

# Usefulness of modified distress thermometer in screening adolescents with COVID-19 for psychological distress

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## Research Article

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# Abstract

**Background:** Children and adolescents are more vulnerable than other age groups to the psychosocial effects of the COVID-19 pandemic. The modified DT (m-DT) was recently utilized for measuring the prevalence of psychological distress among adult COVID-19 patients. In the current study, we aimed to test the utilization of this m-DT in screening adolescent patients with COVID-19 for psychosocial distress.

**Methods:** Egyptian adolescent subjects with suspected or confirmed cases of COVID-19 at a University Hospital were enrolled. Binary logistic regression tests were carried out to explore the association between the m-DT cut-off scores of 4 and the clinical variables.

**Results:** Forty-eight percent (87/182) of the study subjects experienced significant (m-DT score  $\geq 4$ ) COVID-19 related distress. There were significant differences between those with and without significant distress with regards to length of quarantine, presence of underlying medical disorder, and presence of chronic respiratory disorders. Length of quarantine time, presence of chronic respiratory disease, worry, and fever were independent factors associated with significant distress in COVID-19 adolescent patients.

**Conclusions:** Almost half of the enrolled Egyptian adolescents with COVID-19 experienced significant psychological distress. The m-DT was useful, as the current study had identified length of quarantine time, presence of chronic respiratory disease, worry, and fever as independent factors associated with significant distress in COVID-19 adolescents. Further studies are needed.

## Introduction

The coronavirus disease 2019 (COVID-19) affected virtually all countries and had posed a significant threat to the health of the population and creating a significant challenge for health systems. Unknown diseases with an uncertain prognosis and associated with a scarcity of medical and protective equipment have led to unwanted mental health consequences. The potential fallout of an economic downturn, as well as the consequences of quarantine and associated social and physical distancing measures, are additional risk factors for mental health problems [1–3].

Some groups may be more vulnerable than others to the psychosocial effects of pandemics. Because they are in a critical period of development, children and adolescents deserve special care to preserve and promote their mental health [4]. The presence of significant distress in certain groups of patients e.g. cancer patients, had motivated many international regulatory organizations and professional societies [(e.g., International Psycho-Oncology Society (IPOS), National Institute for Health and Care Excellence (NICE) and National Comprehensive Cancer Network (NCCN)] to recommend the routine screening and management of distress as an integral aspect of whole-person cancer care in the same way that health-care teams monitor and respond to other vital signs [5, 6].

Therefore, recently we have adopted a modified version of the NCCN distress thermometer (m-DT) and its PL for adults with of COVID-19 [7]. With the modified distress thermometer (m-DT), 60% of adult Egyptian

COVID-19 patients experienced significant distress [7].

Being a vulnerable group for COVID-19-related stress, in the current study, we aimed to test the utilization of this m-DT in screening adolescent patients with COVID-19.

## **Materials & Methods**

### **Study Population**

In this prospective study, Egyptian adolescent (10–18 years old) subjects who fulfilled the criteria of suspected or confirmed case of COVID-19 [8] and managed as outpatients (at the respiratory triage) or admitted at the Pediatric Department of a University Hospital at an isolation room with an adequate command of speaking and reading the Arabic language were enrolled. Subjects who had a history of or undergoing current treatment for psychiatric illness were excluded. Standard sociodemographic data were collected including age, gender, and education level. Medical records were reviewed for past medical history, vaccination history, history of recent travel, and history of quarantine. The study objectives and procedure were fully explained to eligible subjects and their sponsors. The essential infection control precautions for handling patients with COVID-19 were undertaken and the person who carried out the questionnaire wore full personal protective equipment (PPE) [8].

All methods of the study were carried out in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. Ethical approval was obtained from the Institutional Review Board of the Faculty of Medicine of the University. A written consent was obtained from the study participants if they were  $\geq 16$  years old and from the participant's parent and/or legal guardian for carrying out the study procedures.

### **Modified distress thermometer (m-DT)**

As shown in our recent publication [7], we have utilized the m-DT (Fig. 1) to screen the enrolled adolescent subjects for psychological distress, with the use of a cutoff score of  $\geq 4$  for significant distress [7, 9].

Screening was carried out for those patients at their first out-patient/Emergency Department visit or in-patient admission. Patients were asked to rate their distress in the past 3 days on an 11-point visual analog scale ranging from 0 (no distress) to 10 (extreme distress) (Fig. 1). Patients were then asked to fill in PL that accompanies the visual image of the m-DT to check, whether or not (yes/no) they have any of the problems listed during the previous 3 days. For illiterate patients, a research assistant helped them to rate their distress and fill in the PL. Correlation between the PL

and m-DT was carried out to identify the nature of distress and related factors.

### **Statistical analysis**

The following parameters were explored using descriptive statistical analysis; mean score, the standard deviation, the median score, and the frequency distribution of the m-DT. All p-values were two-tailed. A  $p <$

0.05 was considered statistically significant. Binary logistic regression test was carried out to explore the association between the m-DT cutoff scores of 4 [7, 9] and the demographic and clinical variables, while binary and multivariable logistic regression tests were used to analyze the association between the m-DT cut-off scores and individual items in the PL. The Statistical Package for Social Science; SPSS, version 24 (SPSS Inc., Chicago, IL, USA) has been used for data analysis.

## Results

### Sociodemographic and clinical characteristics

A total of 182 patients were prospectively enrolled. The median age was 12.3 (range 10–18) years. Females constituted 45% of the participants. Forty-eight percent (87/182) of the study subjects experienced significant (m-DT score  $\geq 4$ ) COVID-19 related distress. Twenty-four percent (44/182) of patients had chronic underlying medical diseases, among which 30/44 (68%) had chronic respiratory diseases. The later included 24/30 (80%) patients with asthma, 4/30 (13.3%) with bronchiectasis, and 2/30 (6.7%) with interstitial lung disease (ILD), respectively.

There were significant differences between those with and without significant distress with regards to length of quarantine, presence of underlying medical disorder, and presence of chronic respiratory disorders ( $p < 0.001$  for each), respectively. Table 1 shows these data.

Table 1

Sociodemographic characteristics of the study subjects (n = 182) and their association with m-DT score  $\geq 4^*$

<b>Characteristic</b>	<b>Overall N = 182 (%)</b>	<b>m-DT cut off <math>\geq 4</math> N = 87 (48%)</b>	<b>m-DT cut off <math>&lt; 4</math> N = 95 (52%)</b>	<b>P-value</b>
<b>Age in years</b>				
Median (range)	12.3 (10.0–18.0)			
Mean $\pm$ SD	13.1 $\pm$ 2.3	14.2 $\pm$ 1.8	13.8 $\pm$ 2.1	0.118
<b>Age groups (years)</b>				
10 - < 14	129 (71)	56 (64)	73 (77)	
$\geq 14$ –18	53 (29)	31(36)	22 (23)	0.074
<b>Gender</b>				
Female	81(45)	38 (44)	43 (45)	
Male	101 (55)	49 (56)	52 (55)	0.882
<b>Educational level</b>				
Non-educated	16 (9)	11(13)	5 (5)	
Educated	166 (91)	76 (87)	90 (95)	0.115
<b>Length of quarantine</b>				
< 3 months	79 (43)	17 (20)	62 (65)	
> 3 months	103 (57)	70 (80)	33 (35)	< 0.001
<b>Underlying chronic disease</b>				
Present	44 (24)	32 (37)	12 (13)	
Absent	138 (76)	55 (63)	83 (87)	< 0.001
<b>Type of chronic disease</b>				
Respiratory	30/44 (68)	27/30 (90)	3/30 (10)	

\* m-DT; modified distress thermometer. For age, data are expressed in mean  $\pm$  standard deviation and t-test with 95% confidence interval was carried out to compare age between the 2 groups of m-DT cut-off  $< 4$  and  $\geq 4$ . For other sociodemographic characteristics, data are expressed in numbers and percent and Chi-square tests was used to compare the significance of differences between the 2 groups of m-DT cut-off  $< 4$  and  $\geq 4$ .

Characteristic	Overall	m-DT cut	m-DT cut	P-value
	N = 182 (%)	off $\geq$ 4 N = 87 (48%)	off < 4 N = 95 (52%)	
Non-respiratory	14/44 (32)	4/14 (28)	10/14 (72)	< 0.001

\* m-DT; modified distress thermometer. For age, data are expressed in mean  $\pm$  standard deviation and t-test with 95% confidence interval was carried out to compare age between the 2 groups of m-DT cut-off < 4 and  $\geq$  4. For other sociodemographic characteristics, data are expressed in numbers and percent and Chi-square tests was used to compare the significance of differences between the 2 groups of m-DT cut-off < 4 and  $\geq$  4.

## Data from m-DT and PL analysis

The most frequent problems reported on the practical domain of the PL are shown in Table 2, in descending order, fatigue (64.3%), fever (63.2%), myalgia (56.6%), and cough (56.0%).

**Table 2: The most frequent problem list items among the studied**

subjects (n= 182)

Problems List	No. of patients	%
Fatigue	117	64.3
Fever	115	63.2
Myalgia	103	56.6
Cough	102	56.0
Worry	100	54.9
Fears	95	52.2
Shortness of breath	90	49.5
Anosmia	87	47.8
Headache	85	46.7

## Association between m-DT and both the sociodemographics and PL items

Table 3 details the association between m-DT and both the sociodemographic data and PL items.

**Table 3: Association between the m-DT score  $\geq$  4 and both the sociodemographic factors and PL items of COVID-19 patients**

<b>Problem list</b>	<b>Item Present (%)</b>	<b>m-DT cut-off <math>\geq 4</math> N=87 (48%)</b>	<b>m-DT cut-off <math>&lt; 4</math> N=95 (52%)</b>	<b>OR (95% CI)</b>	<b>Adjusted OR (95% CI)</b>	
<b><i>Sociodemographic factors</i></b>						
<b>Age groups (<math>\geq 14 - 18</math>)</b>	53 53 (29)	31(36)	22 (23)	7.467(0.890-19.677)		
<b>Gender (male)</b>	101 (55)	49(56)	52 (55)	0.256 (0.019-2.448)		
<b>Educational (non-educated)</b>	16 (9)	11(13)	5 (5)	0.433(0.008-7.704)		
<b>Length of quarantine (&gt; 3 months)</b>	103 (57)	70 (80)	33 (35)	25.581(3.856-92.952)**	15.726(55.542)**	4.453-
<b>Chronic disease (present)</b>	44 (24)	32(37)	12 (13)	1.149(0.022-9.631)		
<b>Respiratory disease</b>	30 (16)	27(31)	3 (3)	29.140(0.844-88.967)**	29.403(9.572-6.877)***	
<b><i>Emotional Problems</i></b>						
<b>Depression</b>	67 (37)	29 (33)	38 (40)	2.418(0.200-22.203)		
<b>Fears</b>	95 (52)	53 (61)	42 (44)	0.011(0.000-0.914)		
<b>Nervousness</b>	66 (36)	33 (38)	33 (35)	0.328(0.036-3.030)		
<b>Sadness</b>	64 (35)	49 (56)	15 (16)	22.876(6.021-47.978)**		
<b>Worry</b>	100 (55)	72 (83)	28 (29)	25.001(1.263-49.715)**	17.414(2.887-43.374)**	
<b>Loss of interest</b>	32 (18)	20 (23)	12 (13)	2.793(0.127-11.319)		
<b><i>Physical Problems</i></b>						
<b>Cough</b>	102	63	39	1.384(0.160-		

	(56)	(72)	(41)	12.000)	
<b>Shortness of breath</b>	90 (49)	66 (76)	24 (25)	2.275(0.213-19.323)	
<b>Sore throat</b>	45 (24)	35 (39)	10 (11)	0.918(0.386-8.185)	
<b>Headache</b>	85 (47)	40 (42)	45 (47)	0.151(0.010-2.282)	
<b>Chest pain</b>	45 (24)	26 (31)	19 (20)	0.478(0.041-5.586)	
<b>Anosmia</b>	87 (48)	50 (57)	37 (39)	3.566(0.282-25.014)	
<b>Myalgia</b>	103 (57)	60 (69)	43 (45)	2.533(0.309-20.768)	
<b>Diarrhea</b>	26 (14)	19 (22)	7 (7)	18.296(2.098-34.609)**	
<b>Eating/anorexia</b>	61 (33)	48 (55)	13 (14)	4.290(0.980-23.954)	
<b>Fatigue</b>	117 (64)	70 (80)	47 (49)	6.881(0.213-22.182)	
<b>Fever</b>	115 (63)	81 (93)	34 (36)	23.624(8.365-66.694)**	26.727(10.108-72.715)***
<b>Memory/concentration</b>	16 (9)	10 (11)	6 (6)	2.793(0.069-11.271)	
<b>Nausea/vomiting</b>	18 (10)	12 (14)	4(4)	0.741(0.039-10.264)	
<b>Nose dry/congested</b>	49 (27)	24 (27)	25 (26)	1.602(0.164-11.628)	
<b>Pain/body aches</b>	44 (24)	29 (33)	15 (15)	0.148(0.009-2.305)	
<b>Sleep</b>	35 (19)	26 (28)	9 (9)	9.230(0.902-27.666)	

PL; Problem list, OR; Odds Ratio, CI; confidence interval, HC; \* P-value <0.05, \*\* p <0.01, \*\*\* p<0.001. Binary logistic regression showed that m-DT score of 4 or more had statistically significant associations with 6 items: length of quarantine time, the presence of chronic respiratory disease, sadness, worry, diarrhea, and fever. After adjustment to the sociodemographic and clinical characteristics, the multivariable analysis confirmed that length of quarantine time, presence of chronic respiratory disease, worry, and fever were independent factors associated with significant distress in COVID-19 patients. The adjusted odds ratios (95% confidence interval) for these items were 15.726 (4.453– 55.542),



29.403(9.572–86.877), 17.414(2.887–43.374), and 26.727(10.108–72.715), for length of quarantine time, presence of chronic respiratory disease, worry and fever, respectively.

## Discussion

To the best of our knowledge, this is the first Egyptian study that evaluate the adolescents' subjects with COVID-19 for psychological distress using the modified distress thermometer (m-DT). We had used this tool recently for screening adults with COVID-19 for distress [7] and observed that 60% of the screened subjects experienced significant distress. In the current study we found that 48% of Egyptian adolescents suffered from significant distress. By time, we have realized that the current COVID-19 pandemic has led to a substantial degree of mental health crisis along with other aspects of the quality of life [3, 10]. So, it is not surprising that the World Health Organization (WHO) has issued brief messages related to psychological and mental health considerations and has emphasized the execution of psychological first aid [11]. Moreover, the International Psycho-oncology Society terms distress as the "sixth vital sign" [12] and major professional organizations [5, 6, 11] call for standards of care that include psychosocial screening. Screening is the brief first step in a logical process of identifying risks (and competencies), determining need for further evaluation, and developing an appropriate treatment plan [3,4,7,9].

The originally proposed DT for cancer patients is a single-item tool using a point Likert scale resembling a thermometer, where the patient rates his/her level of distress over the past week [5, 9]. The NCCN original Problem List for cancer patients included a 39-item supplemental list of potential sources of distress that is incorporated as an essential part of the assessment to assist the provider in identifying distress. As this PL provides a comprehensive list of categories, it covers almost all aspects that might attribute to distress among cancer patients [5, 9]. However, despite these advantages, we had speculated that modifying this DT and its PL into a more practical and less-time consuming list of only emotional and physical items directly related to the impacts of COVID-19 would be a reproducible tool for assessment of the rapidly growing global pandemic of COVID-19 [7]. Utilizing this modified DT, our results had revealed a high prevalence (60%) of distress among adults with COVID-19 disease.

Some population groups are more vulnerable than others to the psychosocial effects of pandemics. Because this critical life stage includes physical, psychological, and social developmental changes; major transitions from school to work or further education; and growing independence from families, children and adolescents deserve special care to preserve and promote their mental health [13, 14]. Logically, being a relatively novel global illness, no one is immune [15–17], several pathophysiologic aspects of this pandemic are still vague in the eye of the general population, affecting many body organs and systems [18], and still has no definitive therapy, COVID-19 represents a real stressful condition and explains the high prevalence of distress among the studied cohort.

Our demographic data showed that length of quarantine, presence of underlying medical disorder, and presence of chronic respiratory disorders, were significantly related to significant distress among the study cohorts. For adolescents with chronic respiratory disorders and their parents, the development of

COVID-19 related respiratory symptoms -even they were proved later to be an exacerbation of the underlying chronic respiratory disorder, and not COVID-19 disease- represents an exaggerated trigger for distress. The most frequent problems reported on the practical domain of the PL were, fatigue, fever, myalgia, and cough, in this descending order. It is of notice that these problems were a mix of emotional and COVID-19-related ones. Despite that these symptoms represent challenges to the clinician; their predominance reflects the practicality and reproducibility of the used modified DT [7].

Results of the current study had shown that length of quarantine time, presence of chronic respiratory disease, worry, and fever, were independent factors associated with significant distress in COVID-19 adolescent patients. The history of this pandemic has experienced unparalleled changes in recent world history. Among them, the drastic modification of children's and adolescents' routines. While aiming to suppress virus transmission, the preventive strategies of lockdowns and social distancing significantly decrease social interactions, with expected unwanted impacts on the adolescents' mental health [7, 10, 11]. Mental distresses that are already common due to the pandemic, may be heavily exaggerated if less family support is available [14]. Remote schooling, potential sickness, and economic shutdown, play a fundamental role in the mental sufferings of children and adolescents [4, 10]. Worry is highly expected in such global pandemics like COVID-19. Previous reports had highlighted that the presence of one or more of some behavioural and emotional changes should alarm the parents and healthcare givers for significant distress among children and adolescents [10, 19]. These changes include sleep problems and nightmares, development of unfounded fears, increase drugs, alcohol, or tobacco use, tendency to be become isolated from others, lose interest in funny activities, to be angry or resentful easily, and to be disruptive or disrespectful or behave destructively [19–21].

Overall, the findings of the current study confirm the importance of screening of COVID-19 adolescent patients for emotional distress, using a simple and valid tool like m-DT. This could have important clinical implications. Despite that psychiatric management of COVID-19 adolescent patients with significant distress may be beyond the scope of this article, effective screening of those populations could protect against adverse mental health consequences of COVID-19, the most important of which is the pandemic-associated suicidal behaviour [19, 21].

Based upon studies that found previous viral epidemics were associated with increased rates of suicide deaths, COVID-19 pandemic may increase the risk of suicidal ideation and behaviour, including suicides that were reported as an adverse effect of quarantine [22]. Notably, suicidality related to COVID-19 may be due to the hardships imposed by the pandemic, including economic privation, social isolation, reduced access to general medical and mental health care, and the stigma of having COVID-19 [10, 22–24]. As there is a paradigm shift in suicide nature and risk factors due to the ongoing pandemic; hence, exploring specific cohorts to understand suicide nature is warranted in adolescents. It was recently reported [25] that online schooling related

problems led to mother and son suicide-pact in a Bangladeshi youth during the pandemic.

Being the first prospective study utilizing a modified DT in a relatively good number of adolescents does not guarantee that it has no limitations. Possible limitations include being a single centre study, possible convenience sampling which may affect the generalizability of the study findings to all COVID-19 patients, and the study did not include patients admitted to the intensive care unit (ICU). Further studies are needed.

## Conclusions

With the modified distress thermometer (m-DT), almost half the Egyptian COVID-19 adolescents experienced significant distress. This distress was significantly related to length of quarantine, presence of underlying medical disorder, and presence of chronic respiratory disorders. With m-DT, the current study had identified length of quarantine time, presence of chronic respiratory disease, worry, and fever, as independent factors associated with significant distress in COVID-19 adolescent patients. We recommend further larger studies implementing this m-DT for screening COVID-19 adolescents for psychological distress.

## Abbreviations

**DT**; distress thermometer, **ICU**; intensive care unit, **IPOS**; International Psycho-Oncology Society, **m-DT**; modified distress thermometer, **NICE**; National Institute for Health and Care Excellence, **NCCN**; National Comprehensive Cancer Network, **PL**; problem list, **PPE**; personal protective equipment, **WHO**; World Health Organization

## Declarations

- **Ethics approval and consent to participate**

All methods of the study were carried out in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. Ethical approval was obtained from the Institutional Review Board of the Faculty of Medicine of the University. A written consent was obtained from the study participants if they were  $\geq 16$  years old and from the participant's parent and/or legal guardian for carrying out the study procedures.

- **Consent for publication**

A written consent was obtained from the study participants if they were  $\geq 16$  years old and from the participant's parent and/or legal guardian for carrying out the study procedures.

- **Availability of data and materials**

The dataset(s) supporting the conclusions of this article is(are) included within the article

- **Competing interests**

Authors of this study have no conflicts of interest to disclose

- **Funding**

No funding was secured for this study.

- **Authors' contributions**

YG: conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript.

YA: shared in the design of the study.

MA: shared in data collection and drafting of the manuscript.

AB: designed the data collection instruments and collected data.

SM: conceptualized and designed the study, carried out data analysis, wrote the manuscript and reviewed it.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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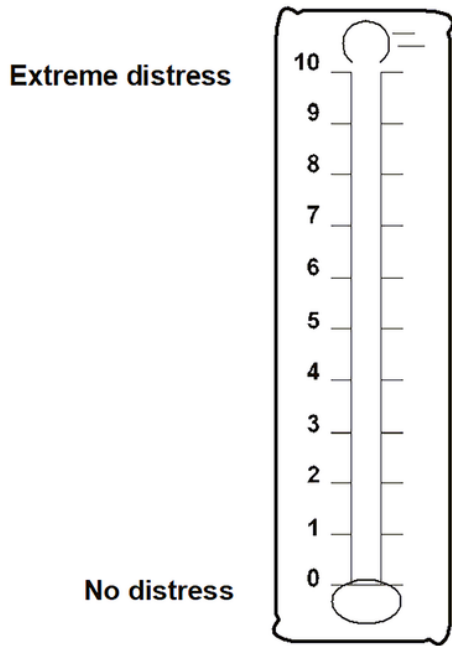
## Figures

# Modified Distress Thermometer and Problem List for COVID-19 Patients

## DISTRESS THERMOMETER

Distress is an unpleasant experience of a mental, physical, social, or spiritual nature. It can affect the way you think, feel, or act. Distress may make it harder to cope with having COVID-19 and/or its symptoms

**Instructions:** Please circle the number (0–10) that best describes how much distress you have been experiencing in the past 3 days including today.



## PROBLEM LIST

Please indicate if any of the following has been a problem for you in the past 3 days including today.

Be sure to check YES or NO for each.

### YES NO Emotional Problems

- Depression
- Fears
- Nervousness
- Sadness
- Worry
- Loss of interest in usual activities

### YES NO Physical Problems

- Cough
- Shortness of breath
- Sore throat
- Headache
- Chest pain
- Anosmia
- Myalgia
- Diarrhea
- Eating/Anorexia
- Fatigue
- Fever
- Memory/concentration
- Nausea/vomiting
- Nose dry/congested
- Pain/Body aches
- Sleep

Figure 1

Modified distress thermometer (with permission from[7])