.30 (0.51–3.30) | 0.58 |
| EMS E | 2.12 (0.58–7.73) | 0.26 | 2.03 (0.60–6.92) | 0.26 |
| EMS F | 0.94 (0.34–2.62) | 0.91 | 0.96 (0.36–2.55) | 0.94 |
| EMS G | **0.18 (0.05–0.65)** | **0.01** | 0.70 (0.26–1.90) | 0.48 |
| EMS H | **0.25 (0.09–0.77)** | **0.01** | 0.66 (0.27–1.65) | 0.37 |
| EMS I | 1.25 (0.47–3.31) | 0.66 | 1.18 (0.47–2.96) | 0.73 |
| EMS J | 0.36 (0.07–1.87) | 0.22 | 1.40 (0.39–4.98) | 0.61 |
| EMS K | 4.52 (0.88–23.05) | 0.07 | 4.56 (0.90-23.05) | 0.07 |
| EMS L | 0.90 (0.26–3.07) | 0.87 | 1.63 (0.53–5.05) | 0.39 |
| EMS M | 1.00 (0.37–2.68) | 1.00 | 2.18 (0.88–5.43) | 0.10 |
| EMS N | 2.04 (0.42–10.02) | 0.38 | 1.06 (0.21–5.25) | 0.95 |

**Table 3** (continued)

| | Fatigue ($R^2$ = 0.036)‡ | | Insomnia ($R^2$ = 0.019)‡ | |
|---|---|---|---|---|
| | **OR (95% C.I.)** | ***P*- value** | **OR (95% C.I.)** | ***P*-value** |
| EMS O | 1.31 (0.46–3.77) | 0.62 | 1.30 (0.47–3.57) | 0.61 |
| EMS P | 0.47 (0.16–1.38) | 0.17 | 1.06 (0.42–2.71) | 0.90 |
| EMS Q | 1.25 (0.48–3.27) | 0.64 | 1.63 (0.65–4.05) | 0.30 |
| EMS R | 1.04 (0.36–3.01) | 0.95 | 1.02 (0.36–2.87) | 0.97 |
| EMS S | 0.33 (0.08–1.37) | 0.13 | 0.72 (0.22–2.37) | 0.59 |
| EMS T | 1.60 (0.58–4.43) | 0.37 | 1.32 (0.50–3.52) | 0.58 |
| EMS U | 0.84 (0.27–2.64) | 0.76 | 0.93 (0.31–2.79) | 0.89 |
| EMS V | 0.97 (0.29–3.20) | 0.96 | 2.88 (0.96–8.62) | 0.06 |
| EMS W | 0.62 (0.18–2.10) | 0.44 | 1.94 (0.71–5.33) | 0.20 |
| EMS X | 0.72 (0.22–2.39) | 0.59 | 1.64 (0.55–4.88) | 0.37 |
| EMS Y | 0.55 (0.16–1.88) | 0.34 | 1.02 (0.34–3.07) | 0.98 |

† Reference group for gender was men, for household was living with partner, for EMS was EMS A, for educational level was bachelor; for occupation was ambulance nurse and for COVID-19 disease status was didn't have COVID-19

‡ $R^2$ is the coefficient of determination for each model

problem. These findings highlight a significant burden of insomnia, fatigue and related symptoms of mental health problems within the EMS nurses. In an initial exploration of personal characteristics associated with an increased odds for insomnia and fatigue, several key factors emerged. These factors are partially recovering from COVID-19 (fatigue) living alone (insomnia) working as an emergency medical dispatcher and more work experience (both higher odds of fatigue). A protective association was observed for recovered from COVID-19 for insomnia and, interestingly, working in certain EMSs for fatigue.

The prevalence of insomnia in this study was found to be somewhat lower compared to a study conducted in Spain [12]. The Spanish study measured insomnia during the first wave of the COVID-19 pandemic, a period marked by heightened uncertainty and widespread disruption. In contrast, our study was conducted two years later, when the immediate impacts of the COVID-19 pandemic had lessened, and societal conditions had started to stabilize. This difference in timing may partially explain the lower prevalence of insomnia in our sample, as the initial shock and stress of the COVID-19 pandemic were likely to have had a more significant impact on sleep quality during its early waves of the COVID-19 pandemic. When comparing our findings with the prevalence of insomnia in the general Dutch population, it becomes clear that insomnia is notably more prevalent among EMS nurses. In 2022, the prevalence of insomnia in the general Dutch population was reported to be 25.3%, which is markedly lower than the 39.2% found in this study sample of EMS nurses [51]. It is worth noting that sleeping problems increased in the general population during the COVID-19 pandemic, likely due to worries about own health [21, 52]. However, the higher prevalence of insomnia among EMS nurses in our study suggest that work-related factors may contribute to the elevated prevalence. This finding is in line with a study about insomnia among critical societal functions during the COVID-19 pandemic [21]. The high-stress nature of work in the prehospital setting, including exposure to critical incidents and shift work, likely exacerbates the odds of insomnia in this population. Addressing these factors is vital for sustainable employability. This underscores the need to gain in-depth insight into the causes of work-related insomnia.

Due to insufficient data on fatigue, a direct comparison with recent prevalences for both EMS nurses and the general population is not feasible. This gap in data means that we are unable to draw conclusions about the relative burden of fatigue within the prehospital setting compared to broader societal trends. However, available prevalence data from previous studies, particularly those conducted in 2015 and 2018, indicate higher rates of fatigue among EMS nurses. These findings suggest that fatigue may be a significant concern in this workforce, likely linked to the unique working conditions of the profession. Given the high prevalences reported in these earlier studies, further research is needed to monitor fatigue trends in this sector.

A comparison of the mental health problem prevalences in this study with those from other research on EMS nurses during the COVID-19 pandemic reveals several notable differences. The prevalence of anxiety in our sample is higher than reported in similar studies. In contrast, the prevalence of depression aligns closely with findings from other studies, indicating consistent prevalence of depressive symptoms among EMS nurses during this period. The prevalence of PTSD in our study, however, is lower than that observed in other research, suggesting regional differences or varying levels of exposure to traumatic events. These discrepancies highlight the complexity of mental health outcomes in this population

and underscore the need for further investigation into the factors contributing to these variations.

Our study identified several groups at higher odds for insomnia and fatigue among EMS nurses, including those living alone and emergency medical dispatchers. Living alone has previously been linked to poorer mental health outcomes, possibly due to fewer opportunities for social support or distraction at home [53]. These groups may require targeted interventions. Note that this study is an initial exploration; other unexamined factors may have influenced insomnia and fatigue, such as Long COVID. A significant number of nurses in this study contracted COVID-19, and speculatively a proportion continue to be impacted by Long COVID. Insomnia and fatigue are known symptoms of Long COVID [54]. However, due to our study design, we were unable to determine the underlying relationship between occupation, Long COVID and our outcomes of interest. We did observe, however, that 'recovery from COVID-19' decreased the odds of insomnia. It is conceivable that this leads to less fear of being infected, which subsequently lead to improved sleep. However, fear related to COVID-19 infection was not collected in the study, and we were not able to explore this theory. Future research is needed to better understand the interaction between individual factors.

Organizational differences in mental health outcomes also warrant further attention, as this study revealed that several EMSs exhibited a protective association with fatigue. Research has shown that a positive work environment contributes to the sustainable employability of healthcare professionals [55]. Future studies could explore the differences between the EMSs to learn from best practices.

### Strengths and limitations

EMS nurses are critical for the chain of the emergency care, and yet the challenges they face are poorly studied and not well understood. Strength is that this study is the first to specifically investigate fatigue among EMS nurses during the COVID-19 pandemic, which adds valuable insight into this under-researched area. Another strength of this study is the use of five validated scales to measure insomnia, fatigue, and mental health status among EMS nurses, allowing for comparisons with other studies in both ambulance care and broader acute or intensive care settings. Additionally, the spread of the study sample is another strength, with data collected from professionals across all EMS organizations in the Netherlands. And demographic characteristics of the sample align with those of the broader population of EMS nurses. A limitation of this study is that it raise concerns about selection bias. EMS nurses experiencing symptoms of insomnia, fatigue, or symptoms of mental health problems may have been more likely to participate, potentially leading to an overestimation of prevalences. Conversely, those with more severe symptoms may have dropped out of work and thus were underrepresented in the study. Mental health issues are a sensitive topic in many countries prone to underreporting. This study was trying to create a free setting where participants could answer openly and honestly. This has to do with the choice for an accessible way of approaching the participants. It has been a conscious choice to gain initial insights into this important topic within this target group in this way. Future research can build on this baseline insight. They could mitigate the selection bias by employing a random sampling strategy and conducting nonresponse analyses to ensure more robust and representative findings. Nonresponse bias could also be a concern since several participants did not complete all scales for all five outcomes. It is possible that participants experiencing symptoms of fatigue were more likely to discontinue the survey. However, our comparison between participants who completed all five mental health outcome scales and those who completed at least one scale did not reveal a statistically significant difference in the five outcomes suggested minimal influence from nonresponse. Lastly, results observed in the regression analyses could potentially be caused by other unmeasured confounders. It is possible that a specific working circumstances influenced both the independent variable and the dependent variable. The fit of the regression models was relatively low ($R^2$ = 0.036 for fatigue and 0.019 for insomnia). However, this is not surprising given that the primary aim of this study was to identify associations between well-established factors. Nevertheless, it is clear that future predictive models will require a broader range of potential explanatory variables.

## Conclusion

This study highlights a remarkable high prevalence of insomnia, fatigue, and symptoms of mental health problems among EMS nurses, with 39.2% reporting insomnia, 32.5% reporting fatigue, 18.4% reporting anxiety, 16.2% reporting depression, and 10% reporting PTSD. A possible explanation is that the COVID-19 pandemic has led to an accumulation of critical incidents, which may have contributed significantly to the mental and physical strain experienced by these professionals. Although the reported prevalences must be interpreted with caution due to the study design, mental health problems are typically underreported and warrant further research in this area.

It is important to consider the fact that 51.5% of EMS nurses reporting insomnia and fatigue are at risk of developing more serious mental health problems, which could lead to increased sickness absence. An important next step in research is to further explore the behaviors of healthcare professionals and work-related conditions that

contribute to the onset of insomnia and fatigue. A better understanding of these factors will enable the setting of targets and targeted interventions to promote change, ultimately improve the wellbeing and sustainability of EMS nurses.

**Abbreviations**

| | |
|---|---|
| CIs | Confidence intervals |
| CHERRIES | Checklist for Reporting Results of Internet E–Surveys |
| COVID | 19–Coronavirus Disease of 2019 |
| EMS | Emergency Medical Service |
| HADS | Hospital Anxiety and Depression Scale |
| IES | 6–Impact of Event Scale–6 |
| ISI | Insomnia Severity Index |
| Q1 | Q3–Quartile 1 and Quartile 3 |
| N | Number of participants |
| NFR | Need For Recovery |
| ORs | Odds ratios |
| PTSD | Posttraumatic stress disorder |
| $R^2$ | Pearson correlation coefficient |
| STROBE | Strengthening the Reporting of Observational studies in Epidemiology |
| VIF | Variance Influence Factors |

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12912-025-03270-y.

Supplementary Material 1

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**Author contributions**
MON, LV, SDP, SB and RE contributed to the conceptualization, design, data collection and analysis, interpretation, and writing and editing of the manuscript. MvdB contributed to the conceptualization, design, interpretation of the results, and review of the manuscript. JH, MK and ES contributed to the data collection, interpretation of the results and review of the manuscript. All the authors read and approved the final manuscript.

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**Data availability**
The datasets generated and/or analyzed during the current study are available in the Dans repository, https://doi.org/10.17026/dans-226-74kt < The application is under process and therefore not accessible right now but will be available in the near future>.

## Declarations

**Ethics approval and consent to participate**
The study was approved by the ethical research committee of the HAN University of Applied Sciences (ECO 334.03/22). This study complies with the Declaration of Helsinki. The participants provided their informed consent to participate before starting the survey. All the experiments were performed in accordance with the relevant guidelines and regulations..

**Consent for publication**
Not applicable.

**Competing interests**
The authors declare no competing interests.

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