



Mental health literacy and COVID-19 related stress: The mediating role of healthy lifestyle in Tabriz

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ABSTRACT

Introduction: Data concerning the relationship between Mental Health Literacy (MHL) and COVID-19 stress are limited. The study explored the relationship between COVID-19-related stress, MHL, and healthy lifestyle and their components. The current study aimed to investigate the moderating role of a healthy lifestyle in the relationship between MHL and COVID-19-related stress among people referring to health complexes in Tabriz.

Methods: In this descriptive-correlational study, 1011 people who referred to health complexes in Tabriz were selected using cluster sampling and responded to the COVID-19 Stress Scale (CSS), Mental Health Knowledge Questionnaire (MHKQ), and Lifestyle Questionnaire (LSQ). Data analysis was performed using structural equation modeling. SPSS ver.19 and LISREL ver. 8.5 statistical software is used to classify, process, and analyze data and test research hypotheses.

Results: The results indicated that stress caused by COVID-19 has a negative relationship with lifestyle and MHL. The relationship between lifestyle and MHL was positive, and it has the positive effect on a healthy lifestyle (with a standardized coefficient of 0.23). In addition, MHL had a negative effect on the stress related to the coronavirus (with a standard coefficient of -0.22), and the relationship between a healthy lifestyle was also negative on the stress related to the coronavirus (with a standard coefficient of -0.20). The evaluation of the hypothetical research model using fit indices showed that the hypothetical model fits the measurement model (Comparative Fit Index (CFI) = 0.97, Goodness of Fit Index (GFI) = 0.95, Root Mean Square Error of Approximation (RMSEA) = 0.055). All the comparative indices as well as the comparative fit index were found to be close to one and greater than 0.90.

Conclusion: This study highlights that healthcare providers must develop effective preventive and therapeutic interventions to deal with COVID-19-related stress and pay attention to the issue of increasing the level of MHL during international crises taking into consideration the moderating role of a healthy lifestyle, and develop educational and treatment programs.

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1. Introduction

Since the rampant spread of the coronavirus in 2019, many countries, especially those with weak healthcare systems and more affected people, have experienced massive changes that have had a profound impact on their daily lives and mental state [1,2]. The COVID-19 pandemic has led to general mental health stress, anxiety, panic, and behavioral disorders worldwide [3]. The incidence rate and deaths from COVID-19 were more than 655 million cases and over 6/5 million by January 2023, respectively [4]. While the global virus has provoked an unprecedented response in the academic community, the main focus of recent research has been on emergency care, viral pathogenesis, etc. Also, little attention has been paid to the effect of COVID-19 on the mental health [5], and the role of a healthy lifestyle in dealing with this virus. Pilot studies on the psychological effects of COVID-19 have shown a significant prevalence of anxiety, depression, stress, insomnia, and post-traumatic stress disorder among COVID-19 patients [6]. Fear of infection, worry for friends and relatives, uncertainty about economic conditions, and loneliness can increase anxiety and depression during the pandemic and quarantine period [7]. Moreover, severe COVID-19-related stress and risk factors can lead to a variety of mental disorders, including mood disorders, burnout, and death anxiety [3]. The prevalence of negative psychological symptoms is reported to be 2 to 3 times higher among people who experience the physical symptoms of the disease [8]. Quarantine and isolation, in addition to the above symptoms, lead to low mood, irritability, and fear of disease [9]. Also, despite the risks and restrictions imposed on the community during the epidemic, the personnel of the medical care system who continue to work as the main pillar of healthcare workers experiences psycho-social problems such as severe stress, anxiety, experiences depression, job burnout, emotional exhaustion, post-traumatic stress disorder and vicarious traumatization [10]. Relevant research on the consequences of COVID-19 also shows that the long-term outbreak of the disease imposes severe psychological pressure on the general public and specific sections of society [6], and that the long-term psychological consequences of quarantining can last for months or possibly years [11]. Although previous research mentions quarantine and social distancing as effective public health measures, which can lead to other health problems besides COVID-19. The main consequence of quarantine-related stress is a lifestyle change. Studies have shown that people adopt an unhealthy diet during quarantine and report reduced physical activity. Frequent stressful exposure to the visual and auditory news of COVID-19 has a direct relationship with overeating. Also, the research findings showed that the effects of the COVID 19 pandemic on lifestyle behaviors reduce sleep adequacy [12]. These studies illustrate that social isolation leads to an unhealthy lifestyle, associated with low mental and physical health, and increases the likelihood of common mental disorders such as depression, anxiety, substance abuse, and cognitive impairment [2,9]. According to recent research disturbances in lifestyle rhythms due to prolonged home quarantining as a countermeasure against COVID-19 can increase psychological distress and lead to mental illness, even among healthy people without a medical history [13–15].

At this time, from the point of view of public health and preventive care, there is a fundamental need to provide effective information and interventions to individuals, communities, and health agencies. These requirements maintain the healthiest lifestyle and strengthen people's competencies to deal with mental health problems or the so-called MHL, which has the potential to prevent these problems from getting worse [2,16]. JEROME defined mental health literacy as ability of recognizing the signs and symptoms of mental illnesses to identify sources of help (specialized and non-specialized) and their causes. According to research, people with higher mental health literacy are more likely to diagnose mental illness and seek appropriate treatment. On the otherhand, lower levels of mental health literacy are associated with early termination of mental health treatment and the use of improper coping strategies like the alcohol and drugs utilizing [17]. Also, a population that has evidence-based knowledge about mental health issues is more likely to initiate preventive and primary treatment interventions and show less stigmatizing attitudes [18].

The emergence of the novel COVID-19 disease has become a major public concern internationally, and its psychological effects as well as its global spread have created gaps in the mental health needs of individuals that have been relatively neglected [19]. Consequently, constant negligence affects the aggravation of the mental illness. After the treatment of general physical symptoms, one of the basic needs of today's societies is to focus on improving the performance of individuals in the face of a health crisis [20]. For this reason, healthcare systems need to investigate the effectiveness of various non-pharmacological interventions including both educational and psychological, to reduce the effects of the pandemic on people, from mortality to psychological health after the crisis in different dimensions. Recent studies have investigated the relationship between COVID-19 and psychological stress and provided a list of mental disorders and distress caused by this pandemic. However, little attention has been paid to the underlying mechanism that increases people's vulnerability to stress. Previous research on the SARS epidemic showed that at the end of this crisis, changes related to a healthy lifestyle were associated with a reduction in stress and the occurrence of PTSD [21]. According to the foregoing, a healthy lifestyle may act as a mediator between MHL and COVID-19-related stress. Although previous studies have investigated lifestyle changes and the 2 relationship between health literacy and COVID-19 [22,23], there has been no study on the mediating role of a healthy lifestyle in the relationship between MHL and COVID-19-related stress. Therefore, the present study aimed to investigate the existence of a significant relationship between a healthy lifestyle and MHL as well as COVID-19-related stress.

Generally, this paper is organized as follows: the method is described in section 2. In Section 3, the results of the presented work are explained. The discussion of the work is presented in section 4. Finally, section 5 concludes this paper.

2. Methods

2.1. Study design and population

A descriptive correlational study was conducted in Tabriz with using a paper survey among people referring to health complexes who agreed to participate in the research by signing the informed consent form in the period of study. Library sources were used to

collect information on the theoretical foundations and literature of the subject, and the field method with the help of questionnaires was used to collect data. The survey includes the CSS, MHKQ, and LSQ. In the end, structural equations were used to measure and model the relationships between variables. Due to the large sample size and geographical dispersion, a single-stage cluster sampling method was used, which was the most appropriate strategy. The sample size was 1011.

2.2. Instruments

The data collection instrument used in the present study is a questionnaire. Also, the following tools are utilized to measure its different parts.

2.3. COVID-19 Stress Scale (CSS)

This questionnaire was developed by Taylor et al. to achieve a better understanding and assess COVID-19-related stress. Moreover, it includes 36 items on COVID-19-related stress [24]. The CSS was developed and initially validated in population-representative samples from Canada (N = 3479) and the United States (N = 3375). A stable 5-factor solution was identified, corresponding to scales assessing COVID-related stress and anxiety symptoms:

1. Fear of the danger of corona and sources of contamination,
2. Fears about economic consequences,
3. Xenophobia,
4. Compulsive checking and reassurance seeking,
5. Traumatic stress symptoms about COVID-19.

The tests of this questionnaire answer 36 questions based on a 5-point Likert scale, ranging from never to very much (for questions 1 to 24) and never to almost always (for questions 25 to 36). CSS was developed after reviewing the relevant literature and consulting with health-related anxiety experts, and the following domains were identified:

1. Fear of risk of infection,
2. Fear of sources of COVID-19 infection (e.g., objects and surfaces),
3. Corona-related xenophobia (meaning that strangers are the source of COVID-19 infection),
4. Fear of COVID-19 personal, social, and economic consequences (e.g., fear of supply chain disruption, fear of looting or insurgency),
5. COVID-19-related searches (e.g., checking news or social media, trusting friends or medical professionals), and
6. COVID-19-related traumatic stress symptoms (e.g., unwanted annoying thoughts or related nightmares).

Cronbach's alpha coefficient for all components was above 80%, indicating good-to-excellent internal reliability. Taylor et al. also obtained acceptable convergent and discriminant validity for this questionnaire [25].

2.4. Mental health literacy questionnaire (MHKQ)

This questionnaire is a 20-item self-report scale developed in 2009 by the Ministry of Health of China to assess general and mental health knowledge. In this scale, items 1–16 are phrases about mental health that require respondents to choose "True," "False," or "Do not know." In cases 17–20, respondents were asked if they had heard of four days of mental health promotion, and each question was assigned a score of 1 or 0 for answers of yes or no, respectively [26]. The psychometric test reported internal consistency of coefficients of $\alpha = 0.57$ to $\alpha = 0.73$, and 2-week test-retest reliability was measured by intra-class correlation coefficients of ICC = 0.68. Exploratory factor analysis provided a three-factor solution that addressed three aspects of MHL:

- Awareness of mental health characteristics and mental disorders,
- Belief in the epidemiology of mental disorders,
- Awareness of mental health promotion activities with Cronbach's alpha coefficients of $\alpha = 0.62$ to $\alpha = 0.67$.

2.5. Lifestyle Questionnaire (LSQ)

LSQ developed by Lali et al. (2012), aims to evaluate and measure lifestyle. It consists of 70 questions answered based on a four-point Likert scale, with scores of Never (0), Sometimes (1), Usually (2), and Always (3). This scale consists of 10 factors:

1. Physical health,
2. Physical activity and health,
3. Weight control and nutrition,
4. Disease prevention,
5. Psychological health,

Table 1
The correlation matrix, mean and standard deviation of studied variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Danger and contamination	–																				
2. Socioeconomic consequences	0.43**	–																			
3. Xenophobia	0.48**	0.45**	–																		
4. Traumatic stress symptoms	0.57**	0.45**	0.43**	–																	
5. Compulsive checking	0.42**	0.22**	0.28**	0.48**	–																
6. COVID stress	0.77**	0.72**	0.76**	0.79**	0.62**	–															
7. Physical health	–0.14**	–0.12**	–0.04	–0.16**	–0.001	–0.12**	–														
8. Exercise and fitness	–0.20**	–0.10**	–0.07*	–0.19**	–0.03	–0.16**	0.65**	–													
9. Weight control and nutrition	–0.13**	–0.11**	–0.04	–0.15**	–0.03	–0.12**	0.58**	0.53**	–												
10. Illness prevention	–0.07*	–0.15**	0.02	–0.12**	0.02	–0.08*	0.49**	0.41**	0.55**	–											
11. Psychological health	–0.23**	–0.15**	–0.04	–0.26**	–0.09**	–0.20**	0.57**	0.56**	0.47**	0.51**	–										
12. Spiritual health	–0.14**	–0.15**	0.01	–0.18**	–0.03	–0.13**	0.47**	0.41**	0.41**	0.54**	0.71**	–									
13. Social health	–0.08*	–0.10**	0.02	–0.13**	0.04	–0.06*	0.44**	0.39**	0.37**	0.51**	0.66**	0.65**	–								
14. Drug and alcohol avoidance	–0.08*	–0.12**	–0.01	–0.15**	–0.06	–0.13**	0.25**	0.15**	0.24**	0.34**	0.27**	0.34**	0.26**	–							
15. Accident prevention	–0.02	–0.07*	0.05	–0.06	0.05	–0.01	0.33**	0.23**	0.40**	0.56**	0.35**	0.41**	0.44**	0.38**	–						
16. Environmental health	–0.02	–0.06	0.01	–0.05	–0.002	–0.04	0.38**	0.29**	0.45**	0.58**	0.42**	0.46**	0.46**	0.30**	0.61**	–					
17. Lifestyle	–0.17**	–0.16**	–0.02	–0.21**	–0.02	–0.15**	0.73**	–0.68**	0.71**	0.77**	0.79**	0.77**	0.73**	0.51**	0.65**	0.69**	–				
18. KCMHMD	0.02	–0.11**	–0.10**	–0.12**	0.02	–0.10**	0.003	–0.002	0.04	0.14**	0.07*	0.13**	0.11**	0.11**	0.12**	0.13**	0.12**	–			
19. BEMD	–0.05	–0.20**	–0.17**	–0.23**	–0.03	–0.19**	–0.06*	–0.08**	–0.03	0.12**	0.06*	0.09**	0.06*	0.20**	0.10**	0.06**	0.07*	0.37**	–		
20. AMHP	–0.07*	–0.02	–0.09**	–0.11**	0.04	–0.07*	0.11**	0.12**	0.15**	0.16**	0.17**	0.12**	0.14**	0.08*	0.17**	0.15**	0.20**	0.19**	0.34**	–	
21. Mental Health Literacy	–0.07*	–0.15**	–0.17**	–0.22**	0.02	–0.17**	0.03	0.02	0.09**	0.20**	0.15**	0.16**	0.16**	0.19**	0.19**	0.16**	0.19**	0.62**	0.73**	0.72**	–
Mean	2.14	1.08	1.64	1.02	1.53	1.48	1.81	1.51	1.81	2.35	2.06	2.29	2.24	2.48	2.42	2.27	2.13	0.76	0.55	0.42	0.57
Standard Deviation	0.81	0.99	1.10	0.90	0.78	0.67	0.51	0.75	0.63	0.47	0.66	0.65	0.59	0.63	0.57	0.56	0.42	0.16	0.29	0.32	0.18

**P < 0.01, *P < 0/05.

Abbreviation. KCMHMD: knowledge of the characteristics of mental health and mental disorders, BEMD: belief in the epidemiology of mental disorders, AMHP: awareness of mental health promotion activities.

6. Spiritual health,
7. Social health,
8. Avoidance of drugs, narcotics, and alcohol,
9. Accident prevention,
10. Environmental health.

High scores in each of the components and on the whole questionnaire indicate an appropriate lifestyle. Lali et al. used the construct validity analysis test to confirm the construct validity of the LSQ as a multidimensional tool for assessing and measuring lifestyle. To evaluate the convergent validity of the LSQ, the correlation of its components with the psychological well-being scale was calculated. A positive and significant correlation exists between LSQ components and the psychological well-being scale ($p < 0.001$). Cronbach's alpha coefficients were calculated to determine the internal consistency method between the LSQ components and the whole questionnaire, and Cronbach's alpha coefficients ranged from 0.76 to 0.89. Reliability coefficients were calculated by the test-retest method and ranged from 0.84 to 0.94. The reliability of the questionnaire was estimated to be $\alpha = 0.87$ [27].

3. Results

The structural model was previously tested, as it is the basis for the analysis of causal correlation models. Thus, the matrix of inter-variable correlation coefficients was calculated. Table 1 presents descriptive statistics related to mean and standard deviation along with a correlation matrix of the relationships between different research variables. This table gives information about the results of the correlation matrix, mean, and standard deviation of studied variables. Partial results show that COVID stress has the most positive correlation with traumatic stress symptoms with 0/79%. The lowest level of direct relation in this scale belongs to compulsive checking with 0/62%. In this table, lifestyle has strong correlation with 0/79% with psychological health. On the other hand, there is a strong inverse correlation with the danger and contamination sub scale with $-0/17\%$. Also, we can see a proper correlation between MH and the BEMD sub-scale (0/73), which has a negative relation with traumatic stress symptoms ($-0/22$).

In other words, were the responses of the people who completed the questionnaires adequate enough to draw accurate and valid conclusions accordingly? The values of the indices obtained in this research are shown in Table 2. In this table, the fit indices of the measurement model illustrate the optimal fit of this model ($X^2/df = 4/26$, Comparative Fit Index (CFI) = 0.97, Goodness of Fit Index (GFI) = 0.95, Adjusted Goodness of Fit Index (AGFI) = 0/92, Root Mean Square Error of Approximation (RMSEA) = 0.055. Thus, the observed variables have the necessary ability to operate the latent variables. In this study, the X^2 result is 4.257 that is close to 5 and acceptable for the presented model. Moreover, the GFI, Adjusted Goodness of Fit Index (AGFI), and CFI results are close to one, which are good for the model. Also, the RMSEA and root mean square residual results in this table are in acceptable range and very close to zero. Based on the overall results of structural model evaluation, it can be concluded that the model has good data fit.

Fig. 1 reflects the standardized and (t) values of the path model. Also, it can be seen that there is a correlation between MHL as the exogenous variable and lifestyle as the endogenous variable. The results prove the hypothesis and illustrate the significant positive relation between these variables ($P = 5/13$). According to the structural model, lifestyle has a significant inverse relation with COVID stress, and the result of relation in the presented model is $P = -5/14$. Also, MHL has a negative correlation ($P = -4/6$) with COVID stress.

According to the model, MHL has a positive and significant effect on the required lifestyle with a standard coefficient of 0.23 (t-value = 13.5). MHL has a negative and significant effect on the COVID-19-related stress with the standard coefficient of -0.22 (T-value = -4.6). A healthy lifestyle with the standard coefficient of -0.20 (T-values = -5.14) has a significant negative impact on COVID-19-related stress. Considering that the significance of the path coefficient in the structural model is determined using the T-value, if the T-value is more than 1.96, the relationship between the two constructs is significant, and therefore, all path coefficients are remarkable.

4. Discussion

Most studies have separately dealt with covid related stress and lifestyle changes. Also, some of them have investigated the role of mental health literacy levels on the experience of covid related stress with the mediation of lifestyle [28,29]. The imposition of quarantine and the implementation of restrictive laws by governments to prevent the spread of the disease had exposed the general population and healthcare workers to psychological distress [30]. A relatively high rate of symptoms of anxiety, depression, post-traumatic stress disorder, mental distress, and stress have been reported in the general population. Based on the theoretical model

Table 2
Model Fit Indices Presented in the Research. Index of Fit Indicator values.

Chi Square (X^2)	451.24
X^2/df	4.257
Goodness of Fit Index (GFI)	0.95
Adjusted Goodness of Fit Index (AGFI)	0.92
Comparative Fit Index (CFI)	0.97
Root Mean Square Error of Approximation (RMSEA)	0.057
Root Mean Square Residual	0.021

Abbreviation. KCMHMD: knowledge of the characteristics of mental health and mental disorders, BEMD: belief in the epidemiology of mental disorders, AMHP: awareness of mental health promotion activities

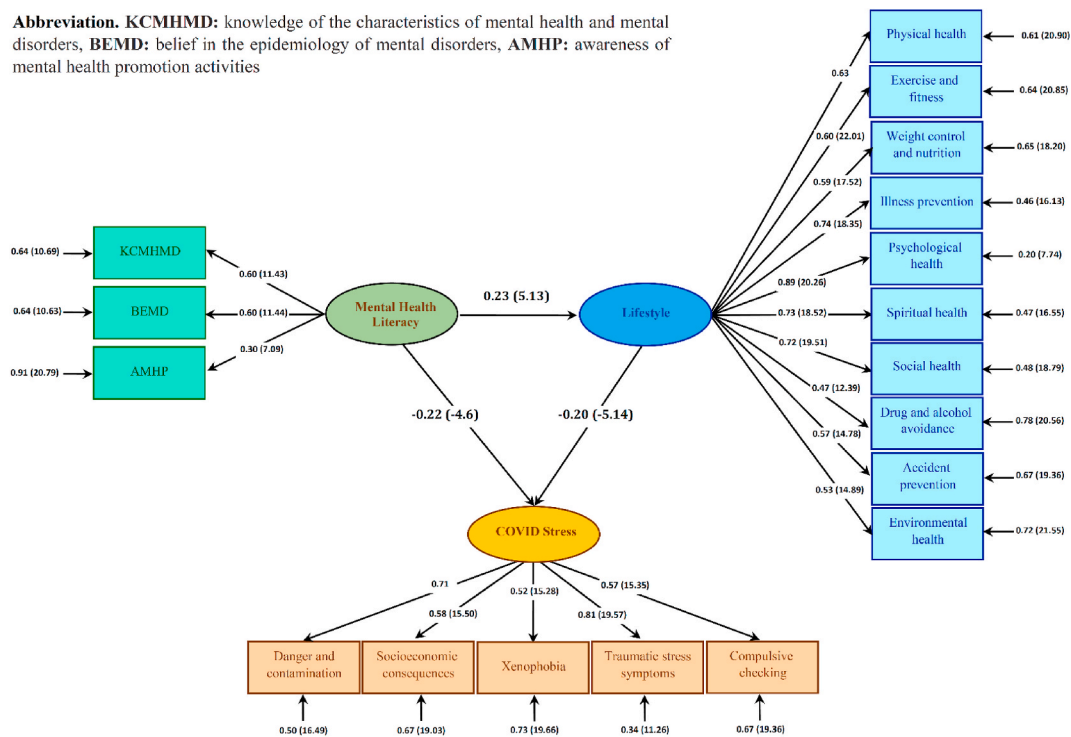


Fig. 1. Standardized and (t) values of the finalized structural model (N = 1011).

of Hu & Tan, mental health literacy as a positive psychological quality can effectively help reduce psychological problems such as stress [31]. Slewa-Younan et al. believed that increasing MHL can lead to two goals: first, empowering people to understand mental disorders, thus facilitating prevention, early intervention, and treatment in society, and second, empowering people to use appropriate tools to make informed decisions about access to mental health care [32].

The presented study revealed a negative correlation between MHL and Covid-19-related stress. Based on the results, traumatic stress symptoms had the highest negative correlation with MHL, and low levels of mental health literacy were associated with traumatic stress symptoms about COVID-19. According to Lazarus and Folkman’s transitional model of stress, a person’s interpretation of stressful events is more important than the event itself. Also, his perception of potential harm, threat, and challenge that will be created, and the level of confidence he will have in facing these issues, determine his ability to deal with stress [33]. In this regard, improving knowledge about mental health and mental disorders along with enhancing awareness of how to seek help and treatment can promote mental health results [34]. Woloshyn and Savage showed that a mental health training course increased mental health literacy as well as a stresscoping skills in their study participants. People with higher mental health literacy seem to be less likely to show negative emotional responses such as stress because they have a more realistic understanding of the nature of the disease and the related therapeutic measures. In other words, high levels of mental health literacy lead to less perceived threat and ambiguity and, also consistent with the results of the present study, less Covid-19-related stress [35].

This study illustrated that the stress caused by covid-19 has a negative correlation with lifestyle. Based on this, people with high levels of stress have poor psychological health (P = -20). Studies show that quarantine and isolation are associated with stress and depression and lead to an unhealthy lifestyle, including an unhealthy diet, smoking, alcohol, and reduced physical activity [9]. People under the pressure of stress abandon healthy lifestyle behaviors. They engage in behaviors that are effective in the short term to adapt to stress (like smoking and drinking), But they are not considered healthy at all [36]. The current result demonstrated that a healthy lifestyle predicts a lower level of covid-19 related stress, which is consistent with the result of previous research conducted with Indonesian participants [37].

The results of the presented work indicated that the mental health literacy level positively predicts a healthy lifestyle. Based on this result, high levels of MHL are directly correlated with illness prevention as a lifestyle factor. This finding was consistent with the results of studies by Bektas et al. and Noroozi et al. [38,39]. characteristics such as health literacy are important in acquiring and maintaining healthy behaviors that reflect a healthy lifestyle [40]. In this regard, research literature shows that improving the mental health literacy level in different ways can be effective in different components of a healthy lifestyle. People with higher mental health literacy are more sensitive to various issues related to their mental health. Considering their higher mental health literacy levels, these people have better management to prevent diseases and have higher mental and physical health.

In addition to the direct effect of MHL on Covid-19-related stress and a healthy lifestyle, the results of the present study showed that MHL can indirectly affect Covid-19-related stress through a healthy lifestyle. Therefore, it can be stated that a healthy lifestyle has a

mediating effect on the relationship between MHL and Covid-19-related stress. This finding is consistent with the results of previous studies [41–43]. According to the Diathesis-Stress model, protective factors play an effective role in reducing the impact of stressful life events [44]. One component of a healthy lifestyle that can be affected by MHL is stress management, which is part of the psychological health component. Based on the findings of the presented scheme, high levels of mental health literacy make people adopt appropriate strategies to prevent Covid-19. Also, if people use a healthy diet, pay more attention to physical health or symptoms, consult a doctor in time, and spend more time on exercise and continuous physical activity, they can boost the body's immunity and experience lower levels of Covid-19 related stress. The Covid-19 pandemic has caused significant changes in people's lifestyles, and the experience of quarantine and isolation has caused significant levels of anxiety, neuroticism, depression, and stress in people [45,46].

Generally, people with inadequate mental health literacy are more vulnerable to negative emotions and feelings because of the misinterpretation of knowledge about prevention methods, and proper understanding of medical and health advice. Moreover, these information deficiencies disrupt people's personal lives and their professional performances. Also, the results of this study showed that one's mental health literacy level ultimately reduced Covid-19-related stress in various dimensions of a healthy lifestyle. In general, according to the foregoing, it can be stated that there is no simple relationship between mental health literacy and Covid-19-related stress, but the conditional relationship can facilitate a healthy lifestyle. In other words, the healthy lifestyle and its components among individuals can maximize the impact of mental health literacy on Covid-19-related stress during the pandemic period.

There are several limitations existing for the current study. Due to the large sample size in this study, a paper-based questionnaire is used. Therefore, the results are self-reported and based on a subjective assessment of covid stress. In the future work, more objective methods will be used to collect data like specific population interviewing. In addition, future studies can prospect the mediating role of other significant variables (such as burnout variables) between MHL and Covid 19-related stress. Also, because of the high number of questions, a lot of time was spent to get the results. Using short versions of questionnaires can save data collection time. However, it should notice that the subjects of this work are the clients of Tabriz health centers, and we can expand the research results to other test groups. At last, given the long-term effects of the pandemic, all subjective outcomes after the acute crisis experience may contain valuable findings.

5. Conclusion

The presented study illustrated the general steps and explored how MHL can be associated with Covid- 19-related stress. The effect of lifestyle as a mediator provided positive implications, and it can be related to MHL and mitigate covid-19 related stress. The results of the presented work demonstrated that Healthcare providers should focus part of their attention on developing educational programs, including healthy lifestyles during the pandemic. In addition, governments can also increase people's MHL through the media they have to reduce the costs of the pandemic. These proceedings help to decrease the stress caused by international crises.

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Ethics

This project with the approval ID IR.TBZMED.REC.1399.830 was found to be in accordance to the ethical principle and the national norms and standards for conducting Medical Research in Iran.

Author contribution statement

Ali Fakhari: Conceived and designed the experiments; Performed the experiments.

Behzad Shalchi: Conceived and designed the experiments; Analyzed and interpreted the data.

Vahab Asle Rahimi: Contributed reagents, materials, analysis tools or data.

Reza Naghdi Sadeh: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data.

Elnaz Lak: Performed the experiments; Analyzed and interpreted the data.

Atieh Najafi: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Aref Shayeghanmehr: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Data availability statement

The authors do not have permission to share data.

Declaration of competing interest

The authors declare no conflict of interest.

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