Prevalence and determinants of anxiety among healthcare workers (HCWs) in Europe during Covid-19

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EC PSYCHOLOGY AND PSYCHIATRY
Research Article

Prevalence and Determinants of Anxiety among Healthcare Workers (HCWs) in Europe during Covid-19

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Received: August 16, 2023; **Published:** August 30, 2023

Abstract

Introduction: The COVID-19 pandemic, whose origin was established to be in China, wreaked havoc across the world infecting and killing huge numbers of people. Healthcare workers (HCWs) were affected in many ways especially mentally. The study aims at establishing how anxiety affected HCWs in Europe.

Methodology: A systematic review study was carried out based on the Prefrred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) using five databases. The search period was from September 27th to December 7, 2021, and 2326 articles were yielded. Of these, 22 met the inclusion criteria. All the data was inputted onto a data extraction sheet and thematic analysis was carried out on the study outcomes to identify themes.

Results: It was established that there was a significant increase in anxiety among HCWs in Europe. It was likewise found that there were non-modifiable (sex and age) and modifiable (nature of work, vulnerability, comorbidities, workload, social factors and geographical location) risk factors for anxiety among the workers. Young female HCWs were found to have a higher prevalence of anxiety compared to male health workers. Anxiety is also associated with other mental health issues as well as suicidal thoughts.

Conclusion: There was a marked increase in anxiety among HCWs in Europe during the COVID-19 pandemic. Mental health during disease emergencies should be a priority in terms of policy among healthcare employers. There is a need for further research in this area of mental health to build more evidence that informs policy.

Keywords: *Prevalence; Determinants; Anxiety; Healthcare workers; Europe; Covid-19*

Introduction

Havoc was wreaked on the world's demographics by the Coronavirus 2019 (COVID-19) pandemic- a highly contagious viral disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS- CoV- 2). The pandemic originated in Wuhan, China in December 2019 and progressed rapidly, infecting over 623 million people, with over 6 million deaths worldwide [1]. COVID-19 is linked with a range

of illnesses from common cold to severe illnesses that can result in respiratory and cardiac failure, acute respiratory syndrome and death. Asides the physical effect, it can also hurt mental health [2].

On the 24th of January 2020, France reported the first case of COVID-19 in Europe. Germany and Finland followed suit, three and five days later respectively and within the next six weeks all twenty-seven countries of the European Union were affected [3]. During the initial phase of the pandemic, Europe was the continent that was the most affected. It was the epicentre of the pandemic, though the impact varied in different countries [4]. The virus spread the fastest and caused the most tragic deaths in Italy, France and Spain. The apparent mortality rate in Italy, Spain and France was 13%, 11% and 15% respectively as of April 2020 [5]. In the first week of 2022, seven million new cases of COVID-19 were reported in Europe [6]. As of February 2022, a reported 1,812,613 people had died of COVID-19 in Europe, of which 150 481 were in the UK. France had 22.2 million cases, making it the most affected country in Europe [7]. Eastern and Central European countries are the most impacted with some of the highest per capita death rates in the world [8]. Though there has been significant progress in research, which has led to a greater understanding of the virus as well as its management. However, the virus continued to cause mayhem in many countries including those in Europe as they experience second, third and even fourth waves caused by variants [9,10]. Covid-19 affects the mental health of various groups of people in society, including Health Care Workers (HCWs) and this is because of its pathogenicity, rapid spread and high mortality rates. Other factors like lockdowns, closure of schools and businesses also have an impact on mental health [2,11].

During the peak of the pandemic, anxiety due to COVID-19 rose in the general population but more so in HCWs as they are more frequently exposed than the general population. They are more prone to anxiety as a result of the ever-changing COVID-19 protocol, increased work demand, and unavailability of sufficient Personal Protective Equipment (PPE) [12]. They manage infected patients and so they are at a risk of not only being infected but also infecting their families. Physical and mental exhaustion results in decreased immunity which could also increase anxiety levels [12,13]. Infected HCWs have the potential of increasing the transmission chain in and outside the health facilities to the general population [14]. Research has shown that HCWs in the frontline have a higher chance of testing positive to COVID-19 than the general population [15]. Europe has the highest proportion of healthcare workers with COVID-19 infection [16]. Nurses constitute the largest group among the cadre of healthcare workers and are also the ones most affected with an average of 2623 cases and 101 deaths across Europe. This is even a conservative estimate due to the dearth of data [17].

Anxiety has been linked to a decrease in HCWs morale, absenteeism, decreased job satisfaction and quality of care [18]. Their ability to handle stressors is not only critical for their well-being but also of their families and patients [19]. Understanding the prevalence and associated factors of COVID-19 infections among HCWs is essential for developing effective occupational health policies and strategies to better protect them against COVID-19 and other health problems [20] and [21]. Due to the absence of a previous study, this study aims to assess the prevalence and determinants of anxiety among HCWs in Europe during COVID-19.

Methods

Search strategies and selection criteria

This systematic review is reported using The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. Five databases were used for the search of articles including PubMed (Medline), CINAHL, PROQUEST, SCOPUS, SCIENCE DIRECT. These databases chosen were based on their accessibility for researchers. The following keywords were used to find relevant studies; ("Covid-19' OR 'Coronavirus' OR 'Sars-Cov2') AND ('Anxiety' OR "mental health") AND ('Health Care Workers' OR 'Medical staff' OR 'Health Professionals' OR 'Frontline workers') AND ('Europe OR "European countries OR all studies which included any European country").

The search period was from September 27th to December 7, 2021. To be included in the review, the papers had to meet the following inclusion criteria: All types of studies including qualitative, quantitative, and mixed method, articles published in English**,** articles on anxi-

ety and health care workers, articles in full text and primary data. The exclusion criteria on the other hand entailed; papers not published in English, studies on anxiety but not related to COVID-19, papers not in full text, and previous systematic reviews.

Selection process

The papers were passed through various selection processes. All the papers were imported into an Excel file and duplicates were removed. Each researcher took turns to re-screen the articles. Titles of papers were screened four times. The titles were screened and irrelevant ones were removed using the exclusion criteria of the study. All the researchers reviewed before a decision was made to exclude the papers. The abstracts of the papers were read and their full text to further exclude or maintain them. Bibliography of remained studies was read to add if there were any. Two thousand, three hundred and twenty-six (2326) articles of original search articles including conferences, grey literature, government reports and organizational reports on anxiety in healthcare workers conducted in Europe were retrieved. The total number of articles that met the inclusion criteria was 378 articles. Twenty-two articles were relevant to the review. The PRISMA flow diagram in figure 1 shows the systematic steps and approach.

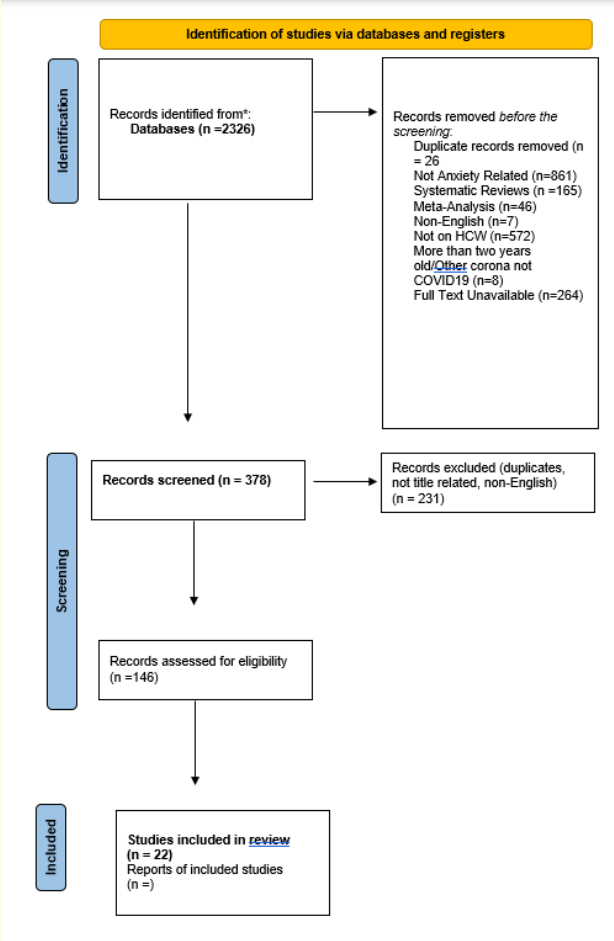

Figure 1: *PRISMA flow diagram for selecting studies.*

Data extraction and charting

Four independent researchers assessed the quality of studies using the Critical Appraisal Skills Program (CASP) [22] checklist for qualitative studies with the study being able to answer the following questions: "Did the study address a focused research question?; "Were participants recruited ethically?"; "Were appropriate methods used to address this issue?"; "Were the effects of intervention reported comprehensively?"; "Can the results be applied to the local population?"; "Were the exposure and outcome accurately measured to minimize bias?"; "Where confounders accounted for?"; "What are the results and how precise are they?"; "Are the studies' results valid?" and "Do these results fit within available evidence. These questions were satisfied in all included papers.

Data from the included papers were extracted using Microsoft Excel sheet which was designed to capture relevant information about the publication. These are year, country, the target population and the section of healthcare they fall under, the aim of the study, results and their findings. All these were recorded in the table data extraction table presented in table 1.

	Study characteristics	Study objective	Methods	Main findings
1.	Tavormina., *et al*. (2020) [23] Italy	To provide a snapshot of the emotional impact related to anxiety and work stress in health professionals in Italy engaged in the treatment, prevention and containment of the COVID-19 pandemic and contribute to the validation of the SAVE 9 rating scale.	Cross-sectional studies/ online self-administered questionnaire/The SAVE-9 (Stress and Anxiety to Viral Epidemics - 9 items) scale was used to assess anxiety/ /n=836	• Among health professionals, there was a significant component of anxiety for their own and their family's health
2.	Marijanović I., *et al*. (2021) [24] Bosnia and Herzegovina	To evaluate the levels of depression, anxiety, and stress in healthcare and administrative staff in 5 oncology institutions in Bosnia and Herzegovina (BiH) in 2020 during the coronavirus disease 2019 (COVID-19) pandemic using the Depression, Anxiety and Stress Scale (DASS-21) questionnaire.	A cross-sectional observational study/n=175/ Data were collected using a questionnaire that captured general information about the participants and a DASS-21	• A statistically significant difference in the level of anxiety (P=0.011) among participants with comorbidities connected with increased risk of severe illness caused by SARS-CoV-2 compared with participants without comorbidities. • Supplement intake and educational level were significantly related (P=0.012). • High levels of anxiety were accompanied by high levels of depression among participants (P < 0.01).
3.	Ghio., *et al*. (2021) [25] Italy	To investigate the impact of the COVID-19 pandemic on Health worker's mental wellbeing.	Cross-sectional/structured questionnaire, delivered on the Lime Survey platform/n=731/ Symptoms of anxiety were assessed using the Generalized Anxiety Disorder-**7** (GAD- 7)	• Increased levels of anxiety (61%) • A statistically significant association between burnout and insomnia, depression, anxiety, and post-traumatic symptoms

4.	Quintana-Domeque (2021) [26] Italy, Catalonia, United Kingdom	To understand the prevalence of anxiety and depression, as well as associated risk factors.	Multi-country Cross-sectional survey/n-5,275/ Random sampling/ GAD-7 questionnaire-Anxiety measure/Patient Health Questionnaire (PHQ-9)-Depression measure.	• Rates of anxiety was highest in Italy (24.6%), second highest in Catalonia (15.9%), and lowest in the UK (11.7%). • Across all countries, higher risk of anxiety was found among women, individuals below 60 years old, those feeling vulnerable/exposed at work, and those reporting normal/below-normal health.
5.	Di Filippo., *et al*. (2021) [27] Italy	To evaluate sleep quality and psychological effects on paediatric healthcare workers during the first wave of the COVID-19 epidemic in Italy and to evaluate differences between primary and secondary care operators.	Cross-sectional study/ online self-administered questionnaire survey/ n=175	• 19.4% of subjects suffered from anxiety. • Lower values of anxiety and social support were found in primary care staff compared to secondary care one. The associations between healthcare professional figures (being primary or secondary care operators) and mental health outcomes were not statistically significant. • However, sex, age and having a SARS-CoV-2-infected relative/friend had an independent effect on mental health outcomes.
6.	Siddiqui (2021) [28] United Kingdom	To identify the causes of anxiety in Health Care Practitioners (HCP) during the COVID-19 pandemic, and to assess whether HCPs felt they had adequate mental health and wellbeing support and to identify their unmet support needs.	A cross-sectional survey/online SurveyMonkey platform/n=558	• The self-rated anxiety score increased significantly during the COVID-19 pandemic compared with pre-pandemic level. • Breakdown by job role revealed pre-pandemic anxiety levels were very similar across all job roles. However, during the COVID-19 pandemic they increased, with the highest increase seen in doctors and nurses. • The factors most associated with anxiety were mainly related to risk of exposure to SARS-CoV-2 to themselves, family and patients, and related to lack of testing and lack of personal protective equipment (PPE).

7.	Franzoi (2021) [29] Italy	To investigate anxiety, post-traumatic stress, and burnout in a sample of Medical Health Practitioners (MHP).	Descriptive, cross-sectional study/ web-based survey/State-Trait Anxiety Inventory- Y (STAI-Y), the Impact of Event Scale-Revised (IES-R)/n = 167	• MHPs reported good overall mental health. • MHPs had lower odds of exhibiting state anxiety and low personal accomplishment compared to HPs not working closely with COVID-19 patients.
8.	Clark, A. (2021) [30] Ireland	To evaluate and analyze elevated anxiety symptoms, post-traumatic stress disorder, and moral trauma in COVID-19 frontline healthcare professionals	Descriptive cross-sectional/Online survey/ n=3800	• A significant prevalence of anxiety especially in moderate–to–severe forms, is directly associated with the family- and work-related conditions generated by the COVID-19 crisis. • Being a woman and a hospital admission for self or the loved ones are related to anxiety
9.	Mosolova., Sosin and Mosolov (2021) [31] Russia	To assess the range of psychopathological symptoms (anxiety, stress, depression, burnout) and risk factors in frontline HCWs during spring and autumn outbreaks of the new coronavirus infection in Russian Federation.	Two independent, cross-sectional hospital-based online surveys/ n= 2195/ SAVE-9 and GAD-7, PHQ-9, MBI and PSS-10 scales.	• The study revealed the rates of anxiety as 32.3%. • Rate of anxiety was higher in October 2020 compared with May 2020. • Risk factors included: female gender, younger age, being a physician, working for over a week, living outside of Moscow or Saint Petersburg, being vaccinated against COVID-19.
10.	Roberts., *et al*. (2021) [32] United Kingdom	Explored UK nurses' experiences of working in a respiratory environment during the COVID-19 pandemic in order to understand and explain the levels of resilience, anxiety and depression in nurses working with respiratory patients during the COVID-19 pandemic.	Cross-sectional study/e-survey/ GAD7 (anxiety)/ n=255	• Nearly 21% (40/191) experiencing moderate to severe or severe symptoms of anxiety • 50.3% experienced minimal anxiety, 28.8% (55/191) experienced mild symptoms and 20.9% experienced moderate severe to severe symptoms • Anxiety variables, age and years of qualification provided the best model fit. • Younger nurses with less experience have higher levels of anxiety and depression and had lower resilience.

11.	Naldi., *et al*. (2021) [33] Italy	To investigate the prevalence of anxiety, distress and burnout in HCWs of North-West Italy during the COVID-19 pandemic, and to detect potential psychosocial factors associated with their emotional response.	Cross-sectional survey/ STAI-Y and IES-R/ n=797	• A total of 618 (77.5%) participants had state anxiety. Severe in 23.3% • Women reported higher levels of severe state anxiety than men • Family division and increased workload were both independently associated with moderate-to-severe symptoms of state anxiety
12.	Londoño-Ramírez., *et al*. (2021) [34] Spain	To assess the differences in anxiety levels between HP and PCP and to detect factors that may influence them.	A descriptive cross-sectional study/The anxiety levels (measured using the Hospital Anxiety and Depression (HAD) scale)	• Study found anxiety "case" (35.6%) and "at-risk" (21%), • The factors associated with the perception of threat and protection were significant determinants of an increase in anxiety • There were greater symptoms of anxiety in the PCP group than the HP group (32% vs. 18%).
13	Bajo., *et al*., (2021) [35] Italy	To evaluate the negative and positive effect of anxiety in trauma on the mental state of health-care professionals.	Participants (N)=232 Questionnaire were used to collect data State Trait Anxiety Inventory, the Davidson Trauma Scale, and the Mental Health Continuum-Short Form.	• The measures of negative mental state and positive mental health loaded on separate but correlated factors. • Personal Protection Equipment availability moderated the effects of state anxiety and traumatic intensity on professionals' well-being.
14	Trumello et. al (2020) [36] Italy	To analyze the psychological adjustment of Italian healthcare professionals during the peak of the COVID-19 pandemic.	Participants (N)=627 Cross-sectional study Online Survey conducted	• Significantly higher levels of anxiety were observed among professionals working with COVID-19 patients.
15	Prazeres., *et al*. (2020) [37] Portugal	To identify the role of spiritual-religious coping regarding fear and anxiety in relation to COVID-19	Total Participants (N)=222 Cross-sectional Quantitative survey .	• Religiosity was neither a significant factor for coronavirus-related anxiety nor it was for fear of COVID-19. • Participants with higher levels in the hope/optimism dimension of the Spirituality Scale showed less coronavirus-related anxiety.

16	Luceño-Moreno., *et al*. (2020) [38] Spain	To analyse posttraumatic stress, anxiety and depression during the COVID-19 pandemic in HCW.	Total participant= 1422 Cross-sectional Study Quantitative Study Non-probabilistic sampling	• The study detailed description of the association between different variables and anxiety
17	Lasalvia., *et al*. (2020) [39] Italy	To assess the magnitude of psychological distress and associated factors among hospital staff during the COVID-19 pandemic in a large tertiary hospital located in north-east Italy.	Total Participants=2195 Online survey conducted Impact of Event Scale (IES-R), the Self-rating Anxiety Scale (SAS) and the Patient Health Questionnaire (PHQ-9)	• Overall, 63.2% of participants reported COVID-related traumatic experiences at work • 50.1% showed symptoms of clinically relevant anxiety
18	Azoulay., *et al*. (2020) [40] France	To assess the prevalence of symptoms of anxiety, depression, and peri-traumatic dissociation in HCPs.	Participants N= 1,058 Cross-sectional Study The Hospital Anxiety and Depression Scale and the Peri-traumatic Dissociative Experience Questionnaire were used	• The prevalence of symptoms of anxiety was 50.4% with the highest rates in nurses. • Male sex was independently associated with lower prevalence of anxiety • HCPs experience high levels of psychological burden during the COVID-19 pandemic.
19	Gonzalez-Plaza., *et al*., (2021) [41] Barcelona	To determine the Anxiety level of the healthcare workers of an obstetric unit during covid-19 pandemic	A descriptive cross-sectional study was used (n=77) State-Trait Anxiety Inventory	• It was observed that professionals who have children and professionals who reported having decreased their family income showed higher average scores of anxiety
20	Di Tella., *et al*. (2020) [42] Italy	The study aimed to assess the psychological impact of the COVID-19 outbreak on nurses and physicians	An online survey Total respondents= 145 Cross-sectional quantitative study The STAI Y1 and PCL-5 were used	• Nurses rated lower on their health and reported to be more worried about contracting COVID-19 • Similarly, significant differences emerged between nurses and physicians on anxiety symptoms

21	Pinho., *et al*., (2021) [43] Portugal	To evaluate and compare the depression, anxiety and stress symptoms in nurses at the beginning of the COVID-19 pandemic and after six months	A prospective cohort study (n=199) The Depression Anxiety Stress Scale was used A questionnaire was used	• Symptoms of anxiety decreased significantly over time • The anxiety score was significantly lower in nurses who frequently or always used all strategies compared to participants who never or rarely used them except for one strategy (rejecting information about COVID-19 from unreliable sources)
22	Apfelbeck., *et al*. (2021) [44] Germany	To assess anxiety, stress level, and perception of safety during the coronavirus disease 2019 (COVID-19) pandemic in health care workers	A cross-sectional survey was conducted Sample size= 63	• The anxiety of infection with COVID-19 wa at a median of 4.7 with no statistically significant difference between nurses and physicians. • The highest fear in 56.7% of the personnel is to get infected by a colleague tested positive for SARS-CoV-2 despite wearing surgical face masks.

Table 1: *Data extraction sheet from the 22 articles.*

The findings were then analysed and categorized using a thematic analysis approach. They were categorized into continents, healthcare workers, factors and prevalence which 22 articles provided data on European countries. Based on the final data, the studies were grouped based on the same findings which sub-themes were further extracted by comparing the articles for similarities and these were themes on effects, remedy and measuring scale used to measure anxiety levels. The data from the 22 articles is presented in table 2.

Results

General characteristics of studies

The 22 papers included in the review emerged from a total of 9 European countries in the years 2020 and 2021 with a total sample of 21511 healthcare workers. The majority of studies (68.2%) were conducted in 2021. Italy had the highest number of studies (40.9%) among HCWs that is followed by Spain (13.6%), Portugal and France (each 9.1%). In terms of study participants, the majority of HCWs were female (56.4%) and were working physicians and nurses (17.6% and 17.3% respectively). This is shown in table 2.

Methods employed in the studies

The majority of the studies employed the quantitative approach (95.45%) with cross sectional design (95.45%) that used questionnaire (95.45%) for data collection. In terms of sampling technique, 13.6% used random and snowball while 9.1% used the convenient method. As also shown in table 3, studies used different types of measuring scales. Prominent amongst the measuring scales being the State Trait Anxiety Inventory-Y (STAY-Y)-(5) which was used in 22.7% of the studies. The Hospital Anxiety and Depression Scale (HADS)-(3) and General Anxiety Disorder-7 (GAD-7)-(3) were used in 13.6% while the Depression and Anxiety Stress Scale (DASS-21)-(2) in 9.1%.

Variable	Frequency	Percentage
Year of Study		
2020	7	31.82
2021	15	68.18
Study Setting		
Online	21	95.45
Not stated	1	4.55
Gender		
Female	12124	56.36
Male	6300	29.29
Not Stated	3087	14.35
Country of Study		
Italy	9	40.91
Spain	3	13.64
Portugal and the United Kingdom	2	9.09
France	2	9.09
Bosnia and Herzegovina	1	4.55
Ireland	1	4.55
Russia	1	4.55
Germany	1	4.55
Italy, Catalonia (Spain) and United Kingdom	1	4.55
Occupation of HCWs		
Nurse	3725	17.32
Physician	3788	17.61
Assistant Nurses	229	1.06
Mental Health workers	56	0.26
Other and not stated	13713	63.75

Table 2: *General characteristics of the studies.*

Prevalence of anxiety among HCWs

The majority of the researches reported an increase in anxiety levels among HCWs during the pandemic compared to pre-pandemic even though the prevalence rates differ. As detailed in table 4, the reported prevalence rate ranges from as low as 11.7% recorded in the UK to 77.5% in Italy.

Variable	Frequency	Percentage
Study Approach		
Quantitative study	21	95.45
Mixed Method Study	1	4.55
Study Type		
Cross sectional	21	95.45
Prospective Cohort	1	4.55
Data collection Tool		
Questionnaires	21	95.45
Online Interview	1	4.55
Sampling Technique		
Random	3	13.64
Snowball	3	13.64
Convenient	2	9.09
Purposive	1	4.55
Non-Probability	1	4.55
Not stated	12	54.55
Anxiety Measuring Scale used		
Version of self-rating scales (SAS, SAVE-9, CVAS and GAD-7)	7	31.82
State Trait Anxiety Inventory-Y (STAY-Y)	5	22.73
Hospital Anxiety and Depression Scale (HADS)	4	18.18
Depression and Anxiety Stress Scale (DASS-21)	2	9.09
10 Item Linkert Scale	2	9.09
Zung Scale	1	4.55
No Scale	1	4.55

Table 3: *Characteristics of the studies based on methods used.*

Country	Prevalence
Bosnia and Herzegovina	29.14%
France	50.40%
Germany	56.50%
Italy	19.4%; 24.6%; 50.1%; 61%; 70.69%; 77.5%
Russia	32.30%
Spain	15.90%; 35.60%; 58.60%
United Kingdom	11.70%; 21%

Table 4: *Prevalence of anxiety among healthcare workers.*

Determinants of anxiety

Determinants of COVID-19 related anxiety identified in the studies are categorized as non-modifiable and modifiable determinants. These are detailed below.

Non-modifiable determinants

Age

Age is associated with anxiety as reported in seven papers. HCWs of a younger age who had a lesser work experience reported with higher levels of anxiety and age was found to be a significant factor [24,26,27,30-32,42]. However, Londono-Ramirez., *et al.* [34] found no significant association with age among those at risk of or actual cases of anxiety.

Sex

Thirteen researches established that sex was associated with anxiety levels. Anxiety was found to be lower in males and higher in females. Also, being a female nurse and having a relative or co-worker admitted for COVID-19 and working in high risk areas increased the odds further [24,26,27,30,31,34,35,37-40,42]. Bajo., *et al.* [35] however, investigated age and profession as cofactors using "Process Syntax" and were found not to be factors. Marijanović., *et al.* [24] concluded, contrastingly, that there was no difference in anxiety levels based on sex among the HCWs.

Modifiable determinants

Nature of work

Seventeen papers from the twenty-two included studies concurred that the type of occupation was a contributing factor to anxiety incidences. Physicians, nurses and nurse-aid working in hospitals, primary and secondary institutions, were found to have the highest risk among other healthcare workers [24,27-34,36,38-40,42-44].

However, HCWs that experienced lower anxiety rate were HCWs working in communities, University institutions and mental health professionals working in mental institutions [25,28,29,38].

Being a physician presented the highest risk of anxiety [26,31]. While Siddiqui., *et al.* [28] recorded no distinction, they noted an increase in both nurses' and doctors' anxiety levels. Bajo., *et al.* [35] found nature of work to be no factor.

Vulnerability

The perceived vulnerability degree of exposure to COVID-19 is highest among those working directly with patients, lack of Personal Protective Equipment (PPE), working in the frontline and lack of related protective measures were found to be factors for anxiety in a number of the reports. The condition was also compounded by fear of infecting or being infected by co-workers, relatives, friends and family members. Lack of testing and the absence of a vaccine were also found to be triggers of anxiety. Healthcare workers who worked in direct proximity and high contagion areas of COVID-19 such as ICU involved in everyday struggle to keep patients alive. Those that experienced job instability and changes, those that worked irregular part time shifts and those who witnessed patient deaths were found to be of higher risk of anxiety. There was also an association with concerns about management of the pandemic and infected HCWs as well as uncertainty about the future, [24,26-28,30-36,38-40,42-44].

Pinho., *et al.* [43] posits that healthcare workers who followed recommended protective protocols had lower anxiety compared to those that did not follow. Bajo., *et al.* [35] pronounces that availability of personal protective equipment neutralised the effects of state anxiety. Some researchers arrived at some descending conclusions, for instance Aphelbeck., *et al.* [44] found that even with PPE avail-

ability, fear by healthcare workers of being exposed to COVID-19 by co-workers kept anxiety levels high. While Marijanovic., *et al.* [24] concluded that there was no association between professionals who are highly exposed to COVID-19 compared to those that are not.

Comorbidities

Having previous ailments, incidence of mental health or psychological conditions and specifically a history of anxiety itself was found to contribute to increased incidence by seven papers [24-26,30,32,37,39].

Workload

HCWs who had a high workload and those working long hours displayed higher anxiety. Higher workloads were as well associated with the severe forms of anxiety [24,31,33,34,40,44]. One research in Russia, demonstrated an elevated anxiety incidence in workers who did shifts that are longer than a week [31]. Londoño-Ramírez., *et al.* [34] attributed 12 to 24 hour shifts to higher anxiety levels.

Social factors

Seven researches linked anxiety to a number of social factors. Low socio-economic status, income losses, inability to care for family, low education level and family conditions such as having dependence are triggers of anxiety in healthcare professionals. Pressures to do with finance, poor communication, family and having dependence were found to be significant contributors to anxiety. Persons that encountered family divisions (living separated from their own family for safety reasons, fear of endangering relatives) experienced greater anxiety, Young nurses who are not in a relationship were also found to be at high-risk [30,33,37,40-42].

However, according to Prazeres., *et al.* [37] healthcare workers who were high in the hope or optimism dimension of the Spirituality Scale displayed a much lower risk of anxiety. This is besides the fact that they found religion to be an insignificant factor to COVID-19-related anxiety. Marijanovic., *et al.* [34] states that there was no difference in levels depending on marital status.

Geographical location

Anxiety was found to be more prevalent in some geographical areas than others. Four articles documented location to be a factor. Anxiety was much higher among healthcare workers particularly doctors in Italy compared to those in Catalonia and lowest in the United Kingdom [24,26,31,39]. Lasalvia., *et al.* [39] declare anxiety levels in some highly burdened areas in the northeast parts of Italy to be higher than levels reported in China. In the Russia study by Mosolova., *et al.* [31] affirms higher incidences of anxiety were recorded in people who lived outside the big cities of Moscow and St Petersburg. In the study by Marijanovic., *et al.* [24] on HCW in Bosnia and Herzegovina, anxiety was found to be at different levels among oncology workers from different cities, the highest being in Mostar and the lowest in Tazia.

Association with other mental conditions

Anxiety often co-existed with other mental health issues such as depression, insomnia, Post Traumatic Stress Disorder (PTSD), emotional drainage and burnout [24-26,30,32,38]. Clark., *et al.* [30] further postulate that anxiety can lead to symptoms of other ailments such as post-traumatic stress disorder symptoms among primary care providers.

Three studies delved further into the consequences of the condition on healthcare workers [23,31,32]. Tavormina., *et al.* [23] state that even though the healthcare workers faced a mentally testing time and faced extreme psychophysical stress the majority were willing to continue with the provision of services. However, in some, the effects were negative, Roberts., *et al.* [32] reports that some healthcare workers found it difficult to provide support to their families. Worse still, suicidal thoughts were expressed by some participants [30,31]. Absenteeism and substance use were reported by some [30].

Discussion

The study was to assess the prevalence and determinants of anxiety among HCWs in Europe during COVID-19. The results provide a starting point for policymakers and managers to have informed responses towards mental health issues during global emergencies such as that posed by COVID-19 among healthcare workers in Europe and elsewhere. They further provide a baseline for researchers in studying mental health issues in the same context. The studies predominantly employed quantitative methods and all concurred that there was an increase in anxiety among Europeans and much higher in HCWs, standing at 41% [26]. This is consistent with the researchers' expectation that HCWs would have a higher prevalence of mental health issues during the pandemic and deserve to be studied unitarily. It was established that anxiety was caused by non-modifiable factors (age and sex) and modifiable factors (nature of work, vulnerability to COVID-19, comorbidities, health care professional's workload, social factors and geographical location that the HCW stays). It was as well found that anxiety had a positive association with other mental health conditions. Suicidal thoughts were one of the outcomes associated with anxiety among HCWs.

It was apparent that anxiety increased significantly among HCWs when COVID-19 came into existence. This was expected, a number of researchers posits that anxiety increased as a result of hospital workers experiencing significant changes in work conditions that they had not experienced before [45,46,52]. This contributed to HCWs experiencing more severe anxiety than that experienced by the general population. Previous research has shown that HCWs have increased anxiety among other mental health conditions during epidemics and pandemics. This is based on evidence from researches during the Ebola outbreak, MARS and SARs [52-55]. Watching sick people, dying or struggling for their life and the perception of being vulnerable were causative of anxiety among HCWs. Similar to the research by Ratiu, Curseu, and Fodor [56], health worker perceived higher vulnerability, mortality and lower job satisfaction.

This mental condition affected different groups of HCWs differently, with some worse than others. There was a general high prevalence of anxiety among nurses, females and those with lower on-the-job experience. It was prevalent in frontline workers working directly with confirmed or suspected cases [57]. HCWs with comorbidities and a history of mental health were likewise found to be associated with significant prevalence.

Age and sex were factors. Kisley., *et al.* [58], in their study, also found that age combined with being less experienced was a factor in increased psychological distress, these can come out as anxiety among other indicators. Being young is associated with less work experience and therefore less resilience and under-developed coping mechanism. Liu, Zhang and Huang [59] aver that younger and more educated people (in the general population) had more in-depth information about the disease compared to the adults, this ability to source information worked against them in terms of mental health. Disease knowledge is a strong predictor of anxiety. Wu., *et al.* [60] suggests that information from social media and different other media outlets increased this disease knowledge.

Furthermore, Serrano-Ripoll M., *et al.* [51], Kang., *et al*. [57] and Marvaldi., *et al.* [61] consent that the combination of being young and a woman were factors for higher levels of anxiety. Woman seem to be more vulnerable possibly for the reasons that include being the majority workers in the frontline and working directly with patience or suspected cases [57]. They are as well the majority participants in most of the studies done. This might as well suggest that females are more open concerning their health statuses compared to their male colleagues. Sriharan., *et al.* [62] points out to some reasons why women experience higher stress, these include the fact that women face gender biases, inequalities, discrimination and sexual harassment. This is further compounded by the fact that women perform more tasks that are unpaid as caregivers at home and as parents compared to men. Liu, Zhang and Huang [59], however did not find association between disease prevalence and gender.

In concurrence with other studies, we found that the nature of work was a factor for anxiety [45,51,52,58]. Green., *et al.* [52] postulates that being a front-line worker and a nurse was highly associated with having escalated levels of any type of mental health issue. Workers whose jobs tasks them to work more directly with infected patients are most likely to experience higher levels of mental health issues [58]. Additionally, Serrano- Ripoll., *et al.* [51] puts forward that low level job training as a factor. Shanafelt, Ripp and Trockel [45] says that healthcare workers also had concerns pertaining to being able to provide competent services after being diploid to other positions which are not their specialty, for instance nurses assigned to ICU. Related to this aspect are the lengthy shifts that HCWs had to adjust to and endure away from the support of family needs.

Additionally, this study found an association between anxiety and increased workload during the pandemic. Marvaldi., *et al.* [61] similarly found that among frontline workers, the workload more than doubled and this triggered elevated incidence of anxiety. There are other studies that as well-found social factors to be attributable to anxiety. Having dependence children is one such a factor pointed out in two studies [52,58]. Lack of support and perceived stigma are findings by Serrano-Ripoll., *et al.* [51] and Greene T., *et al.* [52]. These findings suggest that anxiety is as well a condition that arise from social problems. Some researchers study the implications of COVID-19 on socio-economic status. The consensus is that COVID-19 decreased family and community incomes as well as stifled socio-economic mobility, many lost jobs and others experienced pay cuts [63,64]. Irfan., *et al.* [64] further linked the lowering family income status to anxiety among University students in Malaysia. HCWs are not spared from this universal reality. These findings are however inconsistent with those of Liu, Zhang and Huang [59] who found no link to anxiety and income in their study.

Lack of PPE was expected, as in our findings, to have an adverse effect on mental health. Some studies confirm this notion [45,52,65,66]. Lack of PPE is associated with an increased risk of contracting the virus hence associated fears. Lack of PPE and general protection by employers is associated to "moral injury". This is a concept that concerns workers being distressed psychologically, behaviourally, socially and spiritually due to exposure to an adverse event (s) [67]. Worries of acquiring and or infecting others either family or workmates is a factor pointed out in other researches so as our findings [45,52,58]. Lack of clear information was as well equally a factor [45,58]. It was additionally located that anxiety co-existed with other mental health conditions. A majority of researchers looks at anxiety simultaneously with other mental health ailments particularly depression, insomnia and stress [51,52,61]. Others for instance, Serrano-Ripoll., *et al.* [51] and Kisely., *et al.* [58], use blanket terms such as "psychological distress" or "mental health", these terms incorporate anxiety along with other conditions.

Social proximity and geographical proximity to COVID-19 were found to be positively associated with higher anxiety levels [59]. This finding may help explains why some geographical locations had higher prevalence of anxiety than others in that anxiety was higher in geographical locations with higher COVID-19 prevalence. People who personally knew someone infected or those living in areas with reported cases had higher chances of the mental health issue. This is consistent with previous findings that a shorter distance from those infected increased the risk perception hence anxiety [68]. In Wuhan, parents who had been quarantined showed higher levels of anxiety than those from other cities as compared to their children [60].

Despite an episode of anxiety, some healthcare workers were still willing to continue provision of their professional services while others had much worse outcomes such as suicidal thoughts. This result shows that HCWs are not homogeneous. Differences in outcomes were likewise evident in the research by Mattila., *et al.* [46] they aver that some HCWs experienced minimal levels of anxiety but others, a minority, risks lifelong threats to their well-being. Health care employers should therefore engage in long-term follow-up to personnel's recovery from the pandemic. Sher stated that suicidal thoughts were most likely to increase during the pandemic due to the association between anxiety, stress and sleep disturbance [47]. Sleeplessness reduces the positive effects of good sleep quality and is associated with suicidality.

This study has thrown more light on the severity of anxiety in health care workers in Europe and allowed us to give an overview on the state of their mental health. From the given systematic review, important evidence-based discovery was made which is implicit in ensuring the wellbeing of health practitioners applicable to the general population. This study further complements other researches and add substantive data to literature in this covid-19 pandemic. It analyzed primary data which was acquired through a first-hand information with healthcare workers on the job. Identified common challenges such as lack of personal protective equipment acts as a reminder on the given challenge among healthcare leaders in ensuring appropriate provisions of the needed protective equipment and a safe environment for healthcare workers to work.

The identified predetermined factors, for instance elucidates the catalyst of anxiety levels among healthcare workers. The study is relevant as it will be an evidence-based document which will guide the mitigation of actions against the deteriorating mental health issues among healthcare workers. Most vulnerable groups within the healthcare workers community who are affected the most were identified this will help in quick policy response and prevention interventional processes. The given evidence implies that, healthcare workers are prone to same anxiety levels as the individuals under their care hence it is crucial in ensuring the wellbeing of the given individuals first in order to ensure proper service provisions among the general public. Numerous papers have been published with COVID-19-related research. It is quite evident that most papers in regards to Covid-19 are being published at a very fast pace [48,49]. Other studies on systematic reviews have also identified the burden on the mental health of healthcare workers working in the frontline in this pandemic. De Kock., *et al.* [18] posits that female nurses who were working close with COVID-19 patients recorded highest level of various mental health issues. Comparing our systematic review to this study, we attained similar evidence which buttresses our findings. Additionally, other systematic reviews and studies done also identified narratives of exhaustion due to heavy workload with limited work stuff and equipment affected the mental health of healthcare workers with anxiety being predominant [50,51]. This shows the authenticity of the attained results of our systematic review as it incorporates continual up to date in relevance to emerging new evidence based available data to accessible for other researchers.

Strengths and Limitations

To our knowledge, this is the first systematic review of its nature to be carried out. There have been other studies though not focusing on the same issues as the current, for instance one systematic review focused on general mental health issues in whole populations of countries in Eastern Europe. Different measuring scales were used in assessing anxiety. This lack of uniformity in the measuring scales make comparability difficult and may lead to bias in the conclusions drawn. Majority of the studies included in this review were done in Italy (10 of the 22) and this could be a limitation to the generalizability of our findings seeing that the whole of Europe was not represented as the continent is not homogenous.

Conclusion

This review clearly shows that the prevalence of anxiety in HCWs was high and also identified several factors associated with it. The prevalence of anxiety was found to be more in females, the younger aged HCWs, nurses, lack of PPE, those with high workload, presence of comorbidities and frontline health workers. Recommendations on strategies to reduce this prevalence have been made but more research is needed on the effectiveness of these strategies.

The implementation of policies need factual evidence to support it. Policies are important means of communication among organizations as they provide a road map when it comes to the execution of various day to day healthcare services; both prevention and the management of various diseases [69]. It allows on the proper streamlining of processes and procedures. Studies done globally have been a backbone when it comes to policy making. Therefore, this study is crucial and important for policy makers to make policies to see to the reduction of anxiety level. The study analysed different risk factors contributing to the increasing of anxiety.

Whiles it is important to come up with polices to help assist in the achievement of public health prevention and disease management strategies, it is vital to seek evidence based published research. From the given study, our findings on prevalence of anxiety, determinants, comorbidities, risk factors of anxiety; effects and outcomes play important roles in defining and implementation of policies in ensuring the wellbeing of healthcare workers. Our study identifying high anxiety levels in female nurses, the aged, and those working in COVID-19 high risk areas provides proof for policy makers to come up with various health promotional and prevention strategies with focusing ensuring the wellbeing of female nurses and healthcare workers in this high anxiety level demographic. Improving their mental wellbeing the health practitioner's service delivery ends up improving hence proper care given to the general public [70].

Policymakers can address these factors by providing various avenues for frequent mental well-being screenings among healthcare workers to be incorporated into the routine of health organizations. They should as well, channel more financials into providing personal protective equipment and its proper use should be highly recommended, more medical staff should be employed to ease the burden of the workload on medical staff and also, providing more health equipment. The monitoring and evaluation of various policies put in place should be done more often with recommendations being put in place from time to time. The given factors for increased anxiety among the HCWs provide policymakers with the guidelines for coming up with well-defined policies to protect those at risk during such disease outbreaks.

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