

## Original research

# Prevalence and risk factors associated with perceived stress among university students in South Africa after Coronavirus Disease 2019 pandemic

Thandeka Monicah Mahlangu<sup>1</sup>, Oratilwe Penwell Mokoena<sup>1\*</sup>, Thembelihle Sam Ntuli<sup>1</sup><sup>1</sup>Department of Statistical Sciences, Sefako Makgatho Health Sciences University, Pretoria, South Africa

## Abstract


**Introduction:** Perceived stress is a mental disorder that leads to physical, emotional, and psychological disturbances. This study aimed to assess the prevalence and associated risk factors of perceived stress among a cohort of university students in South Africa after the Coronavirus Disease-2019 (COVID-19) outbreak.

**Methods:** An online cross-sectional survey was conducted involving students in the Faculty of Science at Sefako Makgatho Health Sciences University from August to September, 2023. The perceived stress scale (PSS)-10 was used to assess the level of stress among science students. Logistic regression was conducted to identify predictors of perceived stress.

**Results:** Hundred and fifty-eight (158) students participated in this study, of which 91.1% (n=144) completed sections of the PSS questions and were further analysed. Their mean age was 23.3±2.9 years ranging from 18 to 40 years. There were more female respondents than males (70.8% versus 29.2%). Of the respondents, 93.8% were unmarried, 63.9% were undergraduates and 97.3% were African. Twenty-five percent (n=39) of the participants had symptoms of perceived stress. In the univariate logistic regression model student's age, gender, and marital status were identified as predictors of perceived stress. As per the results of the multivariate logistic model, perceived stress was significantly high among females compared to males.

**Conclusion:** One-quarter of our study participants had perceived stress during the post COVID-19 era. Females were significantly more affected as compared to males. Thus, implementing measures to reduce perceived stress, more specifically among the female undergraduates is a timely requirement.

**Keywords:** Perceived stress, Mental disorder, University students, COVID-19

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\*✉ **Correspondence** [oratilwe.mokoena@smu.ac.za](mailto:oratilwe.mokoena@smu.ac.za)

 <https://orcid.org/0000-0002-0746-1198>

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## Introduction

In December 2019, a Coronavirus Disease 2019 (COVID-19) outbreak was reported among patients in Wuhan, Hubei Province, China [1]. The disease is found

to cause severe acute respiratory syndrome (SARS), transmitted from person to person through respiratory droplets from an infected individual, and has an

estimated incubation period ranging from 2 to 14 days [2]. Patients with advanced age and underlying conditions such as diabetes, lung disease, hypertension, cardiac disease, or cancer were at high risk of morbidity and mortality [3]. On 11 March 2020, the World Health Organization (WHO) declared the outbreak a global pandemic. As of 20 April 2020, more than 2.4 million cases and 165,000 deaths were reported worldwide, of which developed countries mainly Europe and the United States of America accounted for the largest proportion of cases and deaths globally, with Sub-Saharan Africa the least affected but the number of cases increasing [4]. In South Africa (SA), on 20th April 2020, 3300 confirmed COVID-19 cases and 58 deaths were reported, with Gauteng Province recording the highest number of cases (35%) followed by Western Cape (28%) and (19%) Kwazulu-Natal [5].

During the outbreak of the COVID-19 pandemic, countries across the world implemented prevention strategies which include lockdown, quarantine, physical or social distancing, use of face masks, hand washing, and keeping unwashed hands away from the face to mitigate the effects of the pandemic [6]. Despite these, studies have shown that the adopted strategies against the pandemic have negative effects on the social well-being of the population, and students, and may lead to mental health crises, poor academic performances [7], and increased dropout rates [8]. As a result, the long-term effects of this pandemic deserve special attention, but the burden of mental health disorders in post-pandemic is still undocumented in SA. Most studies in SA assessed the level of perceived stress among medical, dental, and physiotherapy students before [9-12], and throughout [13-15] the pandemic, there is a paucity of studies conducted among non-health sciences students.

During pre-pandemic period, the prevalence of perceived stress varied geographically with the rate ranging from 30% to 80% in SA universities [9-12] 70% in Ghana [16]. The prevalence of perceived stress was reported as 35.9% in Ethiopia during the pandemic [17]. To understand the magnitude and effects of mental disorders and to plan for necessary support services, it is crucial to assess students' perceived stress levels during and after the pandemic. However, in our setting, no information is available on the prevalence of perceived stress during and after the COVID-19 outbreak, particularly among Faculty of Science students. Therefore, this study aimed to assess the prevalence of perceived stress among Faculty of Science students at a Medical University in SA after the COVID-19 outbreak.

## Methods

### *Study design and setting*

A cross-sectional online survey was conducted among the students of Faculty of Science at Sefako Makgatho Health Sciences University in SA from August to September 2023. The institution is located in Pretoria North, Gauteng Province of SA.

### *Study population*

Our study population included the students registered in the Faculty of Science for the academic 2023. This study population was selected due to the rising number of students referred to the campus psychosocial support services.

### *Sampling technique and sample size*

The prevalence of perceived stress among South African university students before COVID-19 was 78% [9]. We assumed that the prevalence of perceived stress among students might increase by more than 10% during a lockdown, and this was estimated as 90%. Considering the population size of approximately 1644 registered students in the Faculty of Science in 2023, with an estimated perceived stress of 90% in post-pandemic period, a sampling error of 5% and a 95% confidence interval, a sample size of 128 was required for the study calculated using Raosoft sample size calculator [18]. Adding a non-response rate of 10%, a sample size of 141 was required for the study. All participants who accessed online Google Forms during the study period and volunteered to participate were included in the study. Consecutive sampling, a non-probability sampling technique was used until the required sample size was reached.

### *Data collection*

A self-administered questionnaire was developed on Google Forms and posted online, along with the consent form that describes the study objectives. The Google Forms included questions on demographic characteristics such as age, gender, ethnicity, marital status, academic department, academic year of study, and family members (i.e. father, mother, and sibling), relatives, and friends who were infected with COVID-19 followed by questions on the Perceived Stress Scale (PSS) [19]. The PSS is made up of 10 items, each of which with five response options: never, almost never, occasionally, almost always, and always. Items 1, 2, 3, 6, 9, and 10 are scored directly from 0 to 4, while items 4, 5, 7, and 8, are reversed from 4 to 0. Total scores were obtained by summing all the scale items with a total score range between 0 and 40. A cut-off score of 25 or

above was considered high perceived stress, otherwise no perceived stress, which was used by other authors [17].

#### Data analysis

All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) Software version 25 (IBM Corp). The data is presented as the mean and standard deviation for continuous variables, frequency, and percentages for categorical variables. Association between students with perceived stress and those without perceived stress was performed using student t-test and chi-square test for continuous and categorical variables, respectively. Subsequently, the binary and multivariable logistic regression analysis was conducted to determine potential risk factors for perceived stress, and the results were presented as odds ratios (ORs) and 95% CIs. Variables that were significant at  $p < 0.25$  in the bivariate model were considered significant and included in the multivariate model. The cut-off value of less than 0.25 is supported by literature [20]. In the multivariate logistic regression, variables were considered significant if  $p < 0.05$ .

#### Ethical considerations

Ethical approval was sought from Sefako Makgatho Health Sciences University's Research Ethics Committee (REF: SMUREC/S/214/2023: PG). The ethics committee approved the online survey as well as the online letter of consent. Permission to conduct the study was obtained from the Dean of the Faculty of Science, and to ensure participants' privacy and confidentiality, the data were anonymized.

## Results

#### Demographic characteristics

A total of 158 students in the Faculty of Science participated in this study. Of these, 91.1% ( $n=144$ ) completed sections of the PSS questions and were further analyzed. The mean age ( $\pm$  standard deviation) of all students was  $23.3 \pm 2.9$  with a range from 18 to 40 years. There were more female respondents than males [70.8% versus 29.2%]. Most (93.8%) of the respondents were unmarried. The undergraduate students (63.9%) accounted for the largest group of participants. Nearly all of the respondents (97.3%) were Africans. The respondents were also asked if any member of their family, relatives or friend was infected with COVID-19. Forty percent (39.6%,  $n=57$ ) said that their family members relatives or friend were infected with COVID-19.

#### Level of perceived stress

Of the participants, 39 (25%) had symptoms of perceived stress. Overall, the mean PSS score for all students was  $21.4 \pm 4.5$  ranging from 12 to 31. As shown in Table 1, the mean score for "In the last month, how often have you felt nervous and "stressed"?", achieved the highest PSS score ( $2.8 \pm 1.11$ ), and "In the last month, how often have you been angered because of things that happened that were outside of your control?" had the lowest mean score ( $1.6 \pm 1.02$ ).

**Table 1:** Perceived stress scale (PSS) score among the participants.

	Scales	Mean $\pm$ SD
1	In the last month, how often have you been upset because of something that happened unexpectedly?	$2.2 \pm 1.07$
2	In the last month, how often have you felt that you were unable to control the important things in your life	$2.4 \pm 1.17$
3	In the last month, how often have you felt nervous and stressed?	$2.8 \pm 1.11$
4	In the last month, how often have you felt confident about your ability to handle your personal problems?	$1.9 \pm 1.04$
5	In the last month, how often have you felt that things were going your way?	$2.3 \pm 0.98$
6	In the last month, how often have you found that you could not cope with all the things that you had to do?	$2.2 \pm 1.01$
7	In the last month, how often have you been able to control irritations in your life?	$1.8 \pm 0.97$
8	In the last month, how often have you felt that you were on top of things?	$1.7 \pm 1.05$
9	In the last month, how often have you been angered because of things that happened that were outside of your control?	$1.6 \pm 1.02$
10	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	$2.3 \pm 1.10$

SD: Standard Deviation, All the items were uniformly repetitive: Range = 0-4, Median = 2, Interquartile range = 1

*Association between perceived stress and demographic information*

Concerning the association between demographic characteristics and perceived stress, gender was significantly associated with perceived stress ( $p < 0.05$ ), with females presented with symptoms of perceived stress as compared to males (32.4% versus 7.1%, Table

2). The participant’s age, marital status, academic year of study and family member/relatives/friend infected with COVID-19 were not significantly associated with symptoms of perceived stress ( $p > 0.05$ ).

**Table 2:** Relationship between demographics and perceived stress

Variables	n (%)	Perceived stress		p-value	
		Yes, n (%)	No, n (%)		
Age					
	<20	12(8.3)	5(41.7)	7(58.3)	0.211*
	20-24	87(60.4)	23(26.4)	64(73.6)	
	25+	45(31.3)	8(17.8)	37(82.2)	
Gender					
	Male	42(29.2)	3(7.1)	39(93.9)	0.001*
	Female	102(70.8)	33(32.4)	69(67.6)	
Marital Status					
	Unmarried	135(93.8)	32(23.7)	103(76.3)	0.228*
	Married	9(6.3)	4(44.4)	5(55.6)	
Academic year of study					
	Undergraduate	92(63.9)	25(27.2)	67(72.8)	0.423#
	Postgraduate	52(36.1)	11(21.2)	41(78.8)	
Family member/relatives/friend infected with COVID-19					
	No	87(60.4)	19(21.8)	68(78.2)	0.279#
	Yes	57(39.6)	17(29.8)	40(70.2)	

\*Fisher's Exact test, # Chi-square test

*The Influence of demographics on perceived stress*

The univariate logistic regression analysis (Table 3) revealed that age, gender, and marital status were significant predictors of perceived stress. Students aged 25 years and older (OR: 0.30; 95% CI: 0.08-1.20) compared to those aged less than 20 years and unmarried (OR: 0.39; 95% CI: 0.09-1.53) were significantly associated with reduced odds of perceived stress. Female respondents were 6 times more likely to be stressed than male respondents (OR: 6.21; 95% CI: 1.79; 21.60). An academic year of study and family members/relatives/friend infected with COVID-19 did not significantly influence perceived stress.

Multivariable logistic regression analysis indicated that only gender influences perceived stress, with female

respondents being 7 times more likely to be stressed than their male counterparts (OR: 6.93; 95% CI: 1.84; 26.16).

**Discussion**

This study found that 25% of the study participants had symptoms of perceived stress, which is comparable to the rate of 29.5% [12], however, lower than the rate of 78% [9], 87% [11], and the rate ranging from 61.8% to 71.2% [13] reported in SA studies conducted before the pandemic. The lower rate in our study could be due to the psychosocial support services introduced for students during and after the COVID-19 pandemic. Another possible reason could be that some studies used the General Health Questionnaire – 28 (GHQ-28) [13] and Depression, Anxiety, and Stress Scale (DASS-21) [12]

to measure perceived stress, while our study used the PSS-10 tool.

**Table 3:** Predictors of perceived stress among students

Variables	Univariate Logistics Model	Multivariate Logistics Model
	OR (95% CI)	OR (95% CI)
Age		
<20	Reference	Reference
20-24	0.50 (0.15;1.74)	0.39(0.11;1.49)
≥25	0.30 (0.08;1.20)**	0.34(0.08;1.49)
Gender		
Male	Reference 6.21 (1.79;21.60)**	Reference 6.93(1.84;26.16)*
Female		
Marital Status		
Married	Reference	Reference
Unmarried	0.39 (0.09;1.53)**	0.22(0.04;1.06)
Academic year of study		
Postgraduate	Reference	
Undergraduate	1.39 (0.62;3.12)	
Family member/relatives/friend infected with COVID-19		
No	Reference	
Yes	1.52(0.71;3.25)	

Univariate Logistic Regression Model: \*\*p<0.25

Multivariate Logistic Regression Model: \*p<0.05

OR: Odds Ratio , CI: Confidence Interval

We further analysed individual PSS items and found that the items that achieved the highest and the lowest PSS scores were “In the last month, how often have you felt nervous and stressed?”, and “In the last month, how often have you been angered because of things that happened that were outside of your control?”, respectively. In contrast, Awoke *et al.* [17] in their study found that the item “In the last month, how often have you been angered because of things that were outside of your control?” achieved the highest score, while “In the last month, how often have you felt that things were going your way?” achieved the lowest PSS score. In our study, the reason for students felt nervous and stressed, but not angry it could be due to the adjustment in the teaching methods, adaptations in class attendance, limited social activities and restriction on other activities on campus, thus, the university should take a

multifaceted approach to support students to deal with mental health after pandemic.

Concerning the influence of demographic factors on perceived stress, in the bivariate logistic regression, the finding of the present study suggests that as the age increases students were less likely to experience perceived stress, but the result was not statistically significant in the multivariate logistic regression. This finding is consistent with the results of previous studies [21,22], but it is inconsistent with the findings of others [17]. In our study, the reason for the decrease in perceived stress with an increase in student’s age could be due to the increased maturity level and being more experienced as age increases.

The result of the present study also revealed that the female gender was 7 times more likely to have perceived stress as compared to the male gender. The higher perceived stress level reported among female than male students agreed with previous studies [23,24,25]. Inconsistent with our findings, a study in Ethiopia identified no statistically significant association between perceived stress and gender [17]. The possible reason for higher perceived stress among females could be that females have higher cortisol hormones, which is associated with perceived stress [26]. Graves and co-authors mentioned another possible reason, which was that women have low self-esteem and experience more academic stress and pressure from exams [25].

Our results are like other studies conducted during the pandemic [23], which showed that in the bivariate logistic regression, unmarried students were less likely to experience stress than married students, but in the multivariate logistic regression model, the result was not statistically significant. This could be because married students have to take care of their families, as well as their academic obligations, which leads to them being more stressed than unmarried students. In a Turkish study, it was seen that having friends or family member who were infected with COVID-19 significantly increases perceived stress level [27]. In our study, we observed that perceived stress was prevalent among students with family or friends infected with COVID-19 but the result was not significant. This could be that the two groups of students were concerns for the safety and health of their families.

## Conclusion

The findings of this study revealed that perceived stress remains a common mental health problem among university students after the COVID-19 pandemic. There was a gender difference in the level of perceived stress with female students experiencing perceived stress than their male counterparts. Thus, the study results have provided relevant information to highlight the requirement of taking measures to reduce perceived stress, more specifically among the female undergraduates.

## Study Limitations

This study has several limitations. First, the study was conducted in a single faculty in a public university; therefore, the results cannot be generalizable to faculties in the university or faculties in other public universities in South Africa. Second, the findings are limited by the use of a cross-sectional design, which limits the establishment of causality. Another study limitation is that the sampling technique used to select the participants did not involve randomness, which might affect the results.

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