

COVID-19 SERIES

The impact of the COVID-19 on research



Letter to the editor

The World Health Organization declared the coronavirus disease of 2019 (COVID-19) as a pandemic. Extreme control measures have been applied globally. Borders between countries have been closed, and quarantining and physical distancing have been practiced. These control measures come at a socioeconomic cost and certainly come at the expense of scientific research. Clinical research often involves human to human interaction; however, such interaction has become hazardous due to the highly contagious nature of COVID-19. The extreme control measures applied globally are relatively novel and form the main challenges to ongoing research. Continuation of research studies that were in process during the prepandemic phase is challenging. Researchers have taken one of two routes: a temporary pause or continuation during the pandemic. The Clinical Research Network Coordinating Center reported that 54% of commercial studies and 12% of noncommercial studies had continued as planned [1]. We wish to highlight potential issues with continuing clinical research throughout the pandemic.

In clinical research, practicing control over the independent variable ensures that any resultant effect on the dependent variable is related to the intervention [2]. Control in research increases the internal validity [2]; however, demonstrating control during the COVID-19 pandemic is challenging. Researchers may have lost control over fundamental resources, such as physical access to experimental settings, human resources, assessment clinic appointments, and intervention clinic appointments. The COVID-19 pandemic may have a significant impact on the study's physical setting through either a research location change or an un-changed location but with the application of infection control measures. Such loss of control during the COVID-19 pandemic could risk the internal and external validity of the studies [3].

The findings of any research study could represent a true result or could be due to chance or bias introduced by other factors [4]. Sampling bias is a major threat to research validity during the COVID-19 pandemic. Many health services are opened only for emergency services, meaning that only

those who are in severe pain or with a recent injury may be accessible to researchers. This would result in studies with a sample that is less representative of the target population, risking the generalizability of the research. Additionally, the threats the pandemic present to people's health has led to psychological distress, depression, and anxiety [5,6]. The performance of research volunteers who are psychologically vulnerable may be different from those who are more robust [7,8]. Women, individuals 18 to 30 years old and above 60 years old, people with higher education, and migrant workers have been reported to have the highest distress levels during the COVID-19 pandemic [5]. Therefore, these cohorts may be less likely to volunteer in research, and if they volunteer, their performance may be affected by their psychological well being. Such factors might risk the study's generalizability as the cohort recruited during the pandemic might not be representative of the target population.

The infection control measures practiced during the COVID-19 pandemic have placed ongoing research under the threat of systematic bias. Systematic bias is the tendency to under/overestimate effects due to error in the study design or execution, unlike random bias, which is related to chance and is a feature of all research [9]. Systematic bias can result from a range of factors and leads to incorrect estimations or associations such as selection, confounding, and information bias [3]. Commonly systematic bias is minimized by employing a range of techniques to address confounding variables. However, confounding variables during a pandemic are more complex. For example, examining some of the research volunteers in a nonpandemic environment and others in a pandemic environment for the same study could risk the consistency of procedures, exposing the research to unstable variables. Recognizing the potential effect of pandemics as a source of bias is important to allow a balanced interpretation of the results. The COVID-19 pandemic is a potential source of unintentional bias, and researchers should be careful not to overgeneralize the results and inspect the data for type I/II errors [10].

It is the researchers' responsibility to maintain the safety of their volunteers and research staff. Predictable risk should be balanced with the expected benefits of the research to decide whether to continue or pause the study. Researchers are expected to deal with the impact by applying the required decisions to minimize the risk to participants and to research validity. It is recommended to practice transparency in reporting to aid interpretation of

Conflict of interest: The authors declare no conflict of interest.