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**Researchers in the lab of COVID-19: A scientific Review on the impact of the pandemic on the researchers**

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**Abstract:**

*The COVID-19 has creating a challenging and opportunity situation for all the researchers. It is because The COVID-19 pandemic change the mode of research, teaching, and learning. The researcher tries to know the problem and challenge faced by the students and researchers during the pandemic. The purpose of this research is to study the impact of COVID-19 on the researcher around the world and to know how it change the educational pattern in terms of administration, and institutional infrastructure. This paper analyses the academic research related to the pandemic mostly from the last three years, in the field of education. Due to pandemic, the researcher around the world convert the challenging and painful working habit into new digital world. The researcher recommended the higher education governing bodies to take appropriate steps to give better opportunity to researcher.*

***Keyword:*** *COVID-19, Higher education, Research(er) in/on pandemic, digital-stratification*

**1. INTRODUCTION**

During the pandemic, the lockdown created an isolated system for the researchers due to strict social distancing guidelines. First time in history, trains and buses were not running for public services. Researchers had to stay where they were. The researcher was dependent on the reviewed data available on the internet or from open sources for research purposes. There was not information exchange between the researcher and the rest of the world. Schools, colleges, and universities of the nation were shut down. All major academic tests like as school or board examinations; employment/recruitment, entrance tests; scholarship and fellowship tests; and psychological tests were canceled or postponed by the Ministry of Education. Therefore, there were late in the new sessions of the academic course, education program, diploma, and degree of the learner.

The researchers have significant power to increase research and development potential in a country. To assess the global ranking of a university, organizers also use as one dimension the number of emerging researchers working in the institution. The research in/on time of public health emergency (pandemic, disaster, earthquake, flood, natural or artificial uncertainty) challenging and essential opportunity for the researcher (Weiner et al. 2020). The pandemic is the cruel and “Aapada Me Avasar” (opportunity in disaster), for research in the field of medical science. In this challenging time of the pandemic, the human mind spins for new, updated, creative, reflective, and innovative ideas and ways. Researchers are pressurized by the pandemic situation to think beyond the limitation, and out of the box to understand the nature of the disease, cause, symptoms, precautions, preventions, cost-effective vaccines development, treatments, and efficient management of the available resource for optimum results (Paho, 2020; Weiner et al. 2020). The frontline workers like doctors, nurses, medical storekeepers, hospital teaching and non-teaching staff, and sweepers all suffer from mental, anxiety, frustration, and emotional breakdown (when in front of them life-death decided in seconds). They had shown their willingness that, "the nation is first, rather than self-need". The child daycare homes and schools were shutdowns due to the pandemic, which lead to a negative impact on health care and education sector working women (especially single mothers) (Brodeur et al. 2021). Research also confirmed exponential increases in domestic violence and family stress in women due to COVID-19 (Brodeur et al. 2021). pandemic creates not only medical emergencies but also psychological, social, personal, economic, and academic challenges. Society reconstructs its norms and condition during the pandemic. People reflect the reality of the isolated society. Person were fulfilling their own need rather without thinking about the social equilibrium, showing the skewness of social resources. The pandemic had created a feeling of “extremely Social Exclusion” in students, teachers, administrators, parents, and pupils during lockdown (Kumar et al., 2020; Mahdy, 2020; Jackman et al. 2021). Globally, the world had faced an economic crisis due to banned on business, travel, goods and services, sports, and diplomatic activity. In most of the nations the institutions, colleges, universities, and academic organizations were shut down due to a massive worldwide lockdown (Paho, 2020; Kumar et al., 2020; Mahdy, 2020). Due to strict lockdown, life had become more important than the rest of things. The students were severely affected by the pandemic. Scholars around the world avoided travel not only to other countries but also to go into the local field for their interests (Jackman et al. 2021). Their educational activities like observation, fieldwork, thinking, data collection, analyzing, interpreting, making conclusions, learning, and sharing had stopped due to captured within four walls, a surface, and a ceiling (Kumar et al., 2020). In somehow, the research has been conducted in online mode with ethical safeguards and public safety concerns (Paho, 2020). Due to the pandemic, the teaching-learning process from the fundamental level (primary school) to the professional level (college or university) was shifting from on-campus to online (Emily et al. 2020; Mahdy, 2020; Jackman et al. 2021). It was also a litmus test for humanity, and social concern around the world. The people started to follow the mandatory guidelines and safety needs, such as following social distancing, regular hand sanitization, wearing masks and gloves, and motivating others to become a part of healthy humans in the pandemic environment (Kumar et al. 2020; Mahdy, 2020). But some positive thing come out like, a sense of balanced diet and hygiene was developed in the researcher. Those youngsters, who were, earlier eating burgers, pizza, samosa, chowmein, momos, and other fast food. Now they started having some inclination toward India’s traditional medicine, termed AYUSH-“long life” (Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy), whose main objective is to improve the immunity of the individual (Kumar et al. 2020). Research suggests that people below 35 years of age have solid immunity to beat COVID-19 as compared to senior citizens (Bajpai et al. 2020).

**2. WHAT IS A PANDEMIC?**

In the history of Homo sapiens evolution, pandemic has proven deadly and international emergencies so many times. After the Spanish Influenza (caused by the H1N1 virus) pandemic in 1918, COVID-19 is the second most dangerous chapter of the pandemic series (Brodeur et al. 2021). COVID-19 pandemic had start reducing the entropy of humans since December 2019. Pandemics had the worst impact on two things, public health and the economy of the nation (Bajpai et al. 2020). This covid-19 is a severe acute respiratory syndrome coronavirus 2, or SARS-COV-2 (Bajpai et al. 2020). After the research, the WHO names it coronavirus disease-19 or COVID-19 on 11 February 2020. The first impact of covid-19 was seen in the form of pneumonia disease in the wet market in Wuhan (capital of Hubei province), China (Kumar et al., 2020; Brodeur et al. 2021; Prinja et al. 2020; Bajpai et al. 2020; Pandey et al. 2021). The uncertain and quickly spread in the entire world caused the WHO need to declare it as a public health emergency of international concern on 30 January 2020 (Kumar et al., 2020; Brodeur et al. 2021). Due to rising cases and deaths on a worldwide scale, on 11 March 2020 WHO announces COVID-19 as a pandemic (Prinja et al. 2020; Bajpai et al. 2020). It introduced some unforgettable terms like quarantine (18 days), isolation, social distancing, sanitization, and lockdown (avg. 36 days) to the new generation of the world (Brodeur et al. 2021). World economists forecasted that statistically, around 63 lakhs deaths (total human population of 7.5 billion in 2020, 2.1% mortality rate) will occurs due to the COVID-19 pandemic (Brodeur et al. 2021). Almost 186 countries close their external border to stop COVID-19 transmission (Brodeur et al. 2021). As statistical data reveals, 97% of infected people recover from the disease, and around 2% to 3% person struggle near death or life (Bajpai et al. 2020). The Asian people had faced discrimination and hostility in other continents of the world, other people think they amplify the result of COVID-19. Any pandemic creates a challenging situation for the people, scientists, mental health workers, economists, doctors, engineers, IT experts, data analysts, technologists, educationists, and researchers around the world, how to escape from the same (Weiner et al. 2020).

**2.1. WHAT IS THE SHIFT IN THE PANDEMIC (DURING LOCKDOWN)?**

Teaching and learning are an interactive part of human life. It is the mutual, conscious, and sensitive integration between learner and “Scaffolder and knowledgeable person”. It helps in the development of individuals’ social life more productive. But uncertain appearance of COVID-19 pandemic in the world, it affected most sectors globally, including hospitality, health, business, economics, IT sector, foreign policy, tourism, air travel, and education (Kumar et al., 2020; Prinja et al. 2020; Bajpai et al. 2020; Mahdy, 2020). Before the pandemic, there were many ways of teaching. In which three are common like, on-campus teaching, open distance learning (ODL), and online teaching (Emily et al. 2020; Kumar et al., 2020; Jackman et al. 2021). We all know about most things about the first two, and online learning is also operated in some institutions on a temporary basis. First, in on-campus teaching or physical mode, the researcher had diverse methods to collect information and data from the field. Second, ODL provides freedom to learners for choice, duration, course, and place for academic upliftment. Most of the MOOC courses are available for a less fee and are accredited and certified by a reputed academic body. Academic bodies provide readings, books, and videos for the learner in ODL. Now the learner's turn comes up, how pace and time he/she will be complete that course. Third, Online teaching-learning positively accelerated due to the COVID-19 pandemic. It is a digital platform where learner/s and instructors/teachers come face-to-face intact to reduce the educational gap that arises due to the pandemic. Online teaching is free and opens accessible for all in terms of geographical boundaries, time, space, and academic affiliation. It is based on the central idea of constructivism i.e. in which individual construct and updates their knowledge by self-pace in a learning environment (Emily et al. 2020). In education there was one statement that “Home is the first school of a child” now due to school closures home become the final school, college, and university of most of the child (learners) in the world (Kumar et al., 2020; Brodeur et al. 2021; Jackman et al. 2021).

**3. ONLINE TEACHING-LEARNING: A EMERGING TREND IN THE EDUCATION SECTOR.**

The online e-learning platform provides an opportunity for students, teachers, administrative personnel, and parents to enhance new technical, social, cognitive & psychomotor skills, awareness, and ability during the pandemic (Kumar et al, 2020). The online learning method facilitates to a massive number of learners at a time with live and recorded content. For study, the learner can join according to their interest, personal space, and flexibility with time. In pandemic, it is the best learning environment linked by multiple opportunities and methods of doing research; for those who cannot be accommodating according to academic guidelines and norms in the institutional area (Emily et al. 2020). It is cost-effective and saves money scattered on travel, academic printed material, food, room rent, and friendship expenditure. A learner has an opportunity to watch again course content, reconceive, and enhance the outcome. On other side, the teacher has an opportunity to develop skills, tools, e-learning modules, and pedagogy of teaching. In India, Online teaching going through several e-portal (a total of 41in India) like SWAYAM, DIKSHA, E-PATHSHALA, SMILE, STEM, SILP, SWAYAMPRABHA, e-Shodhsindhu, National Digital Library, etc. which is helpful in shifting the philosophy of education from teacher-centric to child-centric (Kumar et al., 2020). During a pandemic, The learning materials (notes, readings, books, journals, articles, question papers, assignments, videos, and psychological tests) are, now, share digitally by Educational/University websites, Emails, e-books, YouTube, education Applications, WhatsApp groups, Google classroom, Messenger, Telegram etc. (Kumar et al., 2020; Mahdy, 2020). Due to dependent on digital platform, learners are now become slow in reply, irregular in assignment practices, and weak in written work. And also, the internet “Data becomes more important than Aata” (internet data becomes more important than flour). There has been an opportunity for researchers to work in alternative and creative way during the pandemic. The face-to-face data collection method was stopped due to the public safety rules; and the online work facility or Work From Home (WFH) was only available for the researcher. Many researchers around the world have been writing fund proposal letters to the institution, government bodies, private NGOs/stakeholders, and disease control departments for the research on pandemic.

**3.1. WHAT CHALLENGES FACE BY THE RESEARCHER?**

On a global level natural disasters like floods (creates a cut of electricity), storms (create a loss of signal of the internet), drought, land sliding, etc. have increased complications for the researcher in pandemics. The on-campus classroom was shifted to e-learning platforms like Google Meet, Zoom, Webex meet, Team link, Skype, Facebook, YouTube, Google classroom, etc. in education system (Kumar et al., 2020; Jena, 2020; Mahdy, 2020). The government had facilitates education-related direct-to-home (DTH) channels, radio broadcasts, online portals, and online classes for researchers’ advancement during lockdown (Jena, 2020). There are many issues raised related to teaching, learning, and research during the pandemic. Some are as a) internet disconnection, electricity cut, lack of individuals' separate smartphones, unavailable student-friendly electronic devices, b) lack of separate study room, c) environmental noise like traffic sound, DJ sound, marriage-function, religious-cultural function d) disturbance due to child, family members e) lack of convenienceful time (Emily et al. 2020; Kumar et al., 2020). Government school students had face more challenges with electronic resources than private school students do. Students living in different time zone had difficulty in joining online learning-teaching. There is a lack of internet, digital devices, and digital literacy among many rural, remote, and novice people (teachers, learners, and parents) around the globe (Emily et al. 2020; Mahdy, 2020; Jackman et al. 2021). This will generate "digital-stratification" in the 21st-century digital world. The limitation of the data pack and the limited capacity of individuals cause stress during lengthy and boring online classes (Prinja et al. 2020). During the online class, sometimes the learner is passive, tired, sleeping, disconnected, engaging on social media, and playing games (Kumar et al., 2020; Mahdy, 2020). There was less time to complete work like assignments, simulated practical, online tests, book reading, solving questions, etc. due to repeated and continuous classes for the online learner (Mahdy, 2020). So, online classes have created mental issues in the regular learner (Emily et al. 2020; Jackman et al. 2021). Some educational institutions open in two or more shifts, calling only 50% of learners according to alphabetic or class roll number order. The close friends, bench sharers, or comfort zone friends/teachers were missed due to the new guidelines of the school. Many children around the world have faced mental and emotional tragedy due to a) lack of fulfillment of physiological needs (food, shelter, cloth, and education), b) loss of parents, restriction from friends & family c) closure of outdoor activity (playing, singing, dancing, recreation, and school), and d) negative information about the pandemic (Weiner et al. 2020). Repacking, reconstruction and updating of courses during the academic session of the program has shaken learners’ self-esteem, time management, mental balance, and health concern. The online test and evaluation process is complex and difficult for the researcher (Jackman et al. 2021). There is a need to research the impact of COVID-19 on the cognitive, affective, psychomotor, physical, social, spiritual, and scholastic activity of children.

During the lockdown in a pandemic, as a researcher, it is hard to complete some work within time like a) research experiments related to laboratory, performance, software, and field-based b) training, internship, professional development, archive searching c) meeting with the supervisor (Prinja et al. 2020; Vitae et al., 2020; Jena, 2020; Mahdy, 2020; Jackman et al. 2021). The researchers, live in the air, water, and on the land, were missed cognitive, emotional, and psychomotor interactions with the research supervisor/guide. Due to the sudden lockdown imposed, many researchers lose their research data; and left research data at the institution, hostel, locker, and out of their current residence (Vitae et al., 2020; Jackman et al. 2021). The originality of the researchers’ work has unsecure, challengeable, and in the eye of hackers. Due to current scenario, most of the good academic research is suppressed and had not been published during the pandemic and the reason behind this was researchers and public inclination more toward the study related to pandemic COVID-19. The government had given priority to funding money for COVID-19 research more than other disciplines. Therefore, the researchers who work differently from COVID-19 related topics got fewer funds or may not get; so they feel inferior, enter into frustration, and are judged as lower standard research workers (Vitae et al., 2020). On other side, the researchers' academic work as like workshops, conferences, symposiums, and paper presentations were canceled and postponed, which cause delays in paper publication, promotion, and the increment of API score (Vitae et al., 2020; Jackman et al. 2021). Foreigner researchers have lost their job, project, internship, courses, and property due to the expiration of contracts and visa validation-related issues. The international higher education institution was badly affected by the strict lockdown. International researchers’ migration for quality higher education in foreign decelerated significantly due to pandemics (Jena, 2020; Jackman et al. 2021). Due to social distancing measures or lockdown restrictions in public places, the researcher had been less confident during the fieldwork. Some research indicates that there are decrease in working hours of the researcher by 10% during the pandemic (Vitae et al., 2020). The person with disabilities and women researchers faces more challenging situations to balance personal and professional life during the COVID-19 lockdown (Vitae et al., 2020; Jackman et al. 2021). The part-time fellow researcher, ad-hoc, daily basis, and guest faculty members of the institution fear about fissioning their job due to the pandemic. However, some faculties work in online teaching via WFH but they did not receive enough (half, or ¼ of earlier) money from the institution (Brodeur et al. 2021). In WFH, the researcher does so many personal activities like house management, paying the electricity bills, shopping, child caring & nourishment, cooking food, and cultural, religious, and family work with their own research work (Vitae et al., 2020). Due to Work From Home (WFH) the creativity, innovation, thinking, productivity, working potential, and, individual ability of the researcher have decreased significantly (Jackman et al. 2021). Researchers who depend on their part-time work (as mentioned above) are most vulnerable. They are struggling to fulfill basic physiological needs (as mentioned by Maslow) and academic research work. Researchers are searching for money from else because late in the fellowship generation in their bank account. The researcher is not able to pay the institution fee at a fixed interval of time due to a delay in scholarship or fellowship (Jena, 2020). The expenditure on academic material, digital devices, internet and IT equipment, food, medicine, travel-tour, and domestic automatically decreased due to less earnings by the researcher (Agrawal et al. 2020; Jackman et al. 2021). Sometimes few researchers are distracted due to less money and do part-time work for money as tuition-teachers, computer operators, and so on because it is a matter of “Academic lives vs. Livelihood”. Some researchers spent time teaching their own home and neighborhood children and helped them to complete their online work. The researcher has an emotional attachment with their own family member; if anyone suffers from the pandemic, sometimes he/she may have deviated from the research aim. There have been so many cases that happen when a researcher spent time in hospitals and COVID-19 isolation centers for themselves and family members (Agrawal et al. 2020). Pandemics create a "battleground of health" in researchers’ minds related to words like fever, cough, respiratory, fatigue, and headache (Jackman et al. 2021). The pandemic COVID-19 has taught the importance of family, friends, time, money, love, happiness, and a lot of many things to human (Jena, 2020). Due to COVID-19, almost one and a half years of a researcher has collapsed, there are need to accept the extension demand by the desirable researchers to complete the research work (Vitae et al., 2020). A researcher cannot adopt a “wait-and-watch” attitude during a long-term pandemic.

**4. METHOD OF DATA ANALYSIS OF PANDEMIC**

In the modern world, data analysis becomes the most significant tool to evaluate the epic pandemic like COVID-19. It not only provide the data to know the situation but also predict the possible uncertainty and preventive measure to opt-in case of a public health emergency (Weiner et al. 2020). The data helps in statistical analysis and show the road map of the upcoming situation. Scientists use the data for biomedical research, treatments, diagnosis, vaccines, and preventive purposes (Weiner et al. 2020). The science, technology, engineering, artificial intelligence, and innovative ideas combined to tackle the situation through time-efficient, cost-effective, accurate-safety, and top-quality research by the scientist. For all this, the central government has greatly affected by expenditure on medicine, hospital management, infrastructure development, transferring money to unemployed or migrants people, providing food to everyone, COVID-19 infection survey, laboratory research and vaccine development funding, etc. during the pandemic. In this situation, Public health emergency becomes the central priority for the nation (Roope et al. 2021).

**5. POST LOCKDOWN: TRY TO MINIMIZE THE PROBLEM AND MOVE TOWARD THE SOLUTION.**

COVID-19 is very disturbing for every researcher; however, we should remember that we are not the only ones in this traumatic situation. The coronavirus grows exponentially during the mass gathering. To stop the spread of the virus we should follow the social distancing norms, and move out only in case when essential services are required (Brodeur et al. 2021). Our awareness and preventive measure will be helpful for the person who need emergency medical services. The government of every nation should ensure the optimum health resources like a facemask, sanitizer, PPE, testing, isolation, Oxygen supply, ventilators, nurses, doctors, and hospitals for the treatment of sick citizens (Brodeur et al. 2021; Prinja et al. 2020). We need to control disease transmission so that educational institutions can run without any resistance to the upcoming sessions. A friendly relationship with the environment is helpful for both nature and the human species. The lockdown policy and extreme strict guidelines severely affected the pupil mental health. In the post-lockdown period, large-scale pupils expressed issues related to Loneliness, anxiety, a sentiment of social exclusion, depression, and boredom. There is a need to ensure the psychological counselor to serve pandemic-disturb persons through online (phone calls, group discussions, seminars, workshops, rehabilitation sessions, etc.) or physical interaction (Yoga, meditation, face to interaction). “Learn in present, utilize in future” every nation should develop a special rapid action force to decelerate the impact of public health emergencies in the future (Weiner et al. 2020). Some research scholar states that the current working space has not adjustable with COVID-19 protocols (Vitae et al., 2020). WFH habits have significantly decreased the ability, skill, and performance of the researcher as compared to pre-pandemic (Vitae et al., 2020; Jackman et al. 2021). We can reach at end of the pandemic through unity at the country level and solidarity at the world level. To short out the researchers' problem, I am writing a recommendation based on literature review I have done in the paper.

1. Appropriate protocol should be considered for the pandemic.
2. Flexibility in research work format during the pandemic.
3. Give permission to complete mandatory experimental work.
4. Heterogeneous group work discussion for thinking out of the box.
5. Increased working hours for the researchers, and decrease online teaching/class workload.
6. ensure the optimum resources material (living and non-living), funding, and acknowledgment for scientists.
7. Provide e-digital devices, software, remote log Id, and password; so that researchers working outside the educational institution can access and use the resource material.
8. Provide the extension (optimum-time & funding) and non-discriminate fellowship and funds for researchers in all disciplines.
9. Simulated practice, mimic presentation, and 3-D animation for practical purposes.
10. Scatter the internet facility for all; with a cheap, easily available, less buffering, and adequate data limit.
11. There are need to use big data science and artificial intelligence as a tool, technology, and method to improve surveillance, forecasting, identification, management, diagnosing, planning, treatment, health system, and save lives in the pandemic.
12. The cheap & adequate to all ages, transferable, affordable, and the less side-effective vaccine would be the solution to this pandemic.

**6. CONCLUSION**

Pandemic is not good for humans, lockdown vibrates the social equilibrium of living things on the Earth. But on another side, lockdown (Stay At Home) impact positively on the environment, as air quality improves, incensement in ozone concentration, fine particle (PM2.5) reduces significantly, reduction of greenhouse gases (NO2, SO2), and lower electricity consumption etc. (Brodeur et al. 2021). Pandemic has provided the new topic keyword “COVID-19” to the world researchers (Vitae et al., 2020; Jackman et al. 2021). Earlier, We read, speak, and, write only in the classroom about different types of ICT tools, technology, e-conference, teleconferencing, virtual meeting, technical skill, and, online teaching, now we are living life with these (Jena, 2020). Pandemic gives us practical exposure to observe, develop skills, update, learn, and understand new things in our daily routine. It helps in the new digital transformation of the world. World researchers are developing many digital teaching-Learning models, strategies, LMS, and knowledge for the pandemic situation (Jena, 2020). The educational institutions have accelerate attempt to restructure, redesign and re-collaborate the system for researcher-friendly with equipping support to the new digital learning World. COVID-19 pandemic’s waves have been proven successful and helpful in creating the atmosphere of digital literacy, Blended Learning, and online learning on the Earth. E-Content development for learners have been accelerated by researchers around the world to reduce gap between 'Modern World' and 'New Digital World'. The researchers’ autonomy has increased during this pandemic. At last, humans are optimistic and moving towards new digital world with lot of challenges and joyment.

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