Covid 19 Related Stress Among Medical Students in Sri Lanka: Two Years After the Beginning of the Pandemic

Group 14

This research proposal is submitted as a partial requirement for the Communication Learning and Research Module of the Medical Undergraduate Curriculum

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01.Introduction

01.1 Background

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. The virus caused a still ongoing global pandemic referred to as the corona virus pandemic or COVID-19 pandemic. The novel virus was first identified from an outbreak in the Chinese city of Wuhan in December 2019. On January 30, 2020, the World Health Organization (WHO) proclaimed a Public Health Emergency of International Concern and a Pandemic on March 11, 2020. The pandemic had produced about 437 million illnesses and 5.95 million deaths as of March 1, 2022(*COVID Live - Coronavirus Statistics - Worldometer,* no date a). Two years after the beginning of the pandemic, it is still on-going and as of March 2022, the most wide-spread variant of the virus is omicron whilst the other more virulent variants of the virus being alpha, beta and delta.

The first case of the virus in Sri Lanka was confirmed on 27 January 2020, after a 44-year-old Chinese woman from Hubei, China was admitted to the Infectious disease hospital in Angoda, Sri Lanka. Since then, by 02.03.2022, 648 948 cases have been reported alongside 16 244 deaths. At its peak on the 9th of September 2021 76,803 ongoing infections were reported while the daily deaths peaked at 216 on the 30th of August 2021(*Sri Lanka COVID - Coronavirus Statistics - Worldometer,* no date). Since then, the Island wide vaccination program has provided relative relief reducing the number of ongoing infections and daily deaths even without significant Lockdown measures in place. At the time of writing 914 new cases were reported

on the 1st of March alongside 21612 active cases and 32 new deaths reported on the 28th of February. By February 2022 64.7% of the population has been fully vaccinated while 77.1% have received at least one dose and 32.8% have received a booster dose(*Coronavirus (COVID-19) Vaccinations - Our World in Data*, no date).

The first Island Wide lockdown to curtail the ongoing pandemic was imposed on the 20th of March 2020 and since then on and off Island Wide lockdowns alongside isolation of certain high-risk areas were imposed in order to curtail the spread of the virus. All government universities were closed on the 12th March 2020. Nearly two years later by the time of writing (02.03.2022) government University education still hasn't returned to normal with most universities resorting to online based teaching systems alongside limited onsite teaching specially reserved for practical learning, examinations and work training.

The economic burden on the country has been vast specially on the tourism sector which reported a complete halt for a period of 10 months till 21st January 2021. This resulted in rapidly declining foreign reserves leading to significant import restrictions and reduced availability of essential imports (eg- fuel, Milk powder). Unemployment rates have also been higher since the pandemic alongside worsening record inflation rates reported on February 2022 amidst a depreciating Srilankan Rupee.

There are over 13000 medical students in enrolled in government universities in Sri Lanka. Currently university medical education in Sri Lanka is being conducted both online and as live in-person lectures. Clinical training was discontinued during the height of the pandemic but

has been recontinued since, under pandemic related restrictions. Several issues have been brought up by medical student unions, including the lack of university hostel rooms for most students due to strict covid related guidelines limiting the number of students per hostel room. Other issues raised include the non-payment of Mahapola student's bursary for several months due to the lack of funds, increased prices of canteen food items and increased prices of stationary items which are a result of the economic crisis the nation is facing in the immediate aftermath of the peak of the pandemic.

The study is to be conducted during a period after the peak while the entire nation is struggling to recover from the economic and social impact of the pandemic.

01.2 Justification

Since the initial closure of government universities on the 20th of March 2020 nearly all universities have implemented online teaching as the main mode of delivering theoretical education. Since the transition students have been forced to change their normal studying habits and adapt to an electronic based learning system which is also home based away from their normal learning environment.

Since the MBBS (Bachelor of Medicine, Bachelor of Surgery) course is widely accepted as one of the most intensive and stressful courses it is important to assess the psychological impact of the changes brought up by the new learning environment on students.

Although globally several studies have been conducted on the impact of the pandemic on university education, we failed to find any study conducted on the local student population.

Furthermore, the global studies have mainly been conducted during the first and second year of the pandemic amidst complete lockdowns and while online teaching was the only teaching modality. This study will be conducted during a period of neo normalization amidst online teaching conducted alongside limited onsite teaching. Thus, this study will help in measuring the progress and impact of neo normalization of university education on university students.

The results of this study can be used to make necessary changes in university education policies to better suit the student taking into account their mental wellbeing.

Finding can also be used to identify high risk student populations and to make the relevant interventions to prevent dangerous implications of mental stress.

The results will also provide an outlook on coping strategies that are widely accepted among university student populations. Encouragement of positive coping mechanisms and discouragement of negatives can be done accordingly.

The lack of studies on Covid 19 related stresses on the local university student population in spite of the abundance of global studies on the student population will be addressed following the study.

Furthermore, its important to state that the world has faced 3 major pandemics within the last 2 decades before Covid-19 (SARS-2003, H1N1-2009, MERS-2012), so its important to be ready for the next pandemic as it's not a question of if but when regarding the next pandemic. This research will provide data that will be important to better ready university students to face the next pandemic with positive mental health in mind.

01.3 Objectives

02.1 General Objectives

1.To determine the prevalence of perceived Covid 19 related psychological stress, its causes, associated risk factors and related coping mechanisms among medical students in Sri Lanka.

02.2 Specific Objectives

1.To determine the prevalence of covid 19 related psychological stress among medical students in Sri Lanka.

2.To describe the causes of Covid 19 related stress among medical students in Sri Lanka

3.To describe the coping mechanisms of Covid 19 related stress in medical students in Sri Lanka.

4.To determine the risk factors associated with Covid 19 related stress in medical students of Sri Lanka.

02. Literature Review

Search strategy

We used Google Scholar, PubMed and Free medical journals as suitable web-based sources for our literature review. The keywords "Covid-19", "Stress", "Medical Students", "Coping strategies" were used in our initial review. Due to the inadequacy of the number of research articles available we used different keywords such as "University Students" to broaden our search as well as other websites for journal articles. In addition, the WHO website and the CDC.gov was used to obtain current information on relevant topics.

03.1 What is Covid 19?

The SARS-CoV-2 virus causes Coronavirus Disease (COVID-19), an infectious disease. The majority of those infected with the virus will have mild to moderate respiratory symptoms and will recover without the need for medical attention. Some, on the other hand, will become critically unwell and require medical assistance. Serious sickness is more likely to strike the elderly and those with underlying medical disorders such as cardiovascular disease, diabetes, chronic respiratory disease, or cancer. COVID-19 can make anyone sick and cause them to get very ill or die at any age. (*Coronavirus*, no date)

As of 11.03.2022 The total number of worldwide

Coronavirus Cases:**452,624,198**

Deaths:**6,047,631**

Recovered:**387,107,351**(*COVID Live - Coronavirus Statistics - Worldometer*, no date b)

Genomic Structure

SARS-CoV-2 is a new betacoronavirus with 79 percent genome sequence similarity to SARS-CoV and 50 percent similarity to MERS-CoV. Its genomic structure is similar to that of other betacoronaviruses. Replicase (ORF1a/ORF1b), spike (S), envelope (E), membrane (M), and nucleocapsid (N) are the six functional open reading frames (ORFs) ordered in order from 5′ to 3′. In addition, between the structural genes are seven potential ORFs encoding auxiliary proteins. The majority of the proteins encoded by SARS-CoV-2 are similar in length to those encoded by SARS-CoV. Except for the S gene, which diverges11,24, SARS-CoV-2 shares more than 90% amino acid identity with SARS-CoV of the four structural genes. The replicase gene encodes a big polyprotein (pp1ab) that is proteolytically broken into 16 non-structural proteins that cover two-thirds of the 5′ genome.(Hu *et al.,* 2020)

Transmission

SARS-CoV-2 can spread through both direct and indirect contact (droplet and human-to-human transmission) (contaminated objects and airborne contagion). Meanwhile, personal protective equipment (PPE) could be a source of infection in the air. As previously stated, SARS-CoV-2 is thought to transmit mostly by respiratory droplets, which are produced when a patient coughs, sneezes, or even talks or sings. Droplets can only travel a few feet (almost

two meters) and only stay in the air for a short time. SARS-CoV-2, on the other hand, can be suspended in the air for up to three hours and remains intact and contagious in droplets (less than five microns in diameter). As a result, airborne isolation, room ventilation, and proper disinfectant application (particularly in bathrooms) may help to limit aerosol production.(Lotfi, Hamblin and Rezaei, 2020)

Pathogenesis

After Entry of the virus and contact with the target cells. SARS-CoV-2 binds to ACE 2, the receptor of the host target cell.

Non-specific symptoms such as fever, myalgia, headache, and respiratory symptoms are caused by the virus's active replication and release in lung cells. The virus causes transient damage to cells in the olfactory epithelium in an experimental hamster model, resulting to sensory dysfunction, which could explain the brief loss of taste and smell found in covid-19. The locations of infection and patient symptoms may be explained by the distribution of ACE 2 receptors in different tissues. The ACE 2 receptor, for example, can be located on the epithelium of other organs like the gut and endothelial cells in the kidney and blood arteries, which could explain gastrointestinal symptoms as well as cardiovascular issues In patients who died of covid-19, lymphocytic endotheliitis, liver cell necrosis, and myocardial infarction were found in postmortem pathology examinations of the lung, heart, kidney, and liver, as well as liver cell necrosis and myocardial infarction. These data suggest that, like SARS-CoV-1 and influenzae, the virus directly affects a variety of organs.

Much is yet unknown. Is endothelial dysfunction or pathological alterations in the respiratory tract due to direct viral infection, cytokine dysregulation, or coagulopathy, or are they multifactorial? Is it possible that direct viral invasion or coagulopathy contributes directly to some of the ischemic consequences, such as infarcts? These, and other issues, will require greater investigation. (Cevik *et al.,* 2020)

Diagnosis

To diagnose current infection with SARS-CoV-2 and to inform an individual's medical care, viral assays such as Nucleic Acid Amplification Testing (NAATs, such as Reverse Transcription – Polymerase Chain Reaction) and antigen diagnostics are employed as diagnostic tests. Viral tests can also be used as screening tests to help prevent SARS-CoV-2 transmission by identifying infected people who need to be isolated from others.

NAATs are SARS-CoV-2 infection tests with a high sensitivity and specificity. NAATs detect one or more viral ribonucleic acid (RNA) genes and can either suggest a present infection or a recent infection if viral RNA detection is sustained. The presence of a virus capable of reproducing or transmitting to others is not necessarily proven by NAAT results. The majority of NAATs must be done in a lab, although some are point-of-care tests and a few are self-tests. Laboratory tests take 1–3 days to give results, but point-of-care or self-test NAATs can produce results in 15–60 minutes. The majority of NAATs yield qualitative results. Upper respiratory specimens, such as nasopharyngeal, nasal mid-turbinate, anterior nasal, or saliva, can be used for NAATs.(*Overview of Testing for SARS-CoV-2, the virus that causes COVID-19*, no date)

Immunoassays that detect the presence of a specific viral antigen are known as antigen tests. Antigen tests have a similar specificity as NAATs, however they are less sensitive. Most are less expensive than NAATs and can produce findings in minutes, making them helpful in COVID-19 screening programs. Antigen tests are available for at-home testing (self-testing), point-of-care testing, and laboratory testing. Some antigen test results (a negative test in persons with symptoms or a positive test in persons without symptoms) may need to be confirmed with a laboratory-based NAAT due to the performance characteristics of antigen testing. Some point-of-care NAATs can't be used for confirmatory testing because they only give presumptive results to decide when confirmatory testing is required, the Antigen Testing Algorithm should be used.(Mina and Andersen, 2021)

03.2 Stress and Measuring Stress

Stress isn't a one-dimensional thing. On the contrary, it is assumed to have a variety of dimensions. To study, assess, and manage stress, it is necessary to get a theoretical and practical grasp of various facets of stress. Anxiety, homeostasis, and allostasis are the most closely related dimensions to stress, according to the literature evaluation.

In short, it would be plausible to define stress as a painful and hurting feeling that is dependent to a traumatic condition of present or an expectation of a danger in future which is related to an undefined object. Anxiety and stress are not mutually exclusive. The continuum of stress is vast, including biological, social-psychological, and psychological realms, and is considered a key precursor of worry. Anxiety is a complex term that manifests itself in a variety of ways,

including bodily, cognitive, emotional, and interpersonal manifestations. Anxiety is a warning signal that notifies a person to the presence of a danger so that the person can prepare to deal with it. It should be mentioned that low amounts of anxiety are required to survive and shield an individual from potentially dangerous situations. The triggering agent and the emphasis of the initiation are the differences between anxiety and stress. Stress requires an external source (stressor) to disrupt the living being's homeostasis, but anxiety is a subjective experience that can exist without any determined external force and whose nature is unrelated to the objective external component that causes it.(Shahsavarani *et al.*, 2015)

Anxiety disorders are the most common mental disorders (current global prevalence: 7.3 percent [4.8 percent -10.9 percent] Specific phobias are the most frequent, with a prevalence of 10.3 percent, followed by panic disorder (with or without agoraphobia) with a prevalence of 6.0 percent, social phobia (2.7 percent), and generalized anxiety disorder with a prevalence of 6.0 percent (2.2 percent). There is no evidence that these illnesses have become more common in recent decades. Women are 1.5 to 2 times more likely than males to acquire emotional disorders in adolescence, and they are 1.5 to 2 times more likely than men to have an anxiety condition.(Thibaut, 2017)

Measurements of Stress

Self-report assessments, behavioral coding, and physiological measurements can all be used to assess stress responses. Emotions, cognitions, behaviors, and physiological responses triggered by stressful events are among these responses. Self-reports of perceived stress

connected to a specific stressor or one's living circumstances are one of the simplest ways to quantify stress reactions.

The Perceived Stress Scale, for example, is a 10-item self-report questionnaire that reflects a person's opinion of how overwhelmed they are by their present life circumstances(Cohen, Kamarck and Mermelstein, 1983). This scale will be used in the questionnaire of our study. A review of the psychometric evidence of the perceived Stress Scale concluded that overall, the PSS is a simple-to-use survey with well-established psychometric features. The psychometric qualities of the 10-item PSS were found to be superior to those of the 14-item PSS in general, with the 4-item scale performing the worst.(Lee, 2012) A reliability and validity study of the PSS-10 Scale also confirmed that "The PSS-10 showed an adequate reliability and validity supporting its use in this population."(Siqueira Reis, Ferreira Hino and RomÉlio Rodriguez AÑez, 2010)

Acute stress reactions have historically been examined in controlled laboratory settings to capture responses that occur within minutes of exposure to the stressor (e.g-emotional and physiological reactivity to an acute stress task). The Trier Social Stress Test (TSST), a standardized laboratory stress task in which participants give a speech and execute mental arithmetic in front of judges, is a regularly used acute stress paradigm. For the vast majority of subjects, the TSST consistently elicits an acute stress response. Outside of the lab, new technology has improved our ability to capture real-time stress responses in everyday life utilizing mobile phones and wearables, which is something that many researchers are now doing. Many stress models indicate that the stress response mediates the influence of stress exposures on health outcomes, hence considering the effects of both stressor exposure and

stress responses on health may enhance the prediction of health outcomes.(Crosswell and Lockwood, 2020)

 In addition to the perceived stress scale our study will be using self-administered questions to assess the prevalence of academic stress and social stress.

03.3 Prevalence of Covid 19 Related Stress

Many studies have been conducted using local student populations to assess covid 19 related stress in student populations. These have mainly been conducted during the height of the global pandemic.

Data collected through social media from 2082 Nepalese respondents between 23rd April, 2020 and 3rd May, 2020 suggested that half of the respondents suffered from at least one symptom of psychological distress whereas 32% suffered from two or more symptoms of psychological distress such as restlessness, fearfulness, anxiety and worry and sadness in the past 2 weeks preceding the survey date. The findings further suggested that respondents having lower family income, residing in rented room, and participants from province 2 were more likely to suffer from both single and multiple symptoms of psychological distress. (Gautam *et al.,* 2020)The data in this study was collected using Facebook. In contrast to our study population this study was conducted in the general population and even people outside Nepal had participated.

A study done in Palestine using primary and secondary school students in the Gaza strip revealed that the majority of students (89.1%) and students (72.1%) had moderate to severe

anxiety and depression, respectively, while fewer than half of them (35.7%) had moderate to severe stress due to the pandemic. (Radwan *et al.*, 2021) This study had collected data from primary and secondary school students instead of medical students as seen in our study. In addition, the political instability seen in Gaza may result in a higher level of anxiety than what could be expected in our population.

The findings in a study conducted on university students of 2 universities in Saudi Arabia revealed that three-quarters of university students (75%) suffer from depression, with half of those (37.5%) suffering from moderate to severe depression. (Azmi *et al.*, 2022)While this is a high percentage, it is consistent with a study conducted in the United States on 192 university students, which found that 44 percent of participants had high levels of depressive thoughts (Son *et al.*, 2020). In terms of self-esteem, 41% of university students in Riyadh were reported to have low self-esteem.(Azmi *et al.*, 2022) In this study, the 10-item Rosenberg Self-Esteem Scale (RSES) and the Zung Self-Rating Depression Scale (ZSDS) was used instead of the Perceived Stress Scale (PSS-10).

In a study conducted on home quarantined students in Dhaka according to the DASS 21 scale, 28.5 percent of the respondents had stress, 33.3 percent anxiety, 46.92 percent depression from mild to severe, and 69.31 percent had event-specific distress from mild to severe, according to IES.(Khan *et al.*, 2020) The additional stress from being home quarantined (currently our study population is not being home quarantined) might be reflected in higher levels of depression, anxiety and stress than that is to be expected from our population.

On the other hand, a study done in the U.K general population between 23 and 28 March 2020, using a quota sample of 2025 UK adults aged 18 years and older anxiety, depression, and trauma symptoms were reported at higher levels than in prior population studies, but not

significantly so. Young age, the presence of children in the family, and high estimations of personal risk all predicted anxiety or sadness, as well as trauma symptoms. Low income, loss of income, and pre-existing health issues in self and others were also linked to anxiety and depression. COVID-19-related anxiety was found to be higher in older subjects.(Shevlin *et al.,* 2020)

 A systematic review and meta-analysis of covid 19 related stress revealed that the COVID-19 pandemic has had a negative psychological impact on college students, with Chinese college students experiencing lower rates of anxiety, depression, and stress than non-Chinese college students.(Salari *et al.,* 2020) In this article, the prevalence of stress and anxiety among the general population during the COVID-19 pandemic was assessed.

Moving on to the local setting, a study conducted in Sri Lanka on the psychological experience of health care workers revealed that 53.3 percent and 51.3 percent of the subjects, respectively, had higher depressive symptoms and anxiety. There were no differences in the prevalence of heightened depressive symptoms and anxiety between those who were exposed to COVID-19 confirmed or suspected patients and those who were not. The concern of contracting COVID-19 and transferring it to family members was linked to an increased risk of depression.(Perera *et al.,* 2021) Although this study was conducted on health workers it provides one of the few insights on how covid 19 has affected the Sri Lankan population psychologically. Moreover, our study will be focusing on medical students and students who are attending clinical practices during the pandemic are bound to have similar experience to the health care workers seen in this study.

03.4 Psychological Effects of Covid 19

03.4.1 Directly on infected individuals

High rates of psychiatric symptoms have been linked to the COVID-19 pandemic, and mental health issues are important since mental health disorders (such as depression, anxiety disorders, posttraumatic stress disorder, and drug use disorders) are common in people with chronic pain. Mental health issues related to the COVID-19 epidemic could increase these pre-existing illnesses, which could have a negative impact on pain treatment outcomes. Antiviral medications must be administered in combination with psychotropic drugs, such as antipsychotics, antidepressants, and anti-anxiety drugs, if a patient with psychiatric disorders is infected with COVID-19. Patients with psychiatric problems may develop relapses in their mental disease if antiviral medications are used without additional therapy. With the ongoing coronavirus disease (COVID-19) epidemic, psychiatrists are being urged by patients, family members, and patient advocacy groups to help ensure that clozapine, a key medicine for continuous patient treatment, is available. Clozapine may be linked to an increased risk of pneumonia, which is more likely owing to sialorrhea and aspiration than neutropenia. Clozapine levels can rise as a result of an acute systemic infection, causing sedation, myoclonus, and seizures, as well as other symptoms of acute clozapine toxicity.(Kontoangelos, Economou and Papageorgiou, 2020)

The students of our study are less likely to be affected directly considering the fact that the prevalence of ongoing covid 19 infections is low.

03.4.2 Indirectly on uninfected Individuals

When considering the effects of pandemics on various categories of individuals in the community, it is clear that patients and their relatives, healthcare workers, and all other people who are at risk of disease are directly affected. Children are one of the most vulnerable populations when disasters strike, such as pandemics, wars, forced migration, and natural disasters.(Morganstein *et al.,* 2017) Children are thought to be more badly affected mentally than other age groups due to the difficulty in making sense of all these COVID-19 experiences and a lack of self-expression abilities. According to Tsang, Scudds, and Chan (2004), children in families who have a pandemic in their family members cry excessively, have trouble sleeping, and are ashamed.

Middle-aged and elderly adults are also impacted by COVID-19. When we look at the COVID-19 Fatality Rate by AGE, we see that "80+ years old 21.9 percent, 70-79 years old 8.0 percent, 60-69 years old 3.6" are the age groups of persons who died as a result of COVID-19 (*Coronavirus Age, Sex, Demographics (COVID-19) - Worldometer*, no date)In fact, in studies on the psychological effects of COVID-19, it was discovered that psychological problems such as depression, anxiety, and psychological distress were observed in the elderly.

Young people are another demographic that has been badly impacted by the COVID-19 epidemic. In their study on the association between MERS pandemics and stress in university students, found that 77 percent of students have a low degree of anxiety and 18.4 percent have a medium level of anxiety.(Al-Rabiaah *et al.,* 2020) At the same time, given to technological advancements, young people are more likely than other age groups to be exposed to unfavorable COVID-19 epidemic-related flows around the world via the internet and social media. Young individuals are said to be more mentally risky than other age groups as a result

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of this predicament. Similarly, loneliness, melancholy, rage, pessimism, and hopelessness are regarded to have psychological effects for young individuals.(Kong *et al.,* 2020; Wang *et al.,* 2020)

Our study population consists of individuals ranging from 21-29 yrs, so they are more likely to be affected indirectly. Unfortunately, our questionnaire does not have the means to determine anxiety levels in the population.

03.5 Causes of Covid 19 Related Stress and Anxiety in Students

Mental health issues which are caused by COVID 19 Pandemic is a leading impediment to academic success of university students and performances, daily living of health care workers. Mental illness can affect students' motivation, concentration, sleeping patterns and social interactions which are crucial factors for students to succeed in higher education.

University students are ones who behave in groups oftenly. Therefore, transmissibility of COVID 19 among them is relatively higher than other social groups. If one student became positive for COVID 19, the rest of his associators have to be quarantined. Quarantine measures could have negative psychological effects including symptoms of posttraumatic stress, stress, anxiety, and depression. (D'Hondt *et al.*, 2020)

University students are a high-stress population due to the academic competitiveness and learning outcomes required by their institutions. More so in our study setting since the MBBS course is considered one of the toughest undergraduate courses. During the outbreak, teaching

and learning modifications put in place to maintain social distancing have vastly impacted students, resulting in increased incidences of depression and anxiety. The adjustment to online learning, postponement of   examinations, and cancellation of practicals may lead to an increase in stress. university students experienced clinically significant psychological stress accompanied by a deterioration in mental well-being. They also reported disrupted sleeping patterns and appetite than before the pandemic.

Data collected from medical schools in Thailand during the pandemic states that additionally stress from online teaching and learning, stress from online examination and evaluation system, feeling lonely, not being able to meet friends or attend recreational activities, and fear of infection have negative impacts on mental wellbeing of university students.(Puranachaikere *et al.*, 2021) In contrast the study setting of our research is post-peak of the pandemic. As a result, we expect factors like feeling lonely, and not being able to meet friends or attend recreational activities to play a lesser role.

According to research conducted on home quarantined Bangladeshi students stated that due to long lasting lockdowns of the country unemployment rates increased resulting in loss of income of families. As a result, financial burden arose causing inadequate food supply and lack of sanitation. Due to fear and worry about their own health and their loved-ones, students were restricted to their homes leading to reduced physical activities and recreational activities such as sports, hiking, reading, meditation. (Khan *et al.*, 2020) Currently Sri Lanka is also facing a massive economic crisis with unemployment rates and inflation rates at record levels. As a result, a similar but greater effect on psychological stress due to economic factors is expected in our study

03.6 Coping Strategies of Covid 19 related stress and anxiety

According to a study conducted at the department of medical education, college of medicine, King Saud University (KSU), Riyadh, Saudi Arabia, the best ways to cope with mild stress are "regular exercise," "watching online movies," "playing online games," "online fun with family and friends," "religious activities," and "learning to live in the current COVID situation and accept it." "Indulging in religious activities," "viewing online movies and playing online games," and "online fun with family and friends" were among the ways used by students to cope with the extreme stress. Furthermore, children who refuse to accept the current COVID condition have an almost 2-fold higher mild stress level and an almost 11-fold higher severe stress level.(Abdulghani *et al.*, 2020)

According to a study conducted among university students in Jakarta, Indonesia during the Covid 19 pandemic the COPE Brief instrument, devised by Carver (1997), was used to measure the coping strategy variable, which consisted of 28 items with two types of coping strategies, problem- and emotion-focused coping. Active, planning, positive reframing, acceptance, humor, religion, emotional and instrumental support, self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame are among the 14 coping strategies measured by the Brief COPE. To cope with the stressor, people frequently adopted emotion-focused coping. The findings revealed that coping techniques have a negative impact on psychological suffering in people afflicted by the COVID-19 pandemic. Furthermore, in this study, emotion- and problem-focused coping made the largest beneficial and negative contributions to psychological discomfort, respectively. The findings show that numerous

coping methods, including behavioral disengagement, venting, denial, use of emotional support, humor, and self-blame, have a substantial impact on psychological discomfort. Behavioral disengagement, or giving up on trying to address problems, is the coping style that most positively contributes to psychological suffering.(Akbar and Aisyawati, 2021)

In a study done among medical students in Geneva, half of the participants said they used coping mechanisms to deal with the changes they saw over that time period. Physical activity or yoga was mentioned by the majority as a primary technique. Others said they've increased their social interactions through phone or video chats, or that they've started using elaborate day planners to structure and arrange their days. Some students mentioned alternative tactics as taking time for themselves, others, or things they had not previously taken time for, and maintaining their study program with self-directed learning as much as possible to keep a particular pattern in everyday life. They had obtained data by creating a survey with open-ended questions on the one hand, generating qualitative data, and Likert type items and Yes-No replies to closed questions in which students were asked to express their perception on the other hand, yielding quantitative data. (Sophie *et al.,* 2021)

03.7 Demographical Relationship of coping mechanisms, level of stress

An Ethiopian study conducted on adults with chronic diseases concluded that more than two-thirds of study participants (68.4%) were moderately stressed, 13.9% were severely stressed, and 17.8% had low levels of perceived stress. (Girma, Ayalew and Mesafint, 2021) Due to the disease levels of the study populations used in this study the levels of in our study can be expected to be less as generally university students can be perceived to be young and healthy.

But this finding was in line with another study in Oman that reported only 30 (3.1%) students who reported having experienced low stress and that on an average all the respondents experienced a high-moderate stress.

The same study done in Oman reported higher stress levels in female students more than males and also higher levels of stress in married students (more than unmarried), urban student populations (compared to rural), students in joint families (compared to nuclear families), students enrolled in bachelor's degree programs (compared to diploma programs), Students with higher GPA and students in years 2 and 3 (compared to years 1 and 3). (Malik and Javed, 2021)In contrast to ours this study was conducted in a single university in Oman.

On the other hand, a study done in India found out that a higher percentage of males were dissatisfied with the new online based learning system than females whereas an equal proportion of both males and females expressed satisfaction with the new online based learning system.(Chandra, 2021) This study had used 94 participants and had used the perception of academic stress scale to assess academic stress levels.

A polish study concluded that the dominant coping strategies among Polish students were: acceptance, planning, and seeking emotional support. While the less popular coping mechanisms were substance use, denial, behavioural disengagement, and religious coping. This study also found out that factors such as age, gender, and place of residence influenced the choice of specific strategies of coping with stress during the COVID-19 pandemic. The results also showed that the youngest students had the lowest coping skills. The study also concluded that the students' maladaptive strategies of coping with stress, especially during the pandemic, may result in long-term consequences for their psychophysiological health and

academic achievements.(Babicka-Wirkus *et al.,* 2021) This study had used 17 polish institutions and 577 completed questionnaires were used for data collection.

All these studies had been conducted during the first and second years of the pandemic. In contrasts our study will provide data on the third year of the Pandemic and provide useful information on university students during the global recovery process.

04. Methodology

4.1Research design

An observational descriptive cross-sectional study will be used in this proposed research.

4.2 Study Setting and population

This research will be conducted among medical students in some selected universities in Sri Lanka.

4.3 Inclusion and exclusion criteria

4.3.1 Inclusion criteria

Medical undergraduates of first, second, third- and fourth-year batches of all medical faculties in Sri Lanka would be considered eligible for this proposed study

4.3.2 Exclusion criteria

Due to practical difficulties in data collection and ethical issues, final year students will be excluded as they have a busy work schedule.

4.4 Sample size sampling method

4.4.1 Sample size

As this is a cross sectional study the following equation will be used to determine the sample size.

$$n = \frac{z^2 p(1-p)}{d^2}$$

n = sample size

p = Prevalence of perceived stress due to Covid 19 among medical students, (p would be taken as 50% as there were no similar studies done in Sri Lanka)

Z= standard normal deviation for a given confident interval for 95%, Z = 1.96

d= margin of error(precision) = 0.05

n = (1.96^2) x 0.5 (1-0.5) /0.05^2

   = 385

To compensate the possible non responders 10% of the calculated sample size will be added.

Therefore, sample size = 385+(385x10%) = 424

4.3.2 Sampling method

A multi-stage sampling method will be used to select the sample.

Simple random sampling method will be used to select 5 medical faculties out of the 9 universities that have at least 4 functional medical batches to the date. From each of the selected Universities, 2 batches would be selected using the simple random sample method. All the selected batches would be invited to participate this research through their batch representatives. Since the data will be collected using Google forms there will be no specific

sampling methods used to select individual participants from each of the. Those who respond first will be accepted to the study sample.

4.5 Variables

Predictor variables- Academic, social and psychological causes for Covid 19 related stress.

Outcome variable- Psychological stress due to covid 19

Probable confounding variable- sex

4.6 Data collection and data collection tools

Data collection tool will be a pre-tested, self-administered questionnaire with 4 parts, namely A, B, C and D.

Part A: Will consist of 8 questions which will have to be filled appropriately by the participants. The main objective of this questionnaire is to collect general information about the participants, including the socio-demographic particulars of the participants.

Part B: Will consists of the 10-point perceived stress scale modified for covid 19 pandemic. (PCC-10-C) which consists of 10 questions and a 5-point Likert scale for scoring with scores ranging from Never-0 to Always-4. The PCC-10 scale is a self-report questionnaire that reflects a person's opinion of how overwhelmed they are by their present life

circumstances.(Cohen, Kamarck and Mermelstein, 1983). Many studies conducted on the validity of the PCC-10 scale and one such study (Baik *et al.*, 2019) concluded that the findings support the use of the PSS-10 as a valid and reliable measure of perceived stress. Part B will provide us with the necessary data to calculate the prevalence of low stress, moderate stress and high perceived stress.

Part C: Will consist of a 14-item questionnaire to determine the cause of perceived Covid 19 related stress. Participants will be able choose from a 5-point Likert scale ranging from 1- Disagree entirely to 5- Agree entirely. This part of the questionnaire was developed by the investigators after a thorough literature review and with the guidance of the supervisor. For analytical purposes the questions were divided into Academic (7 questions), Social(3 questions) and Psychological (4 questions) causes of stress. The second specific objective which is to describe the causes of Covid-19 related stress in medical students of Sri Lanka will be achieved through this part of the questionnaire.

Part D: Will comprise a version of the Brief-COPE scale which is a validated(García et al., 2018) free to use 28-item multidimensional measure of strategies used for coping or regulating cognitions in response to stressors. This scale will be modified accordingly to be able to relate to the pandemic by including terms such as "due to the pandemic", "during the pandemic" in each question as recommended in prior research.(Akbar et al, 2021) This abbreviated inventory (based on the complete 60-item COPE Inventory)(Carver et al. 1989) is comprised of items that assess the frequency with which a person uses different coping strategies (e.g., "I've been turning to work or other activities to take my mind off things," "I've been making fun of the situation," "I've been criticizing myself") rated on a scale from 1, I haven't been doing this at all, to 4, I've been doing this a lot. There are 14 two-item subscales within the Brief COPE,

and each is analyzed separately: (1) self-distraction, (2) active coping, (3) denial, (4) substance use, (5) use of emotional support, (6) use of instrumental support, (7) behavioral disengagement, (8) venting, (9) positive reframing, (10) planning, (11) humor, (12) acceptance, (13) religion, and (14) self-blame.(Carver et al, 1997) Scores will be given under the following facets.

- Active coping, items 2 & 7 (Problem-Focused)
- Use of informational support, items 10 & 23 (Problem-Focussed)
- Positive reframing, items 12 & 17 (Problem-Focused)
- Planning, items 14 & 25 (Problem-Focused)
- Emotional support, items 5 & 15 (Emotion-Focused)
- Venting, items 9 & 21 (Emotion-Focused)
- Humor, items 18 & 28 (Emotion-Focused)
- Acceptance, items 20 & 24 (Emotion-Focused)
- Religion, items 22 & 27 (Emotion-Focused)
- Self-blame, items 13 & 26 (Emotion-Focused)
- Self-distraction, items 1 & 19 (Avoidant)
- Denial, items 3 & 8 (Avoidant)
- Substance use, items 4 & 11 (Avoidant)
- Behavioral disengagement, items 6 & 16 (Avoidant)

This part of the questionnaire will provide us the necessary data to achieve the third specific objective which is to describe the coping mechanisms of Covid-19 related stress in medical students of Sri Lanka.

The questionnaire will be pre-tested among a sub-sample of medical students (n-=20) to ensure clarity of the questions. They will be randomly selected from the Medical Faculty, University of Peradeniya and they will be sent a link with the Google form questionnaire. They will be observed while they answer the questionnaire and later be inquired whether any doubts or difficulties arose while answering the questionnaire. If such difficulties arise the questionnaire may be updated accordingly pending ethical approval from the Ethics Review Committee of the Faculty of Medicine University of Peradeniya.

4.7 Selection and training of interviewers

Since the data will be collected using Google forms there will be no interviewers.

4.8. Ethical Issues
4.8.1. Written informed consent

Consent will be obtained from each participant prior to data collection with the questionnaire through Google form. The consent forms will be sent to the students along with the questionnaires. The participants must confirm their consent on voluntary participation by ticking the checkbox to continue the questionnaire.

4.8.2. Fair subject selection

Subject selection will be done exactly following the inclusion and exclusion criteria. There will not be any discrimination based on economical state, educational state, religion, political background, behavioral factors, personal attitudes and social marginalization.

4.8.3. Confidentiality

Information will be gathered anonymously and kept strictly confidential among the group members throughout the study particularly in collecting, documenting and publishing of the information.

4.8.4. Autonomy

The study participants will be granted full autonomy to decide whether to participate in the study or not. The participants will have the right of withdrawing from the experiment as he or she wishes.

4.8.5. Privacy

Privacy will be strictly protected regarding the personal information and options. Participants will be asked to refrain from giving their names when answering the questionnaire in order to maintain their privacy and anonymity. Special considerations will be taken to expose none of the participants to possibly harmful physical, psychological or social agents and not to deprive them from potentially beneficial such agents.

4.8.6. Benefits to the subjects, community, scientific literature

The information provided from the study will provide important information for the study subjects on how to cope with the pandemic related stress, what risk factors are to be avoided and to be cautious about the prevalence of psychological stress among medical students during this time period.

The community will benefit from the study by being informed about risk factors of psychological stress and also the positive and negative coping mechanisms that are available.

The data and findings of this study will be important for future researchers to compare study populations, determine the progression of the psychological stresses related to the pandemic and also to further analyze the risk factors related to psychological stress from the pandemic.

4.8.7. Ethical clearance

Ethical clearance will be obtained from the Ethical Clearance Committee of the Faculty of Medicine, University of Peradeniya

4.9. Implementation

The study will be conducted by 11 members in research group 14, after obtaining ethical clearance from Ethical Clearance Committee of Faculty of Medicine, University of Peradeniya.

The research will be supervised by Dr. Samidi Navaratna, Senior Lecturer, Department of Community Medicine, Faculty of Medicine, University of Peradeniya.

The study will be conducted by distributing the google form-based questionnaire among WhatsApp groups of the medical students of each batch that belong to the inclusion criteria.

Then the data will be carefully entered in an excel sheet, for future use. The final data analysis will be done under the guidance of the supervisor.

4.10. Data Entry and Analysis
4.10.1 Coding

The close-ended questionnaire items will be pre-coded. This questionnaire will not include any open-ended questions so the data obtained will be directly entered for analysis.

4.10.2 Data Analysis

The data will be entered into an Excel spreadsheet followed by subsequent transfer to SPSS. Responses to socio-demographic questions will be analyzed using percentages. Responses needed to calculate prevalence, causative factors and coping mechanisms of Covid 19 related perceived stress will be scored according to a Likert scale. Cut off values provided by the creator of the PSS-10 scale will be used to calculate the prevalence of Covid 19 related stress. The results of the responses to coping mechanisms will be presented as percentages. The Brief-COPE scale will be analyzed as recommended by the creator which includes calculating the frequency of the three overarching coping styles which include problem focused coping, emotion focused coping and avoidance coping.

Scores are presented for each of the following facets: -

- Active coping, items 2 & 7 (Problem-Focused)
- Use of informational support, items 10 & 23 (Problem-Focused)
- Positive reframing, items 12 & 17 (Problem-Focused)
- Planning, items 14 & 25 (Problem-Focused)
- Emotional support, items 5 & 15 (Emotion-Focused)
- Venting, items 9 & 21 (Emotion-Focused)
- Humor, items 18 & 28 (Emotion-Focused)
- Acceptance, items 20 & 24 (Emotion-Focused)
- Religion, items 22 & 27 (Emotion-Focused)
- Self-blame, items 13 & 26 (Emotion-Focused)
- Self-distraction, items 1 & 19 (Avoidant)
- Denial, items 3 & 8 (Avoidant)
- Substance use, items 4 & 11 (Avoidant)
- Behavioral disengagement, items 6 & 16 (Avoidant)

Part C of the questionnaire will include three subparts to include academic, social and psychological related causative factors of Covid 19 related stress. Their frequencies will be calculated and further analyzed to find any demographic relations.

To determine the risk factors associated with Covid 19 related stress in medical students, chi-square test will be employed on the answers given in part A of the questionnaire.

4.11 Workplan
4.11.1 Work Schedule

	Task to be performed	Dates	Person assigned to task
1	Finalize the research proposal & literature review	7th Feb – 31st March (2022)	Research team
2	Proposal evaluation	1st April – 30th April (2022)	Department of Community Medicine
3	Ethical clearance	1st May – 31st May (2022)	Research team & Ethical committee
4	Training of researches	1st June – 17th July (2022)	Supervisor & research team
5	Pre-test & pilot study	18th July – 31st Aug (2022)	Research team
6	Data collection	1st Sep – 31st Oct (2022)	Research team
7	Data entry & preliminary data analysis	1st Sep – 31st Oct (2022)	Research team
8	Data analysis	1st Oct – 31st Dec (2022)	Research team
9	Report finalization	1st Jan – 28th Jan (2023)	Supervisor & research team

4.11.2 The GANTT Chart

Task to be performed	Responsible person	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Janu
1.FInalize the research proposal & literature review	Research team	■	■										
2.Proposal evaluation	Community of medicine			■									
3.Ethical clearance	Research team & ethical committee				■								
4.Training of research	Supervisor & research team					■							
5.Pretest & pilot study	Research team						■	■					
6.Data collection	Research team								■	■			
7.Data entry and preliminary data analysis	Research team								■	■			
8.Data analysis	Research team									■	■	■	
9.Report finalization	Supervisor & research team												■

4.12. Budget

Budget category	Unit cost (Rs.)	Number of units	Total cost (Rs.)
A) Printing & Photocopying			
For proposal	300	4	1200.00
For final report	1000	4	4000.00
B) Binding	150	8	1200.00
Total			Rs. 6400.00

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Annexures

<u>Faculty of Medicine, University of Peradeniya</u>

<u>Consent Form for Medical Research</u>

We invite you to participate in a research conducted by the third-year medical students of the Faculty of Medicine, University of Peradeniya. Your participation will be voluntary and there will be no loss of privileges that you already experience by refusing to participate. By answering this questionnaire, we consider that you have given the consent to participate in this research.

Objective of the study

To determine the prevalence of perceived Covid 19 related psychological stress, its causes, associated risk factors and related coping mechanisms among medical students in Sri Lanka.

Procedure

In this questionnaire that we have formed into a google form you will be asked to answer a few questions based on your own experience during the post-pandemic era.

Inconveniences that you may face

We expect that you will not face any inconvenience by answering this questionnaire. If you face any difficulty while answering a certain question, you may contact any member of the research group.

Benefits for you and the society

As the global pandemic has affected us all as medical students the findings of this study will create emphasis on any stress related issues that is prevalent. Furthermore, it will prepare us to better face a similar global catastrophe in the future.

Payments and ransoms

You are not given any payment or ransom for participating in this research.

Confidentiality

Confidentiality of all information given by you will be ensured and disclosure of any

given information will be done only with the permission from you or the law. If there is any information which can be used to detect your identification, those will be separated from the rest of the information.

Your information will be kept in a safe or will be entered to a password-protected computer and the information will be destroyed immediately after completing the final report of the research. We confirm that your identification will not be revealed during publication or during discussions.

Participation or quitting

You can decide whether you are participating in this research or not. You have the right to withdraw from the research at any time even after providing consent.

Introducing the research conductors

If you have any inquiries or questions about the research, you can contact the principal investigator

Mr.T.D. Ratnayake (Contact No.077xxxxx).

Informed Implied consent

I have read and completely understood the above information   Yes ☐   No ☐

I confirm that I am participating in this research voluntarily   Yes ☐   No ☐

Annexure 2- Self-administered questionnaire

Covid 19 Related Stress Among Medical Students in Sri lanka :Two Years After the Beginning of the Pandemic

Questionnaire

This questionnaire consists of 5 pages, and it will take less than 10 minutes to complete. All the data you provide will be kept confidential.

Part A: Fill appropriately.

Part B and C: Choose the best choice of given answers for each question.

Part A

General information.

Please select the relevant response.

1.University: University of Peradeniya

University of Ruhuna

University of Sri Jayawardanapura

University of Kelaniya

University of Rajarata

2.Batch:

15/16	16/17	17/18	18/19	19/20

3.Sex:

4.Age: (Enter Age)

5.Relationship status:

6.Current place of residence:	Hostel	Pvt Boarding	Home

7.Familytype:	Nuclear	Extended

8.Study year	1st Year	2nd Year	3rd Year	4th Year	5th Year

Part B

For each question choose from the following alternatives:

 0 - never

1 - almost never

2 - sometimes

3 - fairly often

4 - very often

1.I have felt as if something serious was going to happen unexpectedly with the epidemic	0	1	2	3	4
2.I have felt that I am unable to control the important things in my life because of the epidemic	0	1	2	3	4
3.I have felt nervous or stressed about the epidemic	0	1	2	3	4
4.I have been confident about my ability to handle my personal problems related to the epidemic	4	3	2	1	0
5.I have felt optimistic that things are going well with the epidemic	4	3	2	1	0
6.I have felt unable to cope with the things I have to do to monitor for a possible infection	0	1	2	3	4

7.I have felt that I can control the difficulties that could appear in my life as a result of the infection	4	3	2	1	0
8.I have felt that I have everything under control in relation to the epidemic	4	3	2	1	0
9.I have been upset that things related to the epidemic are out of my control	0	1	2	3	4
10.I have felt that the difficulties are increasing in these days of the epidemic, and I feel unable to overcome them	0	1	2	3	4

Part C

For each question choose from the following alternatives

1= disagree entirely   2= disagree for the most part

3= undecided   4= agree for the most part

5= agree entirely

Academic

1. My academic workload has increased due to online education during Covid 19	1	2	3	4	5
2. It's difficult to manage my time for self-studies during the pandemic	1	2	3	4	5

3. I am facing difficulties due to the lack of knowledge in using various devices which help my online studies	1	2	3	4	5
4. Accessibility of Internet affects my daily active participation in online learning	1	2	3	4	5
5. My academic performance has decreased during Covid 19	1	2	3	4	5
6. Online learning content is difficult to understand	1	2	3	4	5
7. Accessibility of educational Support and Services provided by the university has been significantly decreased due to the pandemic	1	2	3	4	5

Psychological

8. I am afraid of losing my grades during the pandemic	1	2	3	4	5
9. Spending more time on household activities during the pandemic has mentally increased my stress	1	2	3	4	5
10. I am unable to pay attention during online lectures.	1	2	3	4	5

Social

11. Reduction in family income during the pandemic has increased my stress level	1	2	3	4	5
12. Low Interaction with other colleagues during the pandemic has negatively affected my mental health.	1	2	3	4	5
13. I have had misunderstanding with my romantic partner due to less contact during the pandemic.	1	2	3	4	5
14. Loss of family support in academics during the pandemic has decreased my academic performance.	1	2	3	4	5

Part D:

Instructions:

The following questions ask how you have sought to cope with the pandemic. Read the statements and indicate how much you have been using each coping style.

I haven't been doing this at all - 1
A little bit   - 2
A medium amount   - 3
I've been doing this a lot   - 4

	1	2	3	4
01. I've been turning to work or other things to take my mind off the pandemic situation.	1	2	3	4
02. I've been concentrating my efforts on doing something about the pandemic situation.				
03. I've been saying to myself "The pandemic wasn't real"				
04. I've been using alcohol or other drugs to make myself feel better due to the pandemic.	1	2	3	4
05. I've been getting emotional support from others due to the pandemic.	1	2	3	4
06. I've been giving up trying to deal with the pandemic.	1	2	3	4
07. I've been taking action to try to make the pandemic situation better.	1	2	3	4
08. I've been refusing to believe that the pandemic has happened.	1	2	3	4
09. I've been saying things to let my unpleasant feelings about the pandemic escape.	1	2	3	4
10. I've been getting help and advice from other people due to the pandemic	1	2	3	4
11. I've been using alcohol or other drugs to help me get through the pandemic.	1	2	3	4
12. I've been trying to look at the pandemic from a different light to try and make it seem more positive.	1	2	3	4
13. I've been criticizing myself due to the pandemic.	1	2	3	4
14. I've been trying to come up with a strategy to face the pandemic.	1	2	3	4

15. I've been getting comfort and understanding from someone due to the pandemic.	1	2	3	4
16. I've been giving up the attempt to cope with the pandemic.	1	2	3	4
17. I've been looking for something good in what's happening due to the pandemic.	1	2	3	4
18. I've been making jokes about the pandemic.	1	2	3	4
19. I've been doing something to think about the pandemic les, such as going to the movies, watching TV, reading, daydreaming, sleeping or shopping.	1	2	3	4
20. I've been accepting the reality of the fact that the pandemic happened.	1	2	3	4
21. I've been expressing my negative feelings about the pandemic.	1	2	3	4
22. I've been trying to find comfort in my religion or spiritual beliefs due to the pandemic.	1	2	3	4
23. I've been trying to get advice or help from other people about the pandemic.	1	2	3	4
24. I've been learning to live with the pandemic.	1	2	3	4
25. I've been thinking hard about what steps to take about the pandemic.	1	2	3	4
26. I've been blaming my self for the things that happened during the pandemic.	1	2	3	4
27. I've been praying or meditating due to the pandemic.	1	2	3	4
28. I've been making fun of the pandemic situation.	1	2	3	4

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