



# Perceived Stress among School Students in Distance Learning During the COVID-19 Pandemic in the Gaza Strip, Palestine

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## Abstract

The rapid outbreak of COVID-19 is a global health problem that has a significant effect on the educational systems. Therefore, students shifted to distance learning through the digital platform. Since COVID-19 has consequences on mental health, the present study examined the perceived stress level in school students in distance learning during the COVID-19 period. A cross-sectional study of a sample consisting of 385 school students evaluated the Perceived Stress Scale (PSS) and their concerns and emotions during the COVID-19 pandemic. The results showed that the mean value of the total PSS scores was  $19.50 \pm 9.28$ . About 48.6% of students had moderate stress, 28.8% had low stress, and 22.6% had high stress. Significant associations were found between the level of stress and demographic variables: age, gender, educational level, and place of residence. Female students were significantly higher than the male students in the mean score of perceived stress level (20.14 versus 18.13;  $p$ -value = 0.018). Females were more likely (53.4%) to have moderate stress than males (38.2%) ( $p$  = 0.019). The students aged 15–18 years were significantly higher than those aged 11–14 years in the mean score of perceived stress level (22.64 versus 17.24, respectively;  $p$ -value < 0.001). The students aged 15–18 years were also more likely ( $n$  = 536, 96.4%) to had high levels of stress than the younger students ( $p$  < 0.001). The results showed that secondary school students were significantly higher than primary school students in the mean score of perceived stress level (23.75 versus 16.76, respectively;  $p$  < 0.001). Secondary students were also more likely (43.0%) to have high stress than primary students (9.4%) ( $p$  < 0.001). Students who live in the Rafah governorate had a significantly lowest mean score of perceived stress level when compared to other counterparts ( $p$ -value = 0.005). Gender ( $\beta$  = - 0.282,  $P$  < 0.001), age ( $\beta$  = - 0.379,  $P$  = 0.004), place of residence ( $\beta$  = - 0.096,  $P$  = 0.034), and educational level ( $\beta$  = 0.845,  $P$  < 0.001) were predictors of perceived stress. The results revealed moderate to high levels of stress in school students in the Gaza Strip during schools closure due to the COVID-19 pandemic. The prevalence of psychological distress attributed to suddenly shifted from traditional learning to distance learning. The incorporation of stress management programs and online counselling will minimize stress and enhance the mental health of school students during distance learning.

**Keywords** COVID-19 · Distance learning · Perceived Stress Scale (PSS) · Students · Gaza Strip · Palestine

## Abbreviations

MOEHE Ministry of Education and Higher Education  
MOH Ministry of Health

## Introduction

The COVID-19 pandemic has rapidly spread around the globe, causing an outbreak of acute infectious pneumonia among infected people [12]. This large scale of infection imposed significant stress on the general public,

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individuals, older adults, healthcare and medical providers, and educators [61, 63, 65]. Therefore, committed preventive measures such as wearing gloves and face masks, avoiding gatherings, and practice hand hygiene are key procedures to avoid infections with COVID-19 [46]. Besides the risk of death from infectious, this crisis brought unbearable psychological stress to individuals around the globe [94], where it is affecting all aspects of life around the world. Though the steps taken to contain the COVID-19 pandemic were justified, they had a significant impact on the emotional, economic, and political well-being of people all across the world [92]. The fear of infection, the possibility of infecting family members and loved ones, protracted quarantine, the worry of a relative's death, concerns about educational advancement, and other fears have all increased dramatically. As a result, COVID-19 has the potential to have a disastrous impact on people's minds, especially school students all across the world [55, 92].

Before the COVID-19 period, many studies were carried out to evaluate the level of perceived stress among students, whether school or university students around the world [6, 21, 34, 40, 42, 60, 72, 76, 82, 93], but some studies were carried out on the same problem during the COVID-19 pandemic. Recent studies reported a significantly higher increase in perceived stress among students during the COVID-19 pandemic in many countries around the world such as Ethiopia [10], Spain [51, 57], Saudi Arabia [2, 27], South-East Serbia [44], China [47, 49, 90], India [3, 14], Germany [33], Italy [26], Turkey [9, 13], Jordan [41], and France [16].

The recent studies conducted during the COVID-19 pandemic reported students' perceived stress levels ranged from 12.6 to 30.2% [7, 62, 74]. A study from the southeastern USA revealed that students reported higher levels of perceived stress during the COVID-19 period than before period. Also, white students reported a bigger impact of the pandemic on their well-being than African American students [22]. In south-east Serbia, it was estimated that the mean score of perceived stress was 20.43, reflecting a moderate level of stress among students during the COVID-19 pandemic [44]. A study conducted in China showed that 25% of participants suffering anxiety symptoms, which were linked with heightened concerns about academic delays, economic effects of the COVID-19 pandemic, and influences on daily activities [20]. In Ethiopia, it was found that anxiety and depression symptoms have more than tripled since the spread of the COVID-19 pandemic [56]. A prior study in Ethiopia found that more than half of healthcare providers (51.6%) [23] and 32.5% of students [11] had high levels of perceived stress.

Medical students have been reported to be more stressed than students in other subjects [59]. Age, class, study year,

practical attachment, poor/low social support, stressful life events, financial concerns, and thinking about future job goals were identified as factors associated with the perceived stress of health science students [59]. Besides the factors mentioned above, the unusual disruptions in health education and other activities caused by the spread of the COVID-19 pandemic are predicted to have a negative impact on student's mental health, particularly those who study, train or works in health sciences, healthcare and medical fields [1, 14, 19, 37, 77, 95].

In most countries, many schools were closed for further notice in response to the widespread COVID-19 pandemic. During the current health crisis, mobility of students is considered an effective factor in spreading the coronavirus, and schools' closure is the urgent preventive intervention to break the cycle of COVID-19 spread and control the rapid outbreak of infectious among students [87]. Also, mathematical modelling studies showed that the closing of schools has a significant impact on the size of pandemics and on stopping the exponential progression of the pandemics [30]. Responding to the emergency closing of schools, teachers shifted to online platforms to stay in contact with students and webinars became a temporary classroom to ensure continuing their education during the current crisis. The responsible bodies called teachers and students to shift to distance learning during the COVID-19 period to mitigate school closure and provide online materials that can be utilized during the pandemic. Different social media and educational platforms were used such as Facebook, WhatsApp, YouTube, digital library, learning management system (LMS), Google Forms, virtual classrooms, live streaming and broadcast. School closures for the unlimited period strongly influence students, where the COVID-19 pandemic affected students well-being and mental health [66].

In Palestine, the first case of infection with COVID-19 was detected on 5 March 2020 in West Bank, beginning the spread of the COVID-19 pandemic. To contain the widespread COVID-19 and avoid a possible large scale of infection in students, the Palestinian Ministry of Education and Higher Education has instructed to close all educational institutions, including schools, for an indefinitely period. The guardians were instructed to stay the students at home during closing their schools, while their teachers tutored through the social media platforms. Recent studies revealed that the level of stress, depression, and anxiety was high among school and universities students during the lockdown period [16, 29, 73, 81]. But in the case of the Gaza Strip, the whole situation was completely different. Before the COVID-19 pandemic, the Palestinians, particularly those who live in refugees camps, are suffering from hard poverty, hunger, unemployment, political conflicts, food and water insecurity, water and electricity crisis, and

collapse of all life aspects due to the severe blockade imposed by the Israeli occupation since 2007. As a result, the Gaza Strip is suffering from restrictions on the entry of materials, goods, medications, and personnel. Gaza is a conflict zone that could require evacuation, demobilization, re-mobilization, personnel access challenge and rework of destroyed infrastructure due to the frequent attacks and wars. The Palestinian Central Bureau of Statistics (PCBS) reports that most Palestinians live in poverty and suffer from the inability to provide main necessities to their families including health food, shelter, clothing and medication [28, 43, 52, 67]. With the start of the COVID-19 pandemic, the whole circumstances got worse and become more dangerous than before. Imposed “full closure” policy due to the widespread of the COVID-19 pandemic caused numerous economic, social, educational, and political problems [63]. As the closure of schools, universities, parks, markets, and recreational places led to the loss of the source of income and jobs, students dropping out of schools, and the inability to meet basic needs. Palestinians, as other individuals around the world, also suffered from psychological problems due to stay home, isolation, and other protective procedures such as stress, loneliness, anxiety, fear, depression, and panic during the COVID-19 lockdown [50, 63–66, 79, 85]. Therefore, this crisis has a detrimental influence on the educational functioning, learning, and achievement of students. To our knowledge, no studies have evaluated stress among primary and secondary students during the quarantine period. Therefore, this study aimed to investigate the perceived stress level in distance learning in school students during the outbreak of the COVID-19 pandemic in the Gaza Strip, Palestine.

## Methods

### Study Population and Sample

A pilot study was conducted before the questionnaire to test the viability of the questions, clarify misunderstood sentences, and identify study flaws. With the sample size in mind, the estimation was done using the probability equation and confidence interval. Viechtbauer et al. [86] provided a straightforward strategy for choosing a sample size for a pilot study that ensures high confidence in detecting potential difficulties. The confidence level for our calculations is set at 95%, which corresponds to a significance level of 5%. The equation for sample size sampling, according to Viechtbauer et al. [86], is Eq. (1):

$$n = \ln(1 - \gamma) / \ln(1 - \pi) \quad (1)$$

where  $n$  is the number of study participants, 0.05 denotes probability, and  $\pi$  denotes the level of confidence (95%). In

the current study, the inclusion of  $n = \ln(1 - 0.95) / \ln(1 - 0.05) = 58.40$ , or 59 participants in the pilot study was required for  $\pi = 0.05$  probability, ensuring that the problem was recognized with a high level of confidence. After the pilot study was completed, the questionnaire was conducted on 385 students during the closing of schools due to the COVID-19 pandemic.

The current study was carried out from September 12 to October 15, when schools were closed due to the COVID-19 pandemic. Primary and secondary school students in the Gaza Strip, which has a population of 576,951 students, are the target population. Because of the widespread COVID-19 pandemic, which is the subject of this research and is still affecting Palestine and the rest of the world, social isolation, quarantine, social distancing, and lockdown are being applied as preventive measures to stop the rapid spread of the COVID-19 pandemic. Because it was not possible to conduct a community-based sampling survey during the movement restriction period due to the existing health conditions, data collecting can only be done via the internet utilizing digital platforms.

Based on the authors' relationships with students, teachers, and principals in the Gaza Strip, a poster was distributed on Virtual Classrooms, Facebook, and WhatsApp, and other social media platforms, to allow the biggest number of students to notice it and participate in the study. A brief introduction, the study's background, protocols, objective, voluntary nature of participation, declarations of anonymity and confidentiality, and the link to the required questionnaire were all included on this poster. School students above the age of 12 years who understood the topic of the questionnaire and agreed to participate in the study were told to complete it on their own by clicking on the link. For students under the age of 13 years who face problems understanding the questionnaire, guardians were instructed to complete the questionnaire on their behalf after explaining the questions to their children. One of the student's parents was one of the guardians who answered the questions on their behalf (mother or father). If one or both of them were unable to respond due to death or other circumstances, his sister, brother, or other family answered on his behalf.

In this study, convenience sampling was utilized to collect data because the participants could not be identified in the digital environment. The required sample size was 385 students based on a 5% margin of error, 95% confidence level and 50% outcome response, where the estimated population was 576,951 students. This sample size is thought to be sufficient for the population of the current study. The authors invited 385 students to complete the survey, and all participants (response rate = 100%) from 49 different schools completed it and were included in the data analysis. All Palestinian students are engaging in

private, public, or UNRWA schools. The Palestinian Ministry of Education and Higher Education oversees both private and public schools, while the United Nations Relief and Works Agency for Palestine Refugees (UNRWA) oversees UNRWA schools.

The following were the study's inclusion criteria:

1. Students in primary or secondary school, aged 11–18 years, who are enrolled in a private, public, or UNRWA school.
2. Students who follow their education using digital platforms and electronic tools during the closing of their schools.

The responses to the required questionnaire were used to verify both criteria. Students who were not of the required age were excluded and those who did not follow their education through electronic resources or digital platforms.

### Study Instrument

The online survey comprised three main sections: the first section involved demographic questions that included gender, age, place of residence, and level of education. The second section included questions of the Perceived Stress Scale (PSS). To measure the perceived stress level in distance learning in school students during the COVID-19 pandemic, the authors applied the questionnaire which was developed by Cohen et al. [25]. This scale comprises ten questions that measure the perception of stress suffered by students over the past month. It includes a 5-point Likert scale that captures responses ranging from never (0) to very often. Total mean scores of 0–13 indicate low stress, 14–26 show moderate stress and 27–40 indicate high stress. The PSS is an easily and widely used tool with acceptable psychometric properties [83]. The third section covered a qualitative exploratory question about the emotions and concerns of students during the COVID-19 period. An Arabic-validated version of the PSS questionnaire was applied and then translated to English by a specialist with good experience in survey design and proficiency in the two languages. Some sentences were changed to suit the educational level of school students. A Cronbach's alpha test was applied to measure the internal consistency of the questionnaire, and the value was 0.890 which indicates high reliability.

### Statistical Analysis

Statistical analyses were performed using SPSS version 22.0. In this study, Kruskal–Wallis  $H$  test or Mann–Whitney  $U$  test was used to evaluate mean differences in perceived stress between demographic variables. Descriptive statistics involved frequencies and percentages (%) for

categorical variables, and the Chi-squared test was used to evaluate group differences. Multiple linear regression analysis was used to determine the predictors of perceived stress and test whether demographic variables were associated with perceived stress. We defined perceived stress as the dependent variable and demographic characteristics as the independent variables. Data were considered statistically significant when  $P < 0.05$ .

### Ethical Considerations

Before the data were collected, it was made clear that participation was completely voluntary and that it may be terminated at any moment during the study. All of the participants their guardians gave their consent. All information was gathered and kept private. Ethical approval was obtained from the Ministry of Education and Higher Education, which is responsible for primary and secondary schools in the Gaza Strip, Palestine. The procedures used in this study conformed with the Declaration of Helsinki's guidelines for research with human subjects.

## Results

### Demographic Characteristics

A total of 385 school students participated in the current survey (Table 1). The mean age of students was 14.31 (1.57). More than half of the students were female (68.1%), aged between 11–14 years (58.2%), and from primary school (60.8%). The students were from the five governorates of the Gaza Strip: the Middle governorate (48.1%), Rafah (19.2%), North Gaza (12.5%), Gaza governorate (12.2%), and Khan Younis (8.1%).

### Level of Perceived Stress

Table 2 presents the responses of the study participants to the PSS items. The results showed that 32.2% of the students (fairly or very) often felt stressed and nervous; 31.2% were often angered because of things that happened outside of their control; 33.0% often felt that difficulties came together so high that they could not control them; 35.8% often found that they could not cope with all the things that they had to do; 32.2% often felt the inability to hold and control the important things in their life; 33.7% were often upset due to something that happened unexpectedly. In the contrast, 32.9% of students often felt confident in their ability to deal with problems, 39.7% often able to handle the irritations and upset in their lives, 33.3% often felt that things were going easily in their way, and 37.4% often felt that they were on top of things.

**Table 1** Sample characteristics for students (*n* = 385)

Variable	Categorize	<i>n</i> (%)
Gender	Female	262 (68.1)
	Male	123 (31.9)
Age group	11–14	224 (58.2)
	15–18	161 (41.8)
Educational level	Primary	234 (60.8)
	Secondary	151 (39.2)
Place of residence	North Gaza	48 (12.5)
	Gaza	47 (12.2)
	Middle Gaza	185 (48.1)
	Khan Younis	31 (8.1)
	Rafah	74 (19.2)

The results showed that the mean value of the total PSS scores was  $19.50 \pm 9.28$ , with a range of 0–40, and a median of 19.0. In general, 48.6% of students had moderate stress, 28.8% had low stress, and 22.6% had high stress (Table 3). The results showed that there were significant associations between the level of stress and demographic variables: the place of residence (governorate), gender, age, and educational level. Female students were significantly higher than the male students in the mean score of perceived stress level (20.14 versus 18.13;  $p = 0.018$ ). However, more than half of the students (53.4%) had moderate levels of stress, whereas 21.0% had high levels of stress

(Table 2). Females were more likely (53.4%) to have moderate stress than males (38.2%) ( $p = 0.019$ ).

Students aged 15–18 years had a significantly higher mean score of perceived stress when compared to students aged 11–14 years (22.64 versus 17.24, respectively;  $p < 0.001$ ). However, 40.4% of them had high levels of stress, whereas 31.1% had moderate stress levels. The students aged 15–18 years were also more likely ( $n = 536$ , 96.4%) to had high levels of stress than the younger students ( $p < 0.001$ ). The results showed that secondary school students had a significantly higher mean score of perceived stress when compared to primary school students (23.75 versus 16.76, respectively;  $p < 0.001$ ). Secondary students were also more likely (43.0%) to have high stress than primary students (9.4%) ( $p < 0.001$ ).

Students who live in the Rafah governorate had a significantly lower mean score of perceived stress level compared to other counterparts ( $p = 0.005$ ). However, about 47% show moderate levels of stress, whereas 44.6% show high stress levels (Table 4).

Table 5 showed that gender ( $\beta = -0.282$ ,  $P < 0.001$ ), age ( $\beta = -0.379$ ,  $P = 0.004$ ) and place of residence ( $\beta = -0.096$ ,  $P = 0.034$ ) were significant and negative predictors correlated with perceived stress. The educational level ( $\beta = 0.845$ ,  $P < 0.001$ ) played a positive role in perceived stress. All the previous predictors collectively accounted for 22.70% of the variance in perceived stress (adjusted  $R^2 = 0.227$ ). This result revealed that 22.7% of the factors that affect the perceived stress are related to gender, age, educational level, and place of residence.

**Table 2** Responses of participants to the Perceived Stress Scale (*n* = 385)

Perceived Stress Scale In the last month	Never <i>n</i> (%)	Almost never <i>n</i> (%)	Sometimes <i>n</i> (%)	Fairly often <i>n</i> (%)	Very often <i>n</i> (%)
1. How often have you been upset because of something that happened unexpectedly?	71 (18.4)	65 (16.9)	119 (30.9)	54 (14.0)	76 (19.7)
2. How often have you felt that you were unable to control the important things in your life?	76 (19.7)	81 (21.0)	104 (27.0)	56 (14.5)	68 (17.7)
3. How often have you felt stressed and nervous?	74 (19.2)	100 (26.0)	87 (22.6)	58 (15.1)	66 (17.1)
4. How often have you felt confident about your ability to handle your personal problems?	75 (19.5)	106 (26.8)	80 (20.8)	51 (13.2)	76 (19.7)
5. How often have you felt that things were going your way?	33 (8.6)	147 (38.2)	77 (20.0)	70 (18.2)	58 (15.1)
6. How often have you found that you could not cope with all the things that you had to do?	63 (16.4)	89 (23.1)	94 (24.4)	46 (11.6)	93 (24.2)
7. How often have you been able to control irritations in your life?	31 (8.1)	116 (30.1)	85 (22.1)	76 (19.7)	77 (20.0)
8. How often have you felt that you were on top of things?	49 (12.7)	86 (22.3)	106 (27.5)	88 (22.9)	56 (14.5)
9. How often have you been angered because of things that happened that were outside of your control?	32 (8.3)	141 (36.6)	92 (23.9)	75 (19.5)	45 (11.7)
10. How often have you felt difficulties were piling up so high that you could not overcome them?	58 (15.1)	124 (32.2)	75 (19.5)	75 (19.2)	53 (13.8)



**Table 3** A comparison of the level of stress by demographic characteristics of students ( $n = 385$ )

Variable	Level of stress			Total $n$ (%)	$p$ value <sup>a</sup>
	Low $n$ (%)	Moderate $n$ (%)	High $n$ (%)		
<i>Gender</i>					
Female	67 (25.6)	140 (53.4)	55 (21.0)	262 (100)	0.019
Male	44 (35.8)	47 (38.2)	32 (26.0)	123 (100)	
<i>Age group</i>					
11–14	65 (29.0)	137 (61.2)	22 (9.8)	224 (100)	< 0.001
15–18	46 (28.6)	50 (31.1)	65 (40.4)	161 (100)	
<i>Educational level</i>					
Primary	75 (32.1)	137 (58.5)	22 (9.4)	234 (100)	< 0.001
Secondary	36 (23.8)	50 (33.1)	65 (43.0)	151 (100)	
<i>Governorate</i>					
North Gaza	9 (18.8)	31 (64.6)	8 (16.7)	48 (100)	< 0.001
Gaza	12 (25.5)	28 (59.6)	7 (14.9)	47 (1000)	
Middle Gaza	48 (25.9)	77 (41.6)	60 (32.4)	185 (100)	
Khan Younis	9 (29.0)	16 (51.6)	6 (19.4)	31 (100)	
Rafah	33 (44.6)	35 (47.3)	6 (8.1)	74 (100)	
Total	111 (28.8)	187 (48.6)	87 (22.6)	385 (100)	

<sup>a</sup>Chi-squared ( $\chi^2$ ) test

### Exploring Students' Concerns and Emotions

With respect to the concerns and emotions of students, the exploratory question revealed a difference in their affecting during the COVID-19 crisis. Students confirmed feeling stressed, angry, depressed, anxious, panic, fear, and distress. Students also reported difficulties regarding studying, homework solving, send and receive assignments, and time management. Secondary school students (Tawjihi) who want to get high grades, to ensure admissions in universities they want, were concerned and under stress about their scores and their educational performance. The responses of students for this question are presented verbatim as follow:

S1: “When it comes to taking a test, I get anxious and nervous about how difficult the questions are? Will the time be appropriate for the exam? Will the internet cut while I am answering the questions? I feel like I'm in a continuous struggle until the year is over and I'll find relief”.

S2: “During the closing of my school, I was feeling very stressed and depressed because of my inability to understand and realize difficult subjects such as mathematics and science, as these subjects must be taught face to face with the teacher in the classroom. Some topics are impossible to explain via e-learning”.

**Table 4** PSS scores based on demographic characteristics of participants ( $n = 385$ )

Variable	Categorize	Mean (SD)	95% CI	$p$ value
Gender	Female	20.14 (9.67)	18.97–21.32	0.018 <sup>a</sup>
	Male	18.13 (8.28)	16.66–19.62	
Age group	11–14	17.24 (6.29)	16.42–18.07	< 0.001 <sup>a</sup>
	15–18	22.64 (11.60)	20.84–24.45	
Educational level	Primary	16.76 (6.62)	15.91–17.61	< 0.001 <sup>a</sup>
	Secondary	23.75 (11.07)	21.97–25.53	
Place of resident	North Gaza	17.68 (10.98)	14.50–20.88	0.005 <sup>b</sup>
	Gaza	18.46 (10.18)	15.49–21.46	
	Middle Gaza	19.94 (9.68)	19.94–22.75	
	Khan Younis	19.70 (7.28)	17.04–22.38	
	Rafah	16.64 (5.71)	15.32–17.97	

<sup>a</sup>Mann–Whitney  $U$  test<sup>b</sup>Kruskal–Wallis test

**Table 5** Multiple linear regression model predicting students’ perceived stress ( $n = 385$ )

Model	Unstandardized coefficients		Standardized coefficients $\beta$	$t$	$p$	95% Confidence interval for $B$	
	$B$	SE				Lower bound	Upper bound
(Constant)	16.964	1.807	–	9.389	< 0.001	13.412	20.517
Gender	– 5.608	0.992	– 0.282	– 5.653	< 0.001	– 7.558	– 3.657
Age	– 7.135	2.459	– 0.379	– 2.902	0.004	– 11.971	– 2.300
Educational level	16.052	2.456	0.845	6.536	< 0.001	11.223	20.881
Place of residence	– 0.740	0.347	– 0.096	– 2.130	0.034	– 1.423	– 0.057

$R = 0.485$ ,  $R^2 = 0.235$ , adjusted  $R^2 = 0.227$

S3: “I am a final-year high school student (Tawjihi) and I am preparing for university next year. I have to get high marks and excellent performance to be able to get into the college I want. I intend to study medicine in Turkey and I have applied for a Turkish government scholarship. To win this scholarship, my GPA must be excellent so that I can compete with other students. I still feel anxious, afraid, and over-nervous about my GPA, especially since I continued my education through the virtual classroom. I faced many problems when I completed my education through the virtual classes, such as the cutting of electricity and the internet as well as the density of the topics presented to me. I am still confusing about which one should I choose?”.

S4: “I would like to confirm that I have been in a bad psychological state during the current school year. My family has 11 members, 8 of whom study in primary and secondary schools. When the schools were closed, we were confused and lost, as there were only two mobile phones at home this is a big problem. How will we be able to send and receive assignments and answer tasks and exams? So I had to wait until my turn came and follow my lessons through the virtual classrooms. When I finish I give the mobile phone to my sister so that she could complete her lessons and so on. We were using the mobile phone in turns, as my father was not able to provide an extra laptop, tablet, or mobile phone. I often forgot to turn in my assignment and didn’t continue my education. This made me afraid and worried that my school performance would be negatively affected”.

S5: “I have been spending a long time in front of my mobile phone and laptop to follow my lessons, hand in the tasks required of me, take exams, assignments, and more. I was spending about 10 h a day or more. I was feeling lonely and depressed. Because of imposed closure, I was not able to get out of the house and go to the garden, play or exercise. Besides the fear of infection with the Coronavirus, I was worried about the development of my educational performance”.

## Discussion

The present study is the first to investigate perceived stress levels during the closure of school due to the rapid spreading of the COVID-19 pandemic in the Gaza Strip, Palestine. In this study, the mean value of the Perceived Stress Scale was  $19.50 \pm 9.28$ , and a high-moderate perceived stress was reported by 22.6–48.6% of the study participants. Similar results were reported in the studies that were conducted in other countries such as Saudi Arabia [31], Malasia [8], India [4, 32], and Iran [53]. More recently, Abdulghani et al. [2] have carried out a study to determine the influence of COVID-19 on undergraduate medical students’ learning. They showed that COVID-19 changes the educational strategies and attitudes among medical students and induced stress between them. Also, in the study of Aslan et al. [9], the participating students reported high perceived stress. This result is expected during the time of carrying out the present study, as the number of COVID-19 cases in the Gaza Strip rapidly increases among the population. The preventive procedures have been imposed to stop the rapid outbreak of COVID-19 among people including school closure, which is extended closing to avoid a large scale of infection among students. During the closure of schools, the students shifted to e-learning to complete their education through various digital platforms. The students face many obstacles with regard to employ e-learning tools in their education such as the inability to study all subjects, solve assignments, and time management. The students also stressed and anxious about their educational performance and achievement. Besides the negative impacts of the COVID-19 pandemic on students, the Gaza Strip is still suffering from numerous problems related to all aspects of life due to the hard blockade imposed by the Israeli occupation since 2007. Students and their families strongly struggle to be in life due to hard poverty, inability to provide the required necessities, frequent cutting off electricity, destroyed infrastructure, food insecurity, water pollution, increased

unemployment rate, lost jobs, and other many problems clothing and medication [28, 43, 52, 67]. Most students come from very low-income families and their guardians inability to provide them with electronic resources (laptop, tablet, mobile phone, internet, etc.) required to continue their education through remote learning platforms. All the above-mentioned factors put students in a hard situation when they suddenly shifted from traditional classrooms to virtual classrooms.

Furthermore, more than half of students reported often (fairly or very) felt stressed, angered, nervous and inability to cope with different difficulties during the current crisis. These results were in agreement with the results reported in previous studies conducted in Spain [58], China [20], Bangladesh [75], USA [78, 88], Malaysia [91], and France [38]. In these studies, the mental health of students was evaluated during the COVID-19 period and reported the prevalence of psychological distress as anxiety, stress, and depression among students. Besides the health concerns, students also confirmed academic-related concerns caused shifting to distance learning. It was reported that distance learning was significantly associated with anxiety, depression, and stress due to financial, social, and academic obstacles [45]. Coping with distance learning is considered a big challenge for some students due to the inability to deal with modern technology, limited resources requiring distance learning [71].

In our study, females were significantly higher than males in the mean score of perceived stress level. However, females were more likely to have moderate stress than males. This result may be due to female students represented the majority of the study sample. However, these results were in accordance with results reported in a recent study conducted during the COVID-19 pandemic [69]. They reported high levels of stress among females as compared to males. Acceptable levels of stress have a positive effect to motivate students to study hard during the closing of schools. The differences found in this study between males and females could be directly associated with risk perception such as increase the perception of the risks of dropping their educational performance when they drop out of their educational duties. Recently, it has been reported that gender was an important predictor variable of risk perception levels in participants, where being a female was a predictor of increased risk perception [69].

These results were in harmony with the results mentioned in the study conducted by Wang et al. [89]; they reported that the female gender is a predictor of the negative psychological impact of the COVID-19 pandemic, where females experienced a greater psychological effect of the COVID-19 pandemic and higher levels of stress, anxiety, and depression when compared to males. This also is in agreement with other studies that have shown higher

psychological vulnerability in females compared to males during the COVID-19 pandemic [17, 48, 70]. In the study of Liu et al. [48], they investigated the prevalence and predictors of post-traumatic stress symptoms (PTSS) during the COVID-19 pandemic in China. The results showed that females reported significantly higher PTSS in the domains of negative alterations in cognition or mood, re-experiencing, and hyper-arousal. Also, Rossi et al. [70] showed that the female gender was significantly associated with a greater psychological influence of the COVID-19 pandemic and higher levels of stress, anxiety, depression, insomnia, adjustment disorder, and perceived stress. More recently, Hou et al. [35] have found that males are experiencing less severe anxiety symptoms than females. On the other hand, different results were documented in the study of Rehman et al. [69], and they found that females and males did not differ significantly on stress, anxiety, and depression.

The findings of the current study found a significant difference among the two mean scores of perceived stress. The older students (secondary school students aged 15–18 years) had a significantly higher mean score of perceived stress when compared to younger students (primary school students aged 11–14 years). Secondary students were also more likely to have high stress than primary students. This result could be attributed to the fact that the secondary school students are more committed than the primary students in completing educational tasks remotely such as attendance online lessons for each subject, submission reports and assignments, conducting interviews with teachers and friends, participation in discussion groups, answering exams and other instructional tasks. During the COVID-19 pandemic, the education system entirely, not partially as blended education, shifted to distance education as all educational tasks were achieved remotely. The entire shifted to online mode of education can cause social isolation, inability to manage time and organizing table of lessons, feeling confused and lack of self-motivation and face-to-face communication [68]. Therefore, they have a greater probability to feel stress, which causes fear, panic, anxiety, and depression due to accumulated educational tasks and the inability to achieve them. Also, secondary school students are concerned about the consequences caused by this crisis on their educational achievements due to the closing of schools during the COVID-19 pandemic [20, 24, 71]. Secondary school students may be more aware of the danger of closing schools and have a more realistic perception of the events caused by this closure, so their stress was greater. The authors explain from their experience and being teachers who work in primary schools that primary school students are not aware of the current health crisis and do not have sufficient awareness of the risk of closing schools and the importance



of continuing their education remotely, so they had less stress. The authors confirmed that some primary students neglected their lessons remotely and considered themselves on vacation and they are doing daily activities as usual such as playing on roads, go to picnics and attending social events during the COVID-19 lockdown. Therefore, they had not more lessons and tasks required to achieve, so they did not have experience stress as compared to secondary school students.

Students who live in the Middle governorate had a significantly higher mean score of perceived stress level compared to other counterparts. This result is attributed to the fact that students who live in the Middle governorate may suffer from a difficult economic status and cannot provide the electronic resources necessary to continue their education remotely, thus accumulating burdens and educational tasks on them. According to the statistics of the Islamic Relief Palestine [39], most low-income families and poor housing in the Gaza Strip are mainly from the Middle governorate. The distribution of the poverty status of families showed that the Middle governorate is the second-largest governorate with respect to the number of families with extremely bad economic status in the Gaza Strip. These conditions contributed to increasing the perceived stress of students, therefore academic achievement and performance of students in this governorate highly affected, in particular those who will graduate from high schools to universities, where they under stress to get the acceptable grades to register in the faculties they want. This result is in accordance with the result reported in the studies of [5, 37, 54]. They mentioned that low-income families have limited access to daily necessities during the COVID-19 lockdown. As a result of lockdown and loss of work, most households lose their daily income, therefore inability to provide the necessities to their families. Levels of stress became significantly higher in students from low-income families during the COVID-19 period. Members of those families are worried about the pandemic's long-term effects and economic hardships since they are actively working forces in the community that is disproportionately influenced by lockdowns such as layoffs and loss of wages.

As defined by the definition of perceived stress, in addition to detailing the number and distribution of stressors, to jointly identify the predictors of perceived stress, the investigators in this study extracted the potential resources that respond to perceived stress in the context of the COVID-19 crisis [15, 36]. In terms of individual backgrounds, female students reported more stress than male students, which is consistent with other studies [2, 80]. Females are more sensitive to academic and interpersonal expectations, as well as more likely to communicate their feelings, resulting in a greater perceived stress level [18]. Furthermore, it was found that differences

in neuroendocrine and hypothalamic–pituitary–adrenal (HPA) axis reactivity caused females to report more stress [84]. Gender as a predictor of PS could not be underestimated; hence, female students needed to be given specific attention. This study revealed that age and educational level were the significant predictor of perceived stress among students, in which secondary students experienced higher stress than primary students. During the current pandemic, secondary school students focused mostly on basic subjects such as biology, physics, and mathematics. They were under additional stress, maybe as a result of their maladjustments to online learning of basic subjects in quarantine and increased anxiety over the final exam. Furthermore, secondary students' lower levels of technological knowledge, abilities, and the lack of a learning method could be one explanation for this outcome. This indicated that secondary school students need to provide proper resources such as coping methods, resilience, and learning environment supports.

## Conclusion

This study revealed moderate to high levels of stress among school students in the Gaza Strip during schools closure due to the COVID-19 pandemic. The prevalence of psychological distress attributed to suddenly shifted from traditional learning to online learning. Female and secondary students exhibited a higher level of stress. Besides providing the students with the lessons and educational materials through digital platforms, stress management programs are also highly recommended and introduce online during teaching students and prepare supporting materials to maintain the mental health of students when they study. Also, educate students about how they manage their time is very important to ensure their ability to study all subjects in a regular method. The results showed that some students often felt stressed and angered due to things that happened outside of their control. Also, students reported often felt that difficulties were accumulated so high that they could not defeat them and they could not cope with all the things that they had to do. However, some students confirmed their ability to solve difficulties most times and to control issues in their lives. It is important that policymakers and responsible authorities focus more on students and keeping continuous communication with them during the current crisis. The development of a health protocol for influenced students is urgently needed to maintain them remain resilient during dangerous times.

## Limitation

This study was conducted at the time of school closure due to the COVID-19 pandemic. In spite that this study has made a great contribution and can be used by the Ministry of Education to address the negative psychological impacts of distance learning during the COVID-19 period, it has some limitations. Limitations of the current study including the quarantine period and restrictions movement were a constraint to contact students and collected data in a systematic method. The second limitation related to using online Google Forms to collect data, where students who do not have internet services were not able to participate in the study.

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**Availability of data and materials** The data that support the results of the present study are available on request from the corresponding author. The data are not publicly available to respect the privacy of research participants.

## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** Ethics approvals were obtained from the MOEHE before conducting the data collection.

**Consent to participate** An electronic informed consent was given by participants or their guardians for participation. In this study, confidentiality and privacy were ensured and personal information was not disclosed. The reference number is not available.

**Consent for publication** An electronic informed consent was given by participants their guardians for publication.

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