

PSYCHOLOGICAL DISTRESS IN HEALTHCARE WORKERS DURING COVID-19 PANDEMIC**Ramakant Yadav¹, Ankur Vaidya^{2*}, Raj Kumar³, Shweta Jain⁴, Ajay Kumar Shukla⁵**

1. Department of Neurology, Uttar Pradesh University of Medical Sciences, Saifai, Etawah, U.P., India
2. Pharmacy College Saifai, Uttar Pradesh University of Medical Sciences, Saifai, Etawah, U.P., India
3. Department of Neurosurgery, Uttar Pradesh University of Medical Sciences, Saifai, Etawah, U.P., India
4. Sir Madan Lal Institute of Pharmacy, Etawah, U.P., India
5. Institute of Technology and Management, Department of Pharmacy GIDA, Gorakhpur, U.P., India

ABSTRACT

With the sudden outbreak of coronavirus disease of 2019 (COVID-19) pandemic, the Health Care Workers (HCWs) have claimed varying echelons of stress, anxiety and insomnia. This is the first write up ever reported describing the numerous studies conducted globally to determine the mental health issues in HCWs throughout in COVID-19 pandemic. Herein we compile the studies conducted in different countries worldwide. All these studies alleged high pervasiveness of stress, anxiety, depression, insomnia, somatization, obsessive-compulsive symptoms and other mental disorders in HCWs. Female medical staff showed high occurrence of mental distress over male medical staff. Transmission of infection from HCWs to their family members further increases fear and distress. Ample education, training, psychosocial services and social support have improve mental health of HCWs.

Keywords: Anxiety, Stress, Depression, Mental Health, Psychology, COVID-19**Received-** 10/01/2021, **Reviewed-** 15/01/2021, **Revised/ Accepted-** 22/01/2021**Correspondence****Ankur Vaidya*** ✉ ankur_vaidya2000@yahoo.co.in

Pharmacy College Saifai, Uttar Pradesh University of Medical Sciences, Saifai, Etawah, U.P., India- 206130.

INTRODUCTION

Human disease is an impairment of the usual state of a human being that disturbs or modifies its vital functions. Numerous drugs and technologies have been reported till date for the betterment of humanity. Recently, researchers focusing on new technologies including nanotechnology and drug design techniques for the treatment of these diseases^[1-4]

In December 2019, the sudden outbreak of a 2019 novel coronavirus (2019-nCoV) originated from Wuhan, China, threatens the world that has rapidly spread globally and has now been declared as a pandemic by the WHO. 2019-nCoV is the causative virion of coronavirus disease of 2019 (COVID-19) pandemic, having spherical or pleomorphic enveloped, positive-sense, single-stranded RNA (possibly largest known genome of size between 26 kb and 32 kb) having nucleoprotein. Recently, COVID-19 pandemic has become a clinical threat not only to general population but also to healthcare workers (HCWs) worldwide and entire scientist, researchers and physicians all over the

countries focused to find the treatment of this pandemic disease.^[5]

Mild to severe symptoms of COVID-19 appear from 2 - 14 days after exposure. Fever, cough and tiredness are the common signs and symptoms, while muscle aches, chills, headache, chest pain, shortness or difficulty in breathing, sore throat and smell or taste loss are the other symptoms. Other less common symptoms, including nausea, vomiting and diarrhea have also been reported. Although favipiravir in combination with hydroxychloroquine and corticosteroids and many other drugs had recommended against 2019-nCoV, but still they are not the guarantee treatment of COVID-19.^[6]

The ruined spread of 2019-nCoV over international travel density and immune naivety of the population, triggering urgent, draconian public health measures in many countries. The problem is more decisive for HCWs who are serving in COVID care centers. Psychological distress and mental health illness are the adjuvant symptoms of COVID-19 pandemic. As the

number of patients and occupancy of COVID-19 increases, the mental distresses also increases and urge the psychiatric treatment require not only for infected but also for health care professionals.^[7] The enduring mental health impact of COVID-19 among the common population, children, elderly, wandering workers and healthcare professionals increases the demand of mental health care from specialist professionals. However, to date, there is no specific recommendations issue for both general populations and HCWs from any international agencies mentioning the mental health issues during this COVID-19 pandemic. The fear for COVID-19 among the public appeared more as compared to the severe acute respiratory syndrome (SARS) outbreak, possibly due to increased air mobile and engrained global connectedness made the extent of COVID-19 appeared much more rambling. Furthermore, all-embracing coverage of corpus media, influences the psychological retort of the community to the COVID-19 threat, and further aggravates anxiety among community even when it is used to hearten them to take precautionary and preventive measures to guard themselves from the virus.^[8]

Psychological Distress in Pandemic Condition

At the time of the SARS outbreak, 18% - 57% of HCWs claimed emotional distress. Similarly, during Ebola outbreak numbers of medical practitioners including HCWs were experienced psychological disturbance due to over workload and settings without any protective tools and ambitious mainly by empathy. Alike to SARS and Ebola, COVID-19 pandemic state is not so differ, and poses a more significant mental health effect on the medical practitioners.^[9]

Although it is difficult to predict mental health consequences of the COVID-19 impact, however elevating rates of anxiety, depression, posttraumatic stress disorder (PTSD) and negative societal behaviors have been reported in health care workers. Healthcare workers remain worried for their relatives to be infected by their own transmission and thus avoid coming in contact with their family members.

A study was designed and conducted to assess the psychological impact of COVID-19 on HCWs and to compare it to that of stress brought on by Middle East respiratory syndrome coronavirus (MERS-CoV) epidemic in Saudi Arabia.^[10] 811 HCWs was recruited to measure mental distress during COVID-19 pandemic, along with Generalized Anxiety Disorder (GAD-7). About 71.8% (582 out of 811) HCWs completed the

survey questionnaire, in which about 40% were bared before to MERS-CoV infection. HCWs were reported more anxious about transmitting COVID-19 to a family member rather than acquiring the infection themselves and 41.0% staff was more stressed about COVID-19 as compared to MERS-CoV, while stress level was found to be equal in both infectious diseases. 68.25% (397) enrolled HCWs claimed for mild anxiety, followed with 20.8% (121) moderate anxiety, 8.1% (47) showed high moderate and only 2.9% (17) had very high anxiety against COVID-19 pandemic.

Factors Responsible For Psychological Distress

Demographics and negative society behavior

While taking all protective measures, people remain in fear with the realism of the current and vagueness of the future. Young teenagers and adults are facing uncertainty with respect to their career, professional life and jobs. Fear of infection is creating a panic situation among them. Maintaining a balance between mental and physical health is of utmost prominence to function with optimal clarity.^[11] Moreover a negative society's behavior worsens the mental distress reactions (anger, insomnia, uncertainty and fear of illness), health risk behaviors (augmented consumption of tobacco, alcohol and social isolation), mental health disorders (i.e. anxiety disorders, depression, somatization and post-traumatic stress disorder), and lowered perceived health. Mental health professionals must ensure to provide necessary support to both who infected and to those who deliver care.

In India, the first suicidal case was revealed on 12th Feb 2020 in Andhra Pradesh. Although the patient was not infected with COVID-19, still he was so disturbed that in order to protect his family, he quarantined himself and later due to anxiety and fear committed to suicide by hanging himself from a tree.^[12]

Increased loneliness and social isolation of HCWs in this pandemic situation, increases psychological distress. Monitoring loneliness and endorsing belongings are candidate mechanisms to protect against psychological distress.^[13]

The interference of schedule clinical practice, the sense of loss of control and consequently fear of the impending decline of health services, has annoyed 'overflowing' anxiety and depression among HCWs, a feature which is common of epidemics.^[14] Depression is related with deprived medication adherence, which may upsurge morbidity amid older healthcare professionals

with contemporaneous medical conditions. Seize of freedom of movement with family and friends, steady engagement in leisure deeds and gaining of sustenance and essential items also worsen the psychological poise of HCWs.

Furthermore, as the HCWs had been quarantined, showed severe symptoms of post-traumatic stress as compared to common public who had been quarantined. HCWS also felt more stigmatization than the common public, exhibited additional avoidance behaviors after quarantine, stated more financial loss in terms of income, and were steadily extra affected psychologically: they claimed extensively more annoyance, sadness, worry, fear, frustration, helplessness, loneliness, nervousness, isolation and were fewer happy.

A recent study conducted by Kazmi et al., (2020), to examine the impact of COVID-19 and lockdown on the mental health of the different age groups population of India.^[15] Anxiety, depression and stress were investigated among 1000 individuals of different age groups, genders and employment. Young group (15-35 years) showed an increase incidence of depression, while anxiety and stress were prevalent among 21-25 years of individuals. A significant difference for depression and stress level were reported among employed and unemployed individuals, while no significant difference in anxiety level were claimed in both groups.

Chan and Chan (2004) reported that HCWs who were single, had a more jeopardy of emerging adverse psychiatric symptoms as compared to those who were married^[16] The problem is decisive when these HCWs have been quarantined regularly.

Shortage of healthcare workers

As the COVID-19 cases increase rapidly worldwide, the global public healthcare and mental health care emergency prerequisite also amplify. The scarcity of manpower worldwide is the major hurdle to deal with COVID-19 and thus healthcare workers faced an increased workload thru the fright of being infected. These medical responders face heightened stress and become emotionally exaggerated and traumatized. Increased workload, loneliness and segregation further more increase fear, anxiety, and depression and sleep disorders.

The condition is terrifying in those countries having inadequate numbers of mental health professionals in comparison to the forthcoming growth of demand. The

most recently data published by Kirton (2020) illustrated that the European countries (Eurostat) including Switzerland having 51.7; in Germany 27.4, in France 22.9, in Italy 17.4, in Croatia 16.1, in Spain 10.5, in Poland 9.2 and in Bulgaria 7.8 numbers of psychiatrists available per 100.000 inhabitants.^[17] Even in the U.S., the condition is also alarming and only 11 psychiatrists available per 100.000, while in China it is only 2.2. Furthermore, Marr (2019) reported that in the U.S. 40% lives in scarcity of mental health professionals and even 60% of the population survive without a psychiatrist. Although the availability of adequate numbers of mental health professionals and psychiatrists are not the warranty that the HCWs will not face the psychological distress and mental illness in times of the ongoing pandemic.

Poor working conditions

Health professionals working in critical care units like ICU, especially, require mental health professionals to reduce stress levels and risk of depression. These HCWs remains in fear of high chances of exposure risk possibly due to highly contagious with multiple transmission route, high exposure dose, long daily contact hours, and ICU stay.

Recently, Naushad et al., (2019) reported that the HCWs who works in emergency departments and or intensive care units had a high risk of mounting psychiatric outcomes than those working in other departments.^[18] Working in isolation wards or containment zones further increase anxiety and fear of becoming infected.

According to World Health Organization (WHO) guidelines COVID-19 can be transmitted chiefly from person to person from nose or mouth in the forms of droplets. Thus aerosol generating procedures, including all trans oral interventions, nasal endoscopy, laryngoscopy and tracheostomy deemed to put medical professional at high risk of viral infection and thus International Head and Neck Scientific Group (IHNSG) advised to avoid all these aerosol generating procedures and recommended only to use in emergency.

Psychological Distress Among Healthcare Workers

Kang et al., (2020) reported first the mental health of 994-medical and nursing staff in Wuhan, China.^[19] Of all participants, mental health disturbances were reported sub threshold (36.9%), mild (34.4%), moderate (22.4%) and severe (6.2%) in the instant rouse of the viral epidemic. Young women were heavily disturbed. Importantly, managing tactics were varied in all applicants ranging from perusing psychological materials (36.3%), psychological resources through

media (50.4%), and contributing in counseling or psychotherapy (17.5%).

Lai et al (2020) investigated the stress of unfamiliar environment among 1257 HCWs in 34 hospitals of China in COVID-19 pandemic.^[20] These HCWs were directly engaged in patients care, who were suspected or confirmed COVID-19 positive. 70% of HCWs reported distress, while 50% reported depression of 1257 HCWs. Similarly, Lv et al., (2020) reported overall 34.7% anxiety incidence and 24.8% mild anxiety incidence among 8028 doctors and nurses of 8 provinces (i.e. Beijing, Guangdong, Hainan, Hebei, Henan, Hubei, Jiangxi and Shanxi) of China.^[21] The authors concluded that Chinese medical staff suffered from the psychological disorders. Table 1 represents mental health stress of HCWs around the world.

Table 1: Mental health stress of HCWs, reported in different countries.

Country	Number of HCWs	Stress	Anxiety	Depression	Sleep Disturbance
China	1257	70%	-	50%	-
China	8282	-	34.7%	-	-
Italy	1379	49.38%	19.80%	24.73%	8.27%
Jordan	1,006	-	34%,	19%,	29%
Spain	1459	80.6%	-		-
China	1563	73.4%	44.7%	50.7%	36.1%

A pathetic condition has been aroused in Philadelphia on Thursday, 19 March 2020, when health commissioner Dr. Thomas announced 10 of the 44 people with the Covid virus are healthcare workers.^[22] This report brought a major depression among HCWs.

Spanish physicians Fernández and coworkers (2020) conducted a national self-reported online questionnaire started on 29 March to 5 April 2020 among 781 HCWs including 385 physicians, 233 nurses, and 164 other professionals and 1006 non-HCWs.^[23] Anxiety, depression and acute stress related questions were asked and measured on Hamilton Anxiety Scale (HARS), Beck Depression Inventory (BDI), and the Acute Stress Disorder Inventory (ASDI). For anxiety, no significant differences were observed between HCWs (M 18.2, S.D. 10.4) and non-HCW (M 16.9, S.D. 10.3). While greater depressive symptoms were reported in HCW ($\chi^2 = 2.9$, $p = 0.09$) as compared to non-HCWs. Furthermore, higher symptoms of acute stress were reported in HCWs (M 4.9, S.D. 3.1) than non-HCW (M 4.3, S.D. 3.1). These findings suggested that HCWs have greater impact on mental health than in non-HCWs; even nurses and physician trainees are the most vulnerable groups.

Rossi et al., (2020) reported first in Italy the psychiatric distress among HCWs during COVID-19 pandemic.^[24] A web-based study data were collected between 27 March to 31 March 2020, using an online questionnaire. HCWs of Italy could only be participating. 1379 HCWs were participated in online questionnaire and responds. 273 (19.80%), HCWs claimed anxiety; 114 (8.27%) insomnia; 341 (24.73%) depression; 681 (49.38%) respondents endorsed PTSS and 302 (21.90%), high perceived stress. Younger age and female sex were associated with all investigated outcomes except insomnia, while General practitioners were more likely to endorse PTSS than other HCWs. Health care assistants and nurses claimed severe insomnia. The author's claims mental health issues in HCWs during COVID-19 pandemic, especially in young women and frontline practitioner. Further monitoring and specific interventions for HCWs were suggested to minimize long-term mental health-related disabilities.

Recently, a very impressive study was conducted and reported by Pappa and colleagues (2020) in Brain, Behavior, and Immunity Journal.^[25] A data was obtained available online up to April 17th 2020. The review protocol is registered in PROSPERO and total 33062 participants were enrolled in the study. Anxiety, depression and insomnia were reported among HCWs in COVID-19 pandemic. 29.06% female and 20.92% male HCWs reported for anxiety, while 26.87% female and 20.34% male suffered from depression. The nurses showed higher (25.80%) anxiety as compared to doctors (21.73%); similarly greater depression rate was reported in nurse (29.65%) over doctors (24.5%). These results showed gender and occupational differences. Female HCWs and nurses showed higher rates of affective symptoms compared to male HCWs and medical staff respectively.

Benjamin et al., (2020) investigated the psychological distress of HCWs in Singapore in the midst from 19 February to 13 March 2020.^[26] All HCWs showed the incidence of anxiety, depression, stress, and PTSD. The nonmedical HCWs were reported at highest risk for psychological distress as compared to medical HCWs during this COVID-19 outbreak.

Alike of mental health issue in HCWs worldwide, in UK HCWs also reported unprecedented mental pressures during the dealing with the COVID-19 pandemic. Choudhury et al., (2020) reported the psychological distress amongst 106 healthcare workers, who were

working in a cardiac centre in the North West of England in this COVID-19 pandemic outbreak.^[27] During the time, the centre was anticipating the arrival of large numbers of Covid-19 patients and the hospital had started receiving some earlier cases. Mild anxiety was reported in 27%, moderate in 12% and severe in 22% of survey participants. Women reported higher anxiety levels as compared to men. However, no significant differences in anxiety were reported on the basis of occupation, direct exposure to patients, age or length of NHS experience.

An Ireland physician Gavin and his team members (2020) reported 25% of HCWs were positive for COVID-19 in Ireland, which was higher than Italy and Spain.^[28] Higher positive cases in HCWs amplified fears of healthcare workers that may become ill and unable to care for or risk infecting their children. The authors reported psychological impact on Covid-19 frontline healthcare workers, high rates of anxiety, depression, distress and insomnia.

Tsamakis and colleagues (2020) reported the psychological burden on healthcare professionals in Greece during COVID-19 pandemic. Authors discussed potential measures to minimise psychological distress among frontline HCWs against this biothreat.^[29]

An online survey among 1,006 practitioners (55.3% females) was conducted during a stringent lockdown in Jordan. Exhaustion (34%), anxiety (34%), depression (19%) and sleep disturbances (29%) were reported.^[30] Salgado et al., (2020) described psychological distress level and Sense of Coherence (SOC) of healthcare professionals of Spain during COVID-19 crisis. 80.6% of healthcare professionals had shown psychological distress with mean score on the SOC-13 scale was 62.8 points (SD = 12.02).^[31]

Recently, Zhang et al., (2020) reported the survey outcomes in *Frontiers in Psychiatry*. The survey involved 1563 medical staff, reported that 50.7% of medical staff found the incidence of depression, 44.7% had anxiety and 36.1% sleep disturbance. 73.4% of medical staff showed stress related symptoms. These outcomes may guide health authorities to allocate health resources and to generate suitable treatments for medical staff who have mental health problems.^[32]

Very recent psychological intervention study was conducted by Huang et al., (2020) among 230 healthcare professionals who were involved in the treatment of

COVID-19 in China.^[33] The Self-rating Anxiety Scale (SAS) and PTSD- Self-rating Scale (PTSD-SS) were generated. 53 out of 230 (23.04%), healthcare professionals reported incidence of anxiety, while the severe anxiety (2.17% i.e. 5/230), moderate anxiety (4.78% i.e. 11/230) and mild anxiety (16.09% i.e. 37/230). Female medical staff showed higher incidence of anxiety as compared to male medical staff [25.67% (48/187) vs 11.63% (5/43) respectively], while nurses showed higher anxiety as compared to doctors [26.88% (43/160) vs 14.29% (10/70)]. These results showed high occurrence of anxiety and stress disorder among medical staff and suggested the psychological skills training of medical staff. Female nurses require more attention for mental health treatment.

Furthermore, an online survey was conducted from 19 February to 06 March 2020 by Zhang and colleagues in China, over 2,182 HCWs including both nonmedical health workers (no. 1255) and medical health workers (no. 927).^[34] Medical-HCWs showed high prevalence of insomnia (38.4%), anxiety (13.0%), depression (12.2%), somatization (1.6%) and obsessive-compulsive symptoms (5.3%) over nonmedical-HCWs (30.5%; 8.5%; 9.5%; 0.4% and 2.2%) respectively. Medical HCWs had organic disease was an independent factor for anxiety, depression, insomnia, somatization and obsessive-compulsive symptoms; while nonmedical HCWs had organic disease was at risk factor for depression, insomnia and obsessive-compulsive symptoms. Female HCWs, lived in rural area were reported to be at vulnerable risk factors for anxiety, depression, insomnia and obsessive-compulsive symptoms.

Wang and co-authors (2020) investigated the instant psychological responses and associated factors during the early stage of COVID-19 outbreak in Mainland China among the common population.^[35] Results showed that 53.8% of respondents claimed moderate or severe psychological impact, while 28.8% and 16.5% reported moderate to severe anxiety and depressive symptoms respectively.

Coping Strategies for Psychological Distress

After the first outbreak of COVID-19 in Wuhan, Hubei province, China, the indigenous government of Wuhan had executed the policies, addressing the mental health problems in infected medical staff. Almost 1230 medical HCWs had been called from different provinces to Wuhan for patients care, strengthen logistics support, and to lessen the work pressure on medical workers. A

shift system has been introduced to provide rest for front-line medical workers and to reduce work pressure. Online platforms had been generated to minimize the risk of transmission between the patients and medical staff. In Ren Min Hospital of Wuhan University and Mental Health Center of Wuhan, a psychological intervention team had been set up to provide mental support for HCWs. Hundreds of HCWs received these interventions, and reported worthy response, and their provision is mounting to extra persons and hospitals.

Chen et al., (2020) vividly illustrated a detailed psychological intervention plan of The Second Xiangya Hospital China for their HCWs, to maintain their mental health.^[36] The plan covered three areas including a development of psychological intervention team to provide online materials; a psychological assistance hotline team to guide, supervise and to solve psychological problems; and psychological interventions for group activities. However, healthcare workers showed reluctant to participate in this programme and programme was redesigned and included rest area, guaranteed food, and record video sharing facilities with their families. The rest area was periodically visited by a counsellor. More than 100 HCWs could rest at a time, and most of them report feeling at home in this accommodation. A remarkable result were obtained among HCWs and recommended to include ongoing feedback and modification of such programmes.

Currently, in Ontario, within a week, more than 450 licensed social workers, psychologists and psychotherapists registered themselves to provide free telephone therapy sessions to HCWs in COVID-19 pandemic. While in Canada, medical students offer their services (e.g., household tasks, conveying groceries and providing child care) to HCWs in need.^[37] All these tack ticks can lessen the effect of quarantine or isolation and aid to preserve wellness, and fitness in HCWs so that they can return to work when able.

Blake and coworkers, (2020) utilized Agile methodology for the development and evaluation of a digital learning package for the wellbeing for all UK HCWs.^[38] The package had been accessed 17,633 times within 7 days and HCWs claimed higher satisfaction with it's content, usability and utility. The most important feature of this e-package was free of cost, and direct provides digital support on 'psychological wellbeing for healthcare workers'.

Timely monitoring and reporting mental distress reactions and mental health disorders in general populations and vulnerable groups, including front-line workers, should be the priority to minimize the self-harm and suicide attempts.

Guidelines to Reduce Psychological Burden of COVID-19

According to WHO, it is paradox that still there is no adequate guidelines previously available for HCWs who have been dealing with exposed individuals to provide counseling and psychiatric screening facilities to fight against anxiety, depression and suicide temper. WHO reports of 2020, further claims that numerous physicians develop anxiety, depression, PTSD and burnout after the cessation of the pandemic.

On 18 March 2020, WHO released the guideline regarding the psychosocial deliberations during this COVID-19 outbreak for the general population, healthcare workers, for team leaders or managers, for children to their carrier, for old age people and for people in isolation.

Considering the mental health response in medical staff, National Health Commission of China issued a guideline of psychological emergency intervention for 2019-nCoV on dated January 27, 2020. It was the first guideline in China, exploring the multifaceted psychological fortification of the mental health of medical workers.

CONCLUSION

Healthcare workers remain at increased peril of moral harm and mental health problems and need to proactive steps to protect their mental wellbeing during this COVID-19 pandemic. HCWs must be vigorously monitored, supported, and, where necessary, provided with evidence based treatment. Reducing stress by capitalizing on coping policies akin to encouraging lifestyle behaviors can enormously improve mental health well-being. Continuing convention with loved ones either direct or through social media with maintaining precautions also helps to reduce fear and anxiety. Engaging in habitual physical work, eating healthy food, practicing good sleep hygiene where possible, and guaranteeing sufficient rest and breaks between shifts have been recommended by the WHO. Avoid tobacco and consumption of alcohol or other drugs also beneficial for mental health.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

Declared none

REFERENCES

1. Vaidya A, Pathak D, Shah K, 2020. 1,3,4-oxadiazole and its Derivatives: A Review on Recent Progress in Anticancer Activities. *Chemical Biology & Drug Design* (Online).
2. Vaidya A, Jain S, Jain A, Jain A, 2020. Simvastatin-Loaded PEGylated Solid Lipid Nanoparticles: Lipid Functionalization to Improve Blood Circulation. *Bionanoscience* (In Press).
3. Vaidya A, Jain S, Sahu S, Jain PK, Pathak K, Pathak D, Kumar R, Jain SK, 2020. Anticancer agents based on vulnerable components in a signalling pathway. *Mini-Reviews in Medicinal Chemistry*. 20(10), 886-907.
4. Vaidya A, Jain S, Kumar PBR, Singh SK, Kashaw SK, Agrawal RK, 2020. Synthesis of 1,2,4-oxadiazole derivatives: anticancer and 3D QSAR studies. *Monatshefte für Chemie - Chemical Monthly*. 151, 385-395.
5. Yang D, Leibowitz JL, 2015. The structure and functions of coronavirus genomic 3' and 5' ends. *Virus Research*. 206, 120-133.
6. Yousefi B, Valizadeh S, Ghaffari H, Vahedi A, Karbalaeei M, Eslami M, 2020. A global treatments for coronaviruses including COVID-19. *Journal of Cells & Physiology*. 1-10 (online).
7. Maunder RG, 2009. Was SARS a mental health catastrophe? *General Hospital Psychiatry*. 31, 316-317.
8. Vaidya A, Jain S, Jain AK, Pkumar BR, Kashaw SK, Agrawal RK, 2015. Computational Analysis of Quinoline Derivatives as Potent Topoisomerase-II Inhibitors. *Medicinal Chemistry Research*. 24(1), 383-393.
9. Senga M, Pringle K, Rsay A, 2016. Factors underlying ebola virus infection among health workers, Kenema, Sierra Leone, 2014-2015. *Clinical Infections Disease*. 63, 454-459.
10. Temsah MH, Al-Sohime F, Alamro N, 2020. The psychological impact of COVID-19 pandemic on health care workers in a MERS-CoV endemic country. *Journal of Infection and Public Health*. 13(6), 877-882.
11. Shigemura J, Ursano RJ, Morganstein JC, Kurosawa M, Benedek DM, 2020. Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: mental health consequences and target populations. *Psychiatry and Clinical Neurosciences*. 74(4), 281-282.
12. Hindustan times. Fearing he had contracted coronavirus, man locks family, kills himself. <https://www.hindustantimes.com/india-news/man-suffering-from-cold-and-fever-commits-suicide-in-andhra-pradesh-feared-he-had-contracted-coronavirus-says-family/storynECI2mhrvB5FiX2vHruFcK.html> (Accessed 14 May 2020).
13. John A, Glendenning AC, Marchant A, Montgomery P, Stewart A, Wood S, Lloyd K, Hawton K, 2018. Self-harm, suicidal behaviours, and cyberbullying in children and young people: systematic review. *Journal of Medical Internet Research*. 20, e129.
14. Brooks SK, Dunn R, Amlôt R, Rubin GJ, Greenberg N, 2018. A systematic, thematic review of social and occupational factors associated with psychological outcomes in healthcare employees during an

- infectious disease outbreak. *Journal of Occupational and Environmental Medicine*. 60, 248-257.
15. Kazmi SSH, Hasan K, Talib S, Saxena S, 2020. COVID-19 and Lockdown: A Study on the Impact on Mental Health. *SSRN Electronic Journal*. (in press).
16. Jain AK, Veerasamy R, Vaidya A, Mourya V, Agrawal RK, 2010. QSAR analysis of some novel sulfonamides incorporating 1,3,5-triazine derivatives as carbonic anhydrase inhibitors. *Medicinal Chemistry Research*. 19, 1191-1202.
17. Vaidya A, Jain A, Khare P, Agrawal RK, Jain SK, 2009. Metronidazole Loaded Pectin Microspheres for Colon Targeting. *Journal of Pharmaceutical Sciences*. 98, 4229-4236.
18. Naushad VA, Bierens JJ, Nishan KP, Firjeeth CP, Mohammad OH, Maliyakkal AM, Hadan SC, Schreiber MD, 2019. A systematic review of the impact of disaster on the mental health of medical responders. *Prehospital and Disaster Medicine*. 34, 632-643.
19. Kang L, Ma S, Chen M, 2020. Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novel coronavirus disease outbreak: A cross-sectional study. *Brain Behaviour and Immunity*. (in press).
20. Lai J, Ma S, Wang Y, 2020. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease. *JAMA Network Open*. 3(3), e203976.
21. Lv Y, Zhang Z, Zeng W, Li J, Wang X, Luo GQH, 2020. Anxiety and Depression Survey of Chinese Medical Staff Before and During COVID-19 Defense. *The Lancet*. (in press).
22. Bennett M, 2020. 10 Of 44 Coronavirus Cases In Philadelphia Are Healthcare Workers., (Accessed 29 May 2020).
23. Fernández LG, Ferreiro VR, Roldán PDL, Padilla S, Sierra IC, García MM, Martín JP, Jimenez RR, 2020. Mental health impact of COVID-19 pandemic on Spanish healthcare workers. *Psychological Medicine*. 27, 1-3.
24. Rossi R, Socci V, Pacitti F, Lorenzo GD, Marco AD, Siracusano A, Rossi S, 2020. Mental Health Outcomes Among Frontline and Second-Line Health Care Workers During the Coronavirus Disease 2019 (COVID-19) Pandemic in Italy. *JAMA Network Open*. 3(5), e2010185.
25. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsis E, Katsaounou P, 2020. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain Behavior and Immunity*. (in press).
26. Benjamin YQT, Nicholas WSC, Grace KHL, 2020. Psychological Impact of the COVID-19 Pandemic on Health Care Workers in Singapore. *Annals of Internal Medicine*. M20-1083.
27. Choudhury T, Debski M, Wiper A, Abdelrahman A, Wild S, Chalil S, More R, Goode G, Patel B, Abdelaziz HK, 2020. Covid-19 Pandemic: Looking After the Mental Health of Our Healthcare Workers. *Journal of Occupational and Environment Medicine*. (in press).
28. Gavin B, Hayden J, Adamis D, McNicholas F, 2020. Caring for the Psychological Well-Being of Healthcare Professionals in the Covid-19 Pandemic Crisis. *Irish Medical Journal*. 113(4), P51.

29. Tsamakidis K, Rizos E, Manolis AJ, Chaidou S, Kypmpouropoulos S, Spartalis E, Spandidos DA, Tsiptsios D, Triantafyllis AS, 2020. COVID-19 pandemic and its impact on mental health of healthcare professionals. *Experimental and Therapeutic Medicine*. 19, 3451-3453.
30. Hawari FI, Obeidat NA, Dodin YI, Albtouh AS, Manasrah RM, Alaqeel IO, Mansour AH, 2020. The inevitability of Covid-19 related distress among healthcare workers: findings from a low caseload country under lockdown. *medRxiv*. (in press).
31. Salgado JG, Salas SD, Martín MR, Moreno MO, Iglesias JJG, Frutos CR, 2020. Sense of Coherence and Psychological Distress among Healthcare Workers during the COVID-19 Pandemic in Spain. *Sustainability*. 12, 6855.
32. Zhang C, Yang L, Liu S, Ma S, Wang Y, Cai Z, Du H, Li R, Kang L, Su M, Zhang J, Liu Z, Zhang B, 2020. Survey of Insomnia and Related Social Psychological Factors Among Medical Staff Involved in the 2019 Novel Coronavirus Disease Outbreak. *Frontiers in Psychiatry*. 11, 306.
33. Huang JZ, Han MF, Luo TD, Ren AK, Zhou XP, 2020. Mental health survey of 230 medical staff in a tertiary infectious disease hospital for COVID-19. *Chinese Journal of Industrial Hygiene and Occupational Disease*. 38(3), 192-195.
34. Zhang WR, Wang K, Yin L, 2020. Mental Health and Psychosocial Problems of Medical Health Workers during the COVID-19 Epidemic in China. *Psychotherapy and Psychosomatics*. 9, 1-9.
35. Wang C, Pan R, Wan X, Yilin T, Linkang X, Cyrus SH, Roger CH, 2020. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health*. 17, 1729.
36. Chen Q, Liang M, Li Y, Guo J, Fei D, Wang L, He L, Sheng C, Cai Y, Li X, Wang J, Zhang Z, 2020. Mental health care for medical staff in China during the COVID-19 outbreak. *Lancet Psychiatry*. 7(4), e15-e16.
37. Vendeville G, 2020. As COVID-19 battle escalates, U of T students offer busy healthcare workers help on the home front. *University of Toronto News*. (Accessed 29 May 2020).
38. Blake H, Bermingham F, Johnson G, Tabner A, 2020. Mitigating the Psychological Impact of COVID-19 on Healthcare Workers: A Digital Learning Package. *International Journal of Environmental Research and Public Health*. 17(9), 2997.

How to cite this article

Ramakant Yadav, Ankur Vaidya, Raj Kumar, Shweta Jain, Ajay Kumar Shukla, 2021. Psychological distress in healthcare workers during covid-19 pandemic. *Jour. of Med. P'ceutical & Alli. Sci.* V 10 - I 1, 1019. P-2644-2652. DOI: 10.22270/jmpas.V10I1.1019