

Post-Traumatic Stress Disorder (PTSD) and Depression in Iranian Adolescents with and Without Hearing Loss (HL) in Previous and During the Outbreak of the COVID-19

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Abstract

Background: Due to the unavailability of information and resources about COVID-19 in people with Hearing Loss (HL), especially deaf people, the psychological problems, such as PTSD and depression are probably raised in people with hearing loss (HL) during the outbreak of COVID-19. This study was conducted to compare post-traumatic stress disorder (PTSD) and depression in Iranian adolescents with and without HL in previous and during the outbreak of COVID-19.

Methods: The statistical sample was 112 adolescents half (56) of whom was with HL, while another half (56) was without HL. The two groups were also homogenized in terms of age, gender, and education. Data were gathered using the Child PTSD Symptom Scale for DSM-5 (CPSS-5) and Children's Depression Inventory Short version (CDI: S). The data obtained were analyzed using two-way MANOVA.

Results: Results showed that 46.43% and 41.04% of with-HL adolescents during the outbreak of COVID-19, and 17.87% and 25.00% of them in previous the outbreak of COVID-19 had symptoms of PTSD and depression, respectively. Results indicated that the mean score difference between PTSD and depression during and in previous the outbreak of COVID-19 [(during)-(previous)] was higher in adolescents with HL than the control group.

conclusion: We concluded that psychological and medical interventions must be beneficial to decrease symptoms of PTSD and depression in adolescents (especially in deaf and hard-of-hearing adolescents) during the outbreak of COVID-19.

Introduction

Hard of Hearing (HH) people diagnosed with mild (26–40 db) to severe (61–80 db) Hearing Loss (HL) usually communicate through spoken language and hearing aids such as cochlear implants. On the other hand, deaf people live with profound (81 db or more) HL and use sign language to communicate [1]. According to Schmucker et al. [2], 0.1 to 128 of 1000 children suffer from HL. A study in Iran showed that the prevalence of HL 14.27% [3].

Moreover, HL is likely to be accompanied by psychopathological symptoms [4–7]. Researchers have found that the symptoms of post-traumatic stress disorder (PTSD) [8–10]. and depression [11–14] were higher in people with HL than their hearing peers. In a study conducted by Black and Glickman [15], the prevalence of PTSD in deaf and hearing people was found to be 29.7% and 6.6%, respectively. A study conducted by Schild & Dalenberg [9], 19.5% of deaf people had symptoms of PTSD. Research has also found that 11.4% of people with HL had symptoms of depression [16]. According to Kim et al. [17], the rate of depression in hearing loss group was 7.9% and in hearing people was 5.7%. Therefore, it might be necessary to examine the psychological consequences (especially PTSD and depression) of COVID-19 in people with HL.

A new coronavirus (SARS-CoV-2) is the cause of COVID-19. This virus appeared in December 2019 in Wuhan, China and quickly spread around the world. COVID-19, as an epidemic disease, is a public health emergency [18]. The most common clinical symptoms of COVID-19 are: fever, cough, fatigue, sputum production, shortness of breath, sore throat, and headache [19]. On 17th February 2020, the number of people affected with COVID-19 was 110,145,029 with more than 2,432,301 deaths [20]. In Iran, this virus was first detected in Qom on 19th February 2020 and 1,542,076 were affected until 17th February 2020 with the death rate of 59,184 [21]. As a theoretical framework, natural disasters can be considered as stressors and cause mental disorders in survivors, including PTSD [22]. Many illnesses, such as Acute Respiratory Syndrome (SARS), are considered biological disasters that have a profound effect on survivors [23–24], including PTSD and psychiatric problems [25]. COVID-19 can also be a biological disaster that can cause mental disorders such as PTSD and psychiatric problems. Therefore, conducting this research can be justified in terms of theoretical framework.

COVID-19 disease could be followed by psychological problems [26–35]. The high rates of PTSD [36–40] and depression [33, 35–36, 41–43] have been reported in many studies during the outbreak of the COVID-19. To date, the rate of PTSD and depression in adolescents with HL during the outbreak of the COVID-19 has not been studied. Due to the unavailability of information and resources about COVID-19 in people with HL, especially deaf people [44], the psychological problems, such as PTSD and depression are likely to be raised in people with HL during the outbreak of COVID-19. Accordingly, the present study aimed to investigate the PTSD and depression symptoms in Iranian adolescents with HL during the outbreak of COVID-19 to help them overcome such symptoms. Due to its novelty, this research might also help researchers propose solutions for psychological disorders, including PTSD and depression. Further, it will strengthen the literature in this field.

Methods

Study Design

During the COVID-19 outbreak, we examined, in this research descriptive-comparative study, the prevalence of PTSD and depression, as the psychological consequences of this disease, in deaf and HH adolescents. We also compared adolescents with HL with their hearing peers in terms of PTSD and depression.

Sample and procedure

The statistical population comprised of adolescent students aged 12–18, who had HL problem (either deaf or HH with HL ranging from mild to severe). A total of 56 with-HL students (33 HH and 23 deaf students) from different provinces of Iran, including Borujerd city, Lorestan Province [12 students (7 HH and 5 deaf)]; Malayer city, Hamadan Province [13 students (8 HH and 5 deaf)]; Nahavand city, Hamadan Province [15 students (9 HH and 6 deaf)]; and Tuyserkan city, Hamadan Province [16 students (9 HH and 7 deaf)] participated in the study. All of these HL adolescents attended special schools. All the participants and their parents signed informed consent forms. The participants filled out the questionnaires at home within 25 to 40 min. The control group was also consisted of 56 adolescents without HL. They were matched with HL adolescents in terms of age, education grade, and gender and randomly selected from among ordinary schools. In the final sample, 8.93%, 7.14%, 14.29%, 19.64%, 12.5%, 17.86%, and 19.64% of the participants were at the age of 12, 13, 14, 15,

16, 17 and 18 years old, respectively. Also, 37.5% and 62.5% of the subjects were females and males, respectively. Of the deaf adolescents, 78.26% of was prelingually deaf, while 21.74% was postlingually deaf. Besides, of the HH adolescents, 69.67% used hearing aids. These data were collected in November and December 2019 in previous the outbreak of COVID-19.

Because we wanted to help adolescents with PTSD and depression symptoms after collecting the data, we coded the data and wrote down the address and home phone number of the adolescents. We told the parents that we would help their children if they had any problems, and they agreed. After 5 months (April and May 2020), we returned to follow up the adolescents with PTSD and depression. Unfortunately, the condition of PTSD and depression in some deaf and HH adolescents and even hearing adolescents had worsened. Based on this conditions, we decided to repeat the study between two groups of children with HL and hearing peers. Because it was likely that this worsening of the problem was due to the prevalence of COVID-19 in Iran. Therefore, in April and May 2020, deaf and HH adolescents were reevaluated.

Measures

Child PTSD Symptom Scale for DSM-5 (CPSS-5)

The CPSS-5 [45] is a 27-item self-report instrument measuring the PTSD symptom (20 items) in children aged 8–18; items are scored on a 5-point Likert scale ranging from 0 (not at all) to 4 (6 or more times a week/almost always). The total score ranges from 0 to 80. The CPSS-5 includes 4 subscales: *intrusion* (5 items), *avoidance* (2 items), *changes in cognition and mood* (7 items), and *increased arousal and reactivity* (6 items). A cutoff score of 31 is also used for identifying PTSD symptoms [45]. The Cronbach's alpha for the total scale was .92 and test–retest reliability was .80 [45]. In the present study, however, we found Cronbach's alpha coefficient of .93 for the total scale. The convergent validity (correlations above 0.50 between items and each dimension) also showed that the correlations of each item with sub-scales, such as intrusion (from 0.66 to 0.84), avoidance (from 0.77 to 0.81), changes in cognition and mood (from 0.56 to 0.69), and increased arousal and reactivity (from 0.52 to 0.65). Also, the correlations of intrusion, avoidance, changes in cognition and mood, and increased arousal and reactivity with the total score of the CPSS-5 were 0.83, 0.61, 0.88, and 0.91, respectively.

Children's Depression Inventory Short version (CDI: S)

The CDI: S [46] is a self-report inventory measuring the depression in children aged 8–18. It includes 10 items scored based on the three-option scales from 0=none to 2=definite. The total scores of the CDI: S ranges from 0 to 20. A cutoff score of ≥ 3 is also used for identifying depression symptoms [43]. The Cronbach's alpha coefficient for CDI: S was .80 [46]. Further, the correlation between the CDI and the CDI: S was 0.86 [47]. In addition, the Cronbach's alpha coefficient for CDI: S in young people with physical disabilities was .84 and the validity was approved by the positive correlation between pain intensity, pain interference, and psychological functioning with the CDI: S [48]. The present study also found the test-retest (correlation between CID: S in previous and during the COVID-19) reliability CDI: S as 0.81.

Ethical Considerations

Researchers explained the aim of the study to the participants and their parents. Students, parents (father or mother, or guardian), and school managers signed the written consent forms. The participants were also assured that: 1) their data would be confidential, 2) the results would be published in an article without their personal information, and 3) whether or not they participate in the study, would have no impact on school services. The study was non-experimental; so, it did not pose any physical or psychological risk to the participants. In addition, due to the contagious nature of the coronavirus, health protocols were carefully considered in the research process. This study received the ethic approval from Ethics Committee of Malayer University, Iran (IR.MALAYERU.REC.1399.007).

Statistical analysis

Based on the cut-off point for the PTSD and depression, descriptive statistics (frequencies, percent, mean, and standard deviation) were provided. We used Chi-Square for comparing the frequencies of PTSD and depression in female and male deaf and HH adolescents in previous and during the COVID-19. Multivariate Analysis of Variance (MANOVA) was used for comparing the PTSD and depression in adolescents with and without HL during and in previous outbreak of the COVID-19. The IBM SPSS Statistics version 24 was used to data analysis.

Results

Table 1 shows the prevalence of PTSD and depression in adolescents with and without HL during the outbreak of COVID-19. It shows that 46.43% of with-HL adolescents (52.38% of females and 42.86% of males) and 17.86% of the control group (28.57% of females and 11.43% of males) had symptoms of PTSD during the outbreak of COVID-19, while 17.87% of with-HL adolescents (19.04% of females and 17.14% of males) and 7.14% of the control group (4.76% of females and 8.57% of males) had symptoms of PTSD in previous the outbreak of COVID-19. Also, 41.04% of with-HL adolescents (47.62% of females and 37.14% of males) and 21.43% of the control group (38.09% of females and 11.43% of males) had symptoms of depression during the outbreak of COVID-19. But, 25.00% of with-HL adolescents (38.09% of females and 17.14% of males) and 12.50% of the control group (23.81% of females and 5.71% of males) had symptoms of depression in previous the outbreak of COVID-19. The results of Chi-Square (Table 1) confirmed the high prevalence of PTSD and depression in HL adolescents than control group in previous the outbreak COVID-19 ($p < 0.05$).

Based on the obtained results in Table 1, 47.83% of deaf adolescents (42.86% of females and 50.0% of males) were diagnosed with PTSD, whilst 52.17% of them (57.14% of females and 50.0% of males) were detected with depression during the outbreak of COVID-19. But, 13.04% of deaf adolescents (14.27% of females and 12.50% of males) were diagnosed with PTSD, whilst 26.09% of them (57.14% of females and 12.50% of males) were detected with depression in previous the outbreak of COVID-19. In our results, 45.45% of HH adolescents (57.14% of the females and 36.84% of the males) were also diagnosed with

PTSD and 33.33% of them (42.86% of females and 26.31% of males) with depression during the outbreak of COVID-19. But, 21.21% of HH adolescents (21.43% of the females and 21.05% of the males) were diagnosed with PTSD and 26.09% of them (57.14% of females and 12.50% of males) with depression in previous the outbreak of COVID-19. The comorbidity of PTSD and depression in HL adolescents was 30.36% (34.78% in deaf and 27.27% in HH adolescents), while 14.28% of without-HL adolescents showed this comorbidity during the outbreak of COVID-19.

Table 1
Prevalence of PTSD and depression in adolescents with and without HL

Group	Gender	COVID-19	PTSD	depression	Comorbidity
			n (%)	n (%)	n (%)
Deaf (n = 23)	Female (n = 7)	Previous	1(14.28%)	4(57.14%)	1(14.28%)
		During	3(42.86%)	4(57.14%)	3(42.86%)
	Male (n = 16)	Previous	2(12.50%)	2(12.5%)	1(6.25%)
		During	8(50.0%)	8(50.0%)	5(31.25%)
	All (n = 23)	Previous	3(13.04%)	6(26.09%)	2(8.69%)
		During	11(47.83%)	12(52.17%)	8(34.78%)
HH (n = 33)	Female (n = 14)	Previous	3(21.43%)	4(28.57%)	1(7.14%)
		During	8(57.14%)	6(42.86%)	4(28.57%)
	Male (n = 19)	Previous	4(21.05%)	4(21.05%)	2(10.53%)
		During	7(36.84%)	5(26.31%)	5(26.31%)
	All (n = 33)	Previous	7(21.21%)	8(24.24%)	3(9.09%)
		During	15(45.45%)	11(33.33%)	9(27.27%)
HL (n = 56)	Female (n = 21)	Previous	4(19.04%)	8(38.09%)	2(9.52%)
		During	11(52.38%)	10(47.62%)	7(33.33%)
	Male (n = 35)	Previous	6(17.14%)	6(17.14%)	3(8.57%)
		During	15(42.86%)	13(37.14%)	10(28.57%)
	Chi-Square (p)	Previous	.032 (.85)	3.07(.08)	
		During	.479(.49)	.595 (.44)	
All (n = 56)	Previous	10(17.88%)	14(25.0%)	5(8.93%)	
	During	26(46.43%)	23(41.07%)	17(30.36%)	
Hearing Adolescents (n = 56)	Female (n = 21)	Previous	1(4.76%)	5(23.81%)	0(0.0%)
		During	6(28.57%)	8(38.09%)	6(28.57%)
	Male (n = 35)	Previous	3(8.57%)	2(5.71%)	1(2.86%)
		During	4(11.43%)	4(11.43%)	2(5.71%)
	Chi-Square (p)	Previous	.058(.81)	6.38(.01)	
		During	5.06 (.02)	9.52(.004)	
All (n = 56)	Previous	4(7.14%)	7(12.50%)	1(1.78%)	
	During	10(17.86%)	12(21.43%)	8(14.28%)	
Chi-Square (p) for HL and Hearing Adolescents	Previous	2.93 (.08)	2.87 (.09)		
	During	10.48 (.001)	5.03 (.02)		

The results of Chi-Square (Table 1) confirmed the high prevalence of PTSD and depression in female than male in students without during the outbreak COVID-19 ($p < 0.05$) and high prevalence of depression in female than male in previous the outbreak of COVID-19 ($p < 0.05$). The Mean and SD of the variables are reported in Table 2.

Table 2
M and SD of the PTSD and depression in deaf and HH female and male adolescents in previous and during the outbreak of COVID-19

Group	Gender	COVID-19	PTSD		Depression	
			M	SD	M	SD
Deaf (n = 23)	Female	Previous	25.43	5.29	2.573	1.393
		During	29.86	6.36	4.43	2.293
		[(Previous)-(During)]	4.43	4.50	1.86	1.216
	Male	Previous	23.44	6.74	1.37	.81
		During	27.75	7.06	2.31	.95
		[(Previous)-(During)]	4.31	4.13	.94	.77
	All	Previous	24.04	6.28	1.74	1.14
		During	28.39	6.78	2.96	1.746
		[(Previous)-(During)]	4.35	4.14	1.22	.99
HH (n = 33)	Female	Previous	24.88	7.82	1.86	1.466
		During	30.93	4.65	3.646	2.206
		[(Previous)-(During)]	6.04	4.43	1.786	1.48
	Male	Previous	23.84	6.91	1.21	1.08
		During	28.53	6.43	1.68	1.20
		[(Previous)-(During)]	4.68	3.07	.47	.51
	All	Previous	24.28	7.21	1.48	1.28
		During	29.54	5.79	2.51	1.94
		[(Previous)-(During)]	5.26	3.71	1.03	1.21
HL (n = 56)	Female	Previous	25.06	6.94	2.09	1.44
		During	30.57	5.14	3.90	2.21
		[(Previous)-(During)]	5.50	4.41	1.81	1.36
	Male	Previous	23.66	6.74	1.28	.96
		During	28.17	6.63	1.97	1.12
		[(Previous)-(During)]	4.51	3.54	.68	.66
	All	Previous	24.17	6.78	1.59	1.22
		During	29.07	6.18	2.69	1.86
		[(Previous)-(During)]	4.88	3.88	1.11	1.12
Hearing Adolescents(n = 56)	Female	Previous	21.06	6.94	2.29	.98
		During	24.41	12.59	3.41	2.12
		[(Previous)-(During)]	3.35	2.60	1.12	1.61
	Male	Previous	15.82	10.32	.69	.73
		During	18.95	12.44	1.00	.83
		[(Previous)-(During)]	3.13	2.86	.31	.61
	All	Previous	17.41	10.62	1.18	1.09
		During	20.61	12.63	1.73	1.74
		[(Previous)-(During)]	3.19	2.76	.55	1.08

Furthermore, we used two-way Multivariate Analysis of Variance (MANOVA) for comparing the PTSD and depression in adolescents with and without HL during and in previous outbreak of the COVID-19. Before performing the two-way MANOVA, the Box's Test was used for equality of covariance matrices. Results showed the equality of covariance matrices ($f = 0.936, P < .094$). The Levene's test results also showed the equality of variances across the groups for PTSD ($f = 1.01, P < .39$) and depression ($f = 1.88, P < .08$). Results of two-way MANOVA are reported in Table 3.

Table 3

Results of two-way MANOVA for Comparing the mean scores difference of PTSD and depression symptoms in previous and during [(during-previous)] the outbreak of the COVID-19 in adolescents with and without HL

Source	Dependent Variable	SS	df	MS	F	p	ES
group	PTSD [(During)-(previous)]	77.911	1	77.911	6.82	.010	.06
	Depression [(During)-(previous)]	7.125	1	7.125	7.07	.009	.06
gender	PTSD [(During)-(previous)]	9.192	1	9.192	.80	.37	.01
	Depression [(During)-(previous)]	23.276	1	23.276	23.09	.001	.18
group * gender	PTSD [(During)-(previous)]	3.650	1	3.650	.32	.57	.003
	Depression [(During)-(previous)]	.613	1	.613	.61	.44	.01
Error	PTSD [(During)-(previous)]	1234.394	108	11.430			
	Depression [(During)-(previous)]	108.853	108	1.008			
Total	PTSD [(During)-(previous)]	3156.760	112				
	Depression [(During)-(previous)]	219.000	112				
SS = Sum of Squares; MS = Mean of Squares; ES = Effect Size							

According to Table 3, there was a significant difference between the adolescents with and without HL in terms of PTSD and depression during and in previous the outbreak of COVID-19 (F Wilks' Lambda = 5.90, $P < .004$). Moreover, results showed that the mean scores of PTSD and depression during and in previous the outbreak of COVID-19 [(during-previous)] were higher in adolescents with HL than in those without HL. The effect of gender on depression was also statistically significant, meaning that mean of depression in female was higher than that of in male. In contrast, the effect of gender on PTSD and the effect of Group*Gender on PTSD and depression weren't significant.

Discussion

This study was conducted to examine the prevalence of PTSD and depression in HL and hearing adolescents in previous and during the outbreak of COVID-19 in four cities (Borujerd, Malayer, Nahavand, & Tuyserkan) in Iran. In our study the prevalence of PTSD (46.43%) and depression (41.07%) in adolescents with HL was substantially higher than what would be expected. Previous studies have shown that 19.5–29.7% of deaf people suffered from PTSD [9, 15] and 7.9–11.4% suffered from depression [16, 17]. The prevalence of PTSD and depression in adolescents with HL has not been studied during the outbreak of COVID-19.

According to Information Deprivation Trauma (IDT) hypothesis [9], traumatization is a result of inadequate information in people with hearing loss (especially in the deaf). Misinterpretation of verbal information about COVID-19 may lead to high rates of PTSD and depression because of unavailability of information and resources about COVID-19 in people with HL, especially for deaf people [44] since it is probably difficult for them to understand the messages and news about COVID-19.

Results of Chi-Square showed that the prevalence of PTSD and depression in HL adolescents was higher than their hearing peers. The two-way MANOVA results also confirmed the higher mean scores of PTSD and depression in HL adolescents than their hearing peers. Many studies have reported high rates of PTSD [36–40] and depression [33, 35–36, 41–43] during the outbreak of COVID-19. Researches have also concluded that the prevalence of PTSD and depression symptoms in people with HL are higher than their hearing counterparts [8–14]. It can be argued that adolescents with HL may be more vulnerable to psychological problems such as PTSD and depression; because, they may interpret stressful life events more threateningly than their normal-hearing peers.

One of the descriptive results of the present study was that the prevalence of PTSD and depression in females was higher than males in hearing adolescents. Liu et al. [36] showed that females had reported significantly higher PTSD symptoms than males during the COVID-19 outbreak. The high rates of PTSD symptoms in females can be explained by the genders difference in terms of neural reactivity to fear and arousal reactions so that neural reactivity was higher in females than males [49]. In a study by Pappa et al. [41], the rate of depression was higher in females than males during the COVID-19 outbreak. Similarly, in the current work, since we selected a sample of adolescents, it can be stated that puberty can explain the difference between men and women in terms of depression because previous research works have shown that women experience more depression during puberty than men [50–51]. In addition, although the understanding of gender differences in depression and PTSD is complex, the role of physical strength, personality traits [52], and socioeconomic factors, such as abuse, education, and income [53] of men and women and their reaction to problems and events should be also considered.

According to the results of the present study, the rates of PTSD and depression in deaf adolescents were higher than HH ones just as other studies, which have shown that deaf people experience higher rates of traumatic events in their life [9]. Further, Theunissen et al. [54] showed that the rate of depression in people using sign language was higher than those using oral language. In our study, Higher prevalence of PTSD and depression in deaf adolescents compared to HH adolescents may be duo to more communicative difficulties [55] of the deaf with adverse listening situations such as speech-in-noise and reverberation than HH people [56]. In addition, the deaf problem in understanding the information and resources about COVID-19 [44] in may lead to them to experience more PTSD and depressive symptoms compared with their HH peers.

Moreover, in this study, the comorbidity of PTSD and depression is consisted with findings obtained by Flory and Yehuda [57]; they showed that almost half of the subjects with PTSD also suffer from depression. This comorbidity can be due to high negative affectivity and low positive affectivity among people with PTSD and depression. This has been also confirmed by previous research works [58–59].

Limitations

There was a limitation in our study. We only used the self-report scales for prevalence rates of PTSD and depression in children; therefore, we suggest to take advantage of diagnostic interviews, parent's version of PTSD, and depression scales in future studies. Another limitation was that due to the problems caused by COVID-19, we could not investigate the effects of genetics and environmental factors (e.g., family history, maternal history of depression, parental mood, health-related factors, previous diagnosis of depression or other mental health disorder, socioeconomic status, history of chronic stressors or adverse exposures, medication or other substance use) in this study. Future studies should resolve these limitations.

Conclusion

Our study confirmed the high prevalence of PTSD and depression in adolescents with and without HL, especially deaf adolescents during the outbreak of COVID-19. Hence, Exceptional and clinical psychologists, child and adolescents' psychotherapists, as well as psychiatrists should pay more attention to psychological and medical treatments to reduce the PTSD and depression symptoms in adolescents with HL during the outbreak of COVID-19.

Abbreviations

PTSD: Post-traumatic Stress Disorder, HH: Hard of Hearing, HL: Hearing Loss, CPSS-5: Child PTSD Symptom Scale for DSM-5, CDI: S: Children's Depression Inventory Short version, MANOVA (Multivariate Analysis of Variance), SS: Sum of Squares, MS: Mean of Squares, ES: Effect Size.

Declarations

Ethics approval and consent to participate

This study received ethics approval from the Research Ethics Committee of Malayer University (IR.MALAYERU.REC.1399.007). We confirm that all methods related to the human participants were performed in accordance with the Declaration of Helsinki and approved by Research Ethics Committee of Malayer University. Written informed consent form was obtained from students and their parent.

Consent for publication

Not applicable.

Availability of data and materials

The data sets used and analyzed in this study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SA designed the study and made the statistical analyses. MKH performed recruitment and data collection. SA, MKH, and BA collaborated in interpretation of data. SA is the primary author in the writing of the manuscript. SA, MKH, and BA critically revised and substantially contributed throughout the writing the manuscript. All authors read and approved the final manuscript.

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References

1. Deafness and HL. 2020; Retrieved from <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss>.
2. Schmucker C, Kapp P, Motschall E, Löhler J, Meerpohl JJ. Prevalence of hearing loss and use of hearing AIDS among children and adolescents in Germany: a systematic review. *BMC public health*. 2019;19(1):1-10. <https://doi.org/10.1186/s12889-019-7602-7>.
3. Asghari A, Farhadi M, Daneshi A, Khabazkhoob M, Mohazzab-Torabi S, Jalessi M, Emamjomeh H. The prevalence of hearing impairment by age and gender in a population-based study. *Iranian J of Public Health*. 2017;46(9):1237. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5632326/>.

4. van Gent T, Goedhart AW, Treffers PD. Characteristics of children and adolescents in the Dutch national in-and outpatient mental health service for deaf and hard of hearing youth over a period of 15 years. *Res Dev Disabil.* 2012;33(5):1333-42. <https://doi.org/10.1016/j.ridd.2012.02.012>.
5. Theunissen SC, Rieffe C, Soede W, Briaire JJ, Ketelaar L, Kouwenberg M, Frijns JH. Symptoms of psychopathology in hearing-impaired children. *Ear Hear.* 2015;36(4):e190. <https://doi.org/10.1097/AUD.000000000000147>.
6. Anderson ML, Glickman NS, Mistler LA, Gonzalez M. Working therapeutically with deaf people recovering from trauma and addiction. *Psychiatr Rehabil J.* 2016;39(1):27–32. <https://doi.org/10.1037/prj0000146>.
7. Yigider AP, Yilmaz S, Ulusoy H, Kara T, Kufeciler L, Kaya KH. Emotional and behavioral problems in children and adolescents with hearing loss and their effects on quality of life. *International Journal of Pediatric Otorhinolaryngology.* 2020 Oct 1;137:110245. <https://doi.org/10.1016/j.ijporl.2020.110245>.
8. Anderson ML, Craig KS, Hall WC, Ziedonis DM. A pilot study of deaf trauma survivors' experiences: Early traumas unique to being deaf in a hearing world. *J Child Adolesc Trauma.* 2016;9(4):353-8. <https://doi.org/10.1007/s40653-016-0111-2>.
9. Schild S, Dalenberg CJ. Trauma exposure and traumatic symptoms in deaf adults. *Psychological Trauma: Theory, Research, Practice, and Policy.* 2012;4(1):117-27. <https://doi.org/10.1037/a0021578>
10. Burnash DL, Rothman-Marshall G, Schenkel LS. Child maltreatment in deaf college students: An analysis of the prevalence, characteristics, and clinical outcomes. InPoster presented at the Association for Behavioral and Cognitive Therapies (ABCT) Annual Convention (Child Maltreatment SIG) San Francisco, CA; 2010 https://www.researchgate.net/profile/Gail_Rothman-Marshall/publication/266235257_Child_Maltreatment_in_Deaf_College_Students_An_Analysis_of_the_Prevalence_Characteristics_and_Clinical_Outcomes
11. Ildstad, M., Tambs, K., Aarhus, L., & Engdahl, B. L. (2019). Childhood sensorineural hearing loss and adult mental health up to 43 years later: results from the HUNT study. *BMC Public Health, 19*(1), 1-9. <https://doi.org/10.1186/s12889-019-6449-2>.
12. Dreyzehner J, Goldberg KA. Depression in Deaf and hard of hearing youth. *Psychiatr Clin North Am.* 2019;28(3):411-9. <https://doi.org/10.1016/j.chc.2019.02.011>
13. Adigun OT. Depression and individuals with hearing loss: A systematic review. *J Psychol Psychother.* 2017;7(5):1-6. <http://dx.doi.org/10.4172/2161-0487.1000323>
14. Rostami M, Bahmani B, Bakhtyari V, Movallali G. Depression and deaf adolescents: a review. *Iranian Rehabilitation Journal.* 2014;12(1):43-53. <http://irj.uswr.ac.ir/article-1-359-en.html>
15. Black PA, Glickman NS. Demographics, psychiatric diagnoses, and other characteristics of North American deaf and hard-of-hearing inpatients. *J Deaf Stud Deaf Educ.* 2006;11(3):303-21. <https://doi.org/10.1093/deafed/enj042>
16. Li CM, Zhang X, Hoffman HJ, Cotch MF, Themann CL, Wilson MR. Hearing impairment associated with depression in US adults, National Health and Nutrition Examination Survey 2005-2010. *JAMA Otolaryngol Head Neck Surg.* 2014;140(4):293-302. <https://doi.org/10.1001/jamaoto.2014.42>
17. Kim SY, Kim HJ, Park EK, Joe J, Sim S, Choi HG. Severe hearing impairment and risk of depression: A national cohort study. *PLoS one.* 2017;12(6):e0179973. <https://doi.org/10.1371/journal.pone.0179973>
18. WHO. *WHO Timeline - COVID-19.* 2020; <https://www.who.int/news-room/detail/27-04-2020-who-timeline-covid-19>.
19. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Yu T. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet.* 2020;395(10223):507-13. [http://dx.doi.org/10.1016/S0140-6736\(20\)30211-7](http://dx.doi.org/10.1016/S0140-6736(20)30211-7).
20. WHO. *WHO Coronavirus Disease (COVID-19) Dashboard.* 2021; <https://covid19.who.int/>.
21. *WORLD/ COUNTRIES / IRAN.* 2021; <https://www.worldometers.info/coronavirus/country/iran/>
22. Sprang G, Silman M. Posttraumatic stress disorder in parents and youth after health-related disasters. *Disaster Med Public Health Prep.* 2013;7(1):105-10. <https://doi.org/10.1017/dmp.2013.22>
23. Cheng SK, Chong GH, Chang SS, Wong CW, Wong CS, Wong MT, Wong KC. Adjustment to severe acute respiratory syndrome (SARS): Roles of appraisal and post-traumatic growth. *Psychol Health.* 2006;21(3):301-17. <https://doi.org/10.1080/14768320500286450>.
24. Chong MY, Wang WC, Hsieh WC, Lee CY, Chiu NM, Yeh WC, Huang TL, Wen JK, Chen CL. Psychological impact of severe acute respiratory syndrome on health workers in a tertiary hospital. *Br J Psychiatry.* 2004;185(2):127-33. <https://doi.org/10.1192/bjp.185.2.127>
25. Mak IW, Chu CM, Pan PC, Yiu MG, Chan VL. Long-term psychiatric morbidities among SARS survivors. *Gen Hosp Psychiatry.* 2009;31(4):318-26. <https://doi.org/10.1016/j.genhosppsy.2009.03.001>.
26. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *Gen Psychiatry.* 2020;33(2). <https://doi.org/10.1136/gpsych-2020-100213>
27. Wang C, Pan R, Wan X, Tan Y, Xu L, McIntyre RS, Choo FN, Tran B, Ho R, Sharma VK, Ho C. A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain Behav Immun.* 2020;87:40-8. <https://doi.org/10.1016/j.bbi.2020.04.028>
28. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, Wu J, Du H, Chen T, Li R, Tan H. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Netw Open.* 2020;3(3):e203976. <https://doi.org/10.1001/jamanetworkopen.2020.3976>
29. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry research.* 2020 Jun 1;288:112954. <https://doi.org/10.1016/j.psychres.2020.112954>
30. Moghadasi AN. Evaluation of the level of anxiety among Iranian multiple sclerosis fellowships during the outbreak of COVID-19. *Arch Iran Med.* 2020;23(4):283. <https://doi.org/10.34172/aim.2020.13>
31. Li S, Wang Y, Xue J, Zhao N, Zhu T. The impact of COVID-19 epidemic declaration on psychological consequences: a study on active Weibo users. *Int J Environ Res Public Health.* 2020;17(6):2032. <https://doi.org/10.3390/ijerph17062032>

32. Moghanibashi-Mansourieh A. Assessing the anxiety level of Iranian general population during COVID-19 outbreak. *Asian J Psychiatr.* 2020;51:102076. <https://doi.org/10.1016/j.ajp.2020.102076>
33. Torales J, O'Higgins M, Castaldelli-Maia JM, Ventriglio A. The outbreak of COVID-19 coronavirus and its impact on global mental health. *Int J Soc Psychiatry.* 2020;66(4):317-20. <https://doi.org/10.1177/0020764020915212>
34. Zhang Y, Ma ZF. Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: A cross-sectional study. *Int J Environ Res Public Health.* 2020;17(7):2381. <https://doi.org/10.3390/ijerph17072381>
35. Ozamiz-Etxebarria N, Dosil-Santamaria M, Picaza-Gorrochategui M, Idoiaga-Mondragon N. Stress, anxiety, and depression levels in the initial stage of the COVID-19 outbreak in a population sample in the northern Spain. *Cad Saude Publica.* 2020;36:e00054020. <https://doi.org/10.1590/0102-311X00054020>
36. Liu N, Zhang F, Wei C, Jia Y, Shang Z, Sun L, Wu L, Sun Z, Zhou Y, Wang Y, Liu W. Prevalence and predictors of PTSS during COVID-19 outbreak in China hardest-hit areas: Gender differences matter. *Psychiatry Res.* 2020;287:112921. <https://doi.org/10.1016/j.psychres.2020.112921>.
37. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health.* 2020 Jan;17(5):1729. <https://doi.org/10.3390/ijerph17051729>.
38. Liang L, Ren H, Cao R, Hu Y, Qin Z, Li C, Mei S. The effect of COVID-19 on youth mental health. *Psychiatr Q.* 2020;91(3):841-52. <https://doi.org/10.1007/s11126-020-09744-3>.
39. Chew NW, Lee GK, Tan BY, Jing M, Goh Y, Ngiam NJ, Yeo LL, Ahmad A, Khan FA, Shanmugam GN, Sharma AK. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. *Brain Behav Immun.* 2020;88:559-65. <https://doi.org/10.1016/j.bbi.2020.04.049>.
40. Bo HX, Li W, Yang Y, Wang Y, Zhang Q, Cheung T, Wu X, Xiang YT. Posttraumatic stress symptoms and attitude toward crisis mental health services among clinically stable patients with COVID-19 in China. *Psychol med.* 2020;1-2. <https://doi.org/10.1017/S0033291720000999>.
41. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsis E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain Behav Immun.* 2020; 88: 901–7. <https://doi.org/10.1016/j.bbi.2020.05.026>.
42. Kong X, Zheng K, Tang M, Kong F, Zhou J, Diao L, Wu S, Jiao P, Su T, Dong Y. Prevalence and factors associated with depression and anxiety of hospitalized patients with COVID-19. *MedRxiv.* 2020. <https://doi.org/10.1101/2020.03.24.20043075>
43. Özdin S, Bayrak Özdin Ş. Levels and predictors of anxiety, depression and health anxiety during COVID-19 pandemic in Turkish society: The importance of gender. *Int J Soc Psychiatry.* 2020;66(5):504-11. <https://doi.org/10.1177/0020764020927051>
44. Trecca EM, Gelardi M, Cassano M. COVID-19 and hearing difficulties. *Am J Otolaryngol.* 2020, 41(4): 102496. <https://doi.org/10.1016/j.amjoto.2020.102496>
45. Foa EB, Asnaani A, Zang Y, Capaldi S, Yeh R. Psychometrics of the Child PTSD Symptom Scale for DSM-5 for trauma-exposed children and adolescents. *J Clin Child Adolesc Psychol.* 2018;47(1):38-46. <https://doi.org/10.1080/15374416.2017.1350962>.
46. Kovacs M. *The Children's Depression, Inventory (CDI).* New York. 1992. <https://www.jyosilpsycho-hub.com/psychological-test/children-depression-inventory-cdi>
47. Allgaier AK, Frühe B, Pietsch K, Saravo B, Baethmann M, Schulte-Körne G. Is the Children's Depression Inventory Short version a valid screening tool in pediatric care? A comparison to its full-length version. *J Psychosom Res.* 2012;73(5):369-74. <https://doi.org/10.1016/j.jpsychores.2012.08.016>
48. de la Vega R, Racine M, Sánchez-Rodríguez E, Solé E, Castarlenas E, Jensen MP, Engel J, Miró J. Psychometric properties of the short form of the Children's Depression Inventory (CDI-S) in young people with physical disabilities. *J Psychosom Res.* 2016;90:57-61. <https://doi.org/10.1016/j.jpsychores.2016.09.007>
49. Felmingham K, Williams LM, Kemp AH, Liddell B, Falconer E, Peduto A, Bryant R. Neural responses to masked fear faces: sex differences and trauma exposure in posttraumatic stress disorder. *J Abnorm Psychol.* 2010;119(1):241.. <https://doi.org/10.1037/a0017551>
50. Patten SB, Wang JL, Williams JV, Currie S, Beck CA, Maxwell CJ, El-Guebaly N. Descriptive epidemiology of major depression in Canada. *Can J Psychiatry.* 2006;51(2):84-90.
51. Whiteford HA, Degenhardt L, Rehm J, Baxter AJ, Ferrari AJ, Erskine HE, Charlson FJ, Norman RE, Flaxman AD, Johns N, Burstein R. Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. *Lancet.* 2013;382(9904):1575-86. [https://doi.org/10.1016/S0140-6736\(13\)61611-6](https://doi.org/10.1016/S0140-6736(13)61611-6)
52. Albert PR. Why is depression more prevalent in women? *J Psychiatry Neurosci.* 2015;40(4):219–221. <http://dx.doi.org/1503/jpn.150205>
53. Rai D, Zitko P, Jones K, Lynch J, Araya R. Country-and individual-level socioeconomic determinants of depression: multilevel cross-national comparison. *Br J Psychiatry.* 2013;202(3):195-203. <https://doi.org/10.1192/bjp.bp.112.112482>
54. Theunissen SC, Rieffe C, Kouwenberg M, Soede W, Braire JJ, Frijns JH. Depression in hearing-impaired children. *Int J Pediatr Otorhinolaryngol.* 2011;75(10):1313-7. <https://doi.org/10.1016/j.ijporl.2011.07.023>
55. Kvam MH, Loeb M, Tambs K. Mental health in deaf adults: symptoms of anxiety and depression among hearing and deaf individuals. *J Deaf Stud Deaf Educ.* 2007;12(1):1-7. <https://doi.org/10.3760/cma.j.issn.0578-1310.2020.0001>
56. Tyler RS, Witt SA, Dunn CC, Wang W. Initial development of a spatially separated speech-in-noise and localization training program. *J Am Acad Audiol.* 2010;21(6):390-403. <https://doi.org/3766/jaaa.21.6.4>
57. Flory JD, Yehuda R. Comorbidity between post-traumatic stress disorder and major depressive disorder: alternative explanations and treatment considerations. *Dialogues Clin Neurosci.* 2015;17(2):141-50. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4518698/>
58. Miller MW, Kaloupek DG, Dillon AL, Keane TM. Externalizing and internalizing subtypes of combat-related PTSD: a replication and extension using the PSY-5 scales. *J Abnorm Psychol.* 2004;113(4):636-45. <https://doi.org/10.1037/0021-843X.113.4.636>

59. Miller MW, Wolf EJ, Reardon A, Greene A, Ofrat S, McInerney S. Personality and the latent structure of PTSD comorbidity. *J Anxiety Disord.* 2012;26(5):599-607. <https://doi.org/10.1016/j.janxdis.2012.02.016>