Clinical Cancer Investigation Journal-ISSN: 2278-0513

Nonverbal Signs on Social Media as a Clue for Identifying Mental Health Status

Abstract

Mental illnesses are a serious concern in the modern world. Depression and anxiety are amongst the most common mental illnesses and affect the quality of life of individuals and their families. With increased communication via social media, new opportunities arise for researchers to identify mental illnesses. In this study, we aimed to investigate the association between different aspects of nonverbal signs observed on social media, and mental illnesses.

We designed a cross-sectional study on 79 medical students at Roozbeh Hospital in Iran. We used a 3-sectioned self-reported questionnaire which included sociodemographic variables of participants and application use, as well as the Persian-language version of the Beck Depression Inventory and Beck Anxiety Inventory.

We demonstrate that there is a meaningful correlation between anxiety/depression score and the meantime of using applications, the number of followers, and the number of followings(P-value<0.05). Moreover, constant use of emoji's is correlated with higher anxiety/depression scores (P-value<0.05). There is an association between time spent on social media and the level of anxiety or depression. understanding the direction of this association is important for early diagnosis and further intervention. Additionally, there are signs on social media that can be utilized for early identification of depression or anxiety.

Keywords: *social media, anxiety, depression, mental illness, mental disorders*

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Introduction

Serious mental illness can have significant impacts on individuals, their families, and society due to the elevated risk of substance use, poverty, early mortality, and suicide. Depression is estimated to account for the most disability-adjusted life years than other mental diseases and an important global cause of disability(Ivie et al., 2020). It is a mental disorder characterized by mood disturbance (mostly having a low mood, feeling guilty or having low self-esteem, and substantial loss of interest) and physical symptoms including sleep disturbance, low energy, poor concentration, and increased or decreased appetite(Alhassan et al., 2018). Although many of patients with depression are not recognized at the early stages(Lin et al., 2020). Anxiety disorders are the most common mental illnesses worldwide and have a significant effect on the global burden of diseases(Yang et al., 2021). In recent years there has been a significant increase in social media usage with more people utilizing them to express their feelings(Ghosh & Anwar, 2021). Social media includes websites and mobile applications where users can create content, connect with others and contribute to online social networking(e.g.,WhatsApp,Instagram,Facebook,Twitter)(Naslund et al., 2020). By posting information online, patients share their personal experiences with mental illnesses through online platforms(Tadesse et al., 2019). Moreover, self-disclosure can be defined as any form of communication through which individuals reveal personal information with others and it has considerable impacts on psychological well-being(Luo & Hancock, 2020)

Recent works have shown that social media could provide new opportunities for recognizing mental illnesses such as depression(Giuntini et al., 2020). Social media is appealing in this context because it can allow investigators to reach larger population segments that would otherwise be difficult to reach. Additionally investigators can target individuals based on personal information, enabling them to determine their eligibility for inclusion in particular studies(Gelinas et al., 2017). Although these are said about the benefits of social media, there have been some adverse effects on behavior such as using a phone while driving, distress when separated from the device, and extensive use(Clark & Harris, 2021). Also, it has been demonstrated that heavy use of the internet and social media is linked to an increase in a variety of mental disorders, poor well-being, psychological distress and also suicidal ideation(Hussain & Griffiths, 2021; Naslund et al., 2020).

Many studies have recruited social media as a way of detecting mental illnesses. Most of these studies have utilized text analysis to achieve this goal. However, not many studies have harnessed a method for linking nonverbal signs demonstrated in social media, to mental illnesses. In this study, we aim to investigate the connection between different aspects of social media settings set by individuals and their mental health status.

Methods

Design and sampling

From August 2021 to December 2021, a cross-sectional study was carried out at the Roozbeh Hospital of Tehran University of Medical Sciences in Iran. The minimum sample size of the available samples was determined using statistics on the

prevalence of anxiety and depression in this age range, with an error tolerance of ±5% and a 95% assumed significance level. The study comprised 79 individuals who provided informed consent and agreed to take part in the investigation. Using the Instagram and WhatsApp programs was another need for participation. Among the exclusion criteria was not finishing the Beck questionnaire.

Participants' characteristics

The participants included 79 medical students including 51 women and 28 men between the ages of 22 and 42 years (Mean = 28.2, Standard Deviation = 3.69), all of whom were from Iran and spoke Persian.

Data collection

Data collection was performed using a self-assessment questionnaire. The questionnaire used for data collection had three sections. The first section included sociodemographic variables like age, gender, marital status, and time of admission to medical school, history of mental illnesses, history of anti-depressive or anti-anxiety medication consumption, and history of substance use. The second section obtained information about the use of WhatsApp and Instagram including the frequency of posting Instagram posts, the frequency of posting Instagram stories, the number of followings and followers on Instagram, the status of allowing comments on Instagram posts or stories, the status of activating close friends on Instagram, the status of activation of last seen recently on WhatsApp, the status of activation of read receipts on WhatsApp, status of having a profile picture on WhatsApp. The third section included the Persian-language version of the Beck Depression Inventory(BDI) and the Beck Anxiety Inventory(BAI). BDI-Persian has 21 items concerning these domains: sadness, hopelessness, feelings of guilt, and changes in sleep and appetite. BDI-Persian assesses depression over the past two weeks. Each item is ranked as 0-3 and the total score of 21 responses was added and interpreted as follows: 1–10 meant normal, 11–18 meant mild depression, 19–29 meant moderate depression, and 30–63 meant severe depression. BDI-Persian has been found to have high content validity, construct validity, concurrent validities and criterion validity with a high 1-week test-retest reliability r = 0.93 (suggesting robustness against daily variations in mood) and internal consistency of α = 91(Beck et al., 2019; Beck, Steer, et al., 1988; Ghassemzadeh et al., 2005)BAI-Persian has also 21 items and total score of 21 responses was added and categorized as follows: 1-7 normal, 8-15 mild anxiety, 16-25 moderate anxiety, 26-63 severe anxiety. The BAI-Persian has excellent overall internal consistency and a high test-retest correlation (*r* = 0.67)(Beck, Epstein, et al., 1988; Beck & Steer, 1990; Kaviani & Mousavi, 2008)

Analytic strategy

The data was statistically analyzed using SPSS version 20.0 (SPSS, Chicago, IL, USA). The Kolmogorov-Smirnov test was used to confirm the normality of empirical distributions for quantitative variables. After calculating mean values and standard deviations, we used the Independent T-test to compare mean values between two groups and the one-way ANOVA test for comparing more than two groups. Pearson's correlation test was utilized to determine the statistical association between two quantitative variables. Discrete and ordinal variables were grouped in contingency tables, with numbers (n) and fractions (%) calculated. The results of all the tests were considered significant at a P- value<0.05.

Results

The study involved 79 medical students at Roozbeh Hospital. The mean age of participants was 28.43 years old. Of the 79 participants, 51 (64.6%) were women, 44 (55.7%) were not married, 58 (73.4%) did not have a history of mental illness, and 44 (55.7%) did not have a history of substance use (Table 1).

Table 1. Demographic and clinical characteristics of participants

Baseline characteristic	Frequency	Percent
Gender		
Female	51	64.6
Male	28	35.4
Marital status		
Single	44	55.7
Married	35	44.3
Living status		
With family	47	60.3
Separate house	25	32.1
Dormitory	6	7.7
History of mental illnesses		
Current mental illness	17	21.5
Previous mental illness	4	5.1
No history	58	73.4
History of psychotropic medication		
Current use	26	33.3
Previous use	4	5.1
No history	48	61.5
History of substance or alcohol use or smoking		
Current use	33	42.3
Previous use	1	1.3
No history	44	56.4
Depression		
Mild	26	32.9
Moderate	12	15.2
Severe	4	5.1
Anxiety		
Mild	31	39.2
Moderate	9	11.4

Severe	1	1.3
Most preferred social media		
WhatsApp	30	46.8
Instagram	37	38.0
Other	12	15.2
Activated “last seen recently” on WhatsApp [a]	54	68.4
Inactivated “seen” on WhatsApp [a]	21	26.6
Frequency of emoji use in conversations		
Occasionally	25	31.6
Often	42	53.2
Always	12	15.2
Private Instagram page [a]	76	97.4

[a] Reflects the number of participants answering “yes” to this question.

The most common applications used among our subjects were Instagram and WhatsApp which were preferred by 37(46.8%) subjects and 30(38%) subjects respectively. The mean (±SD) time of using online applications was 3.55(±1.81) hours per day (Table 2).

Table 2. Depression and anxiety scores in different groups on participants

Variable	BDI score			BAI score		
	M	SD	P-value	M	SD	P-value
Female	10.39	9.48	0.386	7.28	7.43	0.362
Male	12.23	7.98		8.82	6.53	
Single	11.13	9.36	0.624	8.18	7.41	0.892
Married	12.14	8.55		8.40	6.85	
Living with family	12.95	9.92	0.204	10.14	7.61	0.021
Living alone	10.40	7.43		5.76	5.81	
Living in dormitory	6.83	4.87		5.00	3.74	
Current mental illness	13.58	9.15	0.587	12.05	8.08	0.34
Positive psychiatric history	11.25	9.10		9.75	8.53	
Negative psychiatric history	11.01	8.98		7.06	6.43	
Current psychotropic medication use	14.26	9.47	0.181	10.69	7.78	0.105
Previous psychotropic medication use	10.25	7.71		7.00	7.11	
No history of psychotropic medication use	10.25	8.72		7.04	6.62	
Activated “last seen recently”	10.64	8.24	0.175	7.05	5.97	0.024
Not activated ”last seen recently	13.60	10.26		10.92	8.69	
Using emoji in conversations						
Always	17.91	9.40	0.027	14.33	9.64	0.005
Often	10.38	8.20		7.16	6.52	
Occasionally	10.56	9.08		7.24	5.30	

Analysis of BDI showed that 37(46.8%) participants were normal, 26(32.9%) participants had mild depression, and 12(15.2%) participants had severe depression. The mean (±SD) scores of depression in male, female, single, and married subjects were 10.39(±7.98), 12.23(±9.48), 11.13(±9.36), and 12.14(±8.55) respectively (Table 2).

Analysis of BAI showed that 38(48.1%) participants were normal, 31(39.2%) participants had mild anxiety, 9(11.4%) had moderate anxiety, and 1(1.3%) participant had severe anxiety. The mean(±SD) scores of anxiety in male, female, single, and married subjects were 7.28(±6.53), 8.82(±7.43), 8.18(±7.41), and 8.40(±6.85) respectively (Table 2).

Results of the Independent Sample T-test revealed that there was no significant difference in depression and anxiety scores, between male and female subjects(P-value>0.05).

Independent Sample T-test showed that there was no significant difference in depression and anxiety scores, between married and single subjects (P-value>0.05).

Subjects living with family and subjects living alone showed no significant difference in BDI scores (12.95±9.92, 10.40±7.43, P-value=0.204). However, they revealed a meaningful difference in the BAI score (P-value=0.032). A significant difference in anxiety scores was found between participants who had a history of mental illness and those who didn’t (P-value <0.05) but there was no difference in depression scores between these groups (P-value>0.05). We demonstrated that there was no significant difference in anxiety or depression scores between subjects who had a history of psychiatric medication use or substance use and subjects who didn’t (P-value>0.05).

Our findings revealed that there was a significant difference in anxiety scores between subjects who activated “last seen recently” and those who didn’t(P-value<0.05); but there was no difference in depression scores between these groups(P-value>0.05).

We demonstrated that there was a significant difference in depression and anxiety scores between participants who always use WhatsApp emoji's and subjects who sometimes use WhatsApp emoji's (P-value<0.05).

Pearson correlation test showed that there is a positive correlation between anxiety score and the meantime of using applications, number of followers on Instagram, and number of followers on Instagram. Additionally, there was a meaningful correlation between the depression score and the meantime of using applications, number of followers on Instagram, and number of followers on Instagram(Table 3).

Table 3. Correlations for study variables

Variable	1	2	3	4	5
1.Anxiety score	-				
2.Depression score	.667**	-			
3.Age	-.106	.020	-		
4.Mean time of using applications per day	.282*	.227*	.051	-	
5.Number of followers	.233*	.227	-.009	.350**	-
6.Number of followings	.296**	.318**	.089	.414**	.897**

*P< .05. **P< .01.

Discussion

In this study, our main purpose was to identify the correlation between mental illnesses including depression and anxiety, and nonverbal signs of online applications namely WhatsApp and Instagram. Our main finding was the association between application use duration and anxiety or depression Because our study was cross-sectional, the directionality of this association is not clear. First, it could be explained that individuals suffering from depression or anxiety tend to use social media more. For instance, many individuals with mental illnesses use social media to share their own challenges and experiences, to seek support and attention from others, and to search new information about treatment strategies(Naslund et al., 2020). The second reason could be that individuals who use social media more, develop higher levels of depression or anxiety. Our results also demonstrated a positive correlation between the constant use of WhatsApp emoji's with anxiety/depression and the living status with the level of anxiety among subjects.

Accumulating studies in support of the association between social media use and anxiety or depression have been emerging in recent decades. Similar to our results, Clark et al.(Clark & Harris, 2021) investigated stress related to the obligation of maintaining a constant connection with others via smartphone and found that with an increased number of connections (e.g. Number of followers and followers on Instagram) the level of anxiety and/or depression increased. Another study found that passive use of social media platforms is linked with greater depressive and anxiety symptoms and active social media use is associated with a decrease in symptoms of anxiety and depression(Thorisdottir et al., 2019). A study conducted by Primack indicated that increased use of social media applications is considerably associated with a higher likelihood of experiencing mental health issues like depression or anxiety symptoms in young adults(Primack et al., 2017). However another study showed that increased time spent on social media was not correlated with increased mental health disorders like anxiety or depression(Coyne et al., 2020).

We found a positive correlation between the constant use of WhatsApp emoji's and anxiety or depression. Furthermore, we demonstrated that subjects who activated "last seen recently" had lower levels of anxiety. "Seen" notifications inform the sender that the receiver has read the message, although not everyone can respond immediately upon opening a message. This can create a sense of pressure for some individuals to respond promptly(Mannell, 2019).Consistent with our findings, it has been shown that people, who are sensitive to the social pressure of receiving answers or having to give them quickly, would probably profit from activating "last seen recently" as it helps to establish boundaries between absence and presence(Mols & Pridmore, 2021; Pielot et al., 2014). However, unlike these studies, we didn't find a meaningful association between inactivating read receipt and increased level of anxiety or depression.

We also found that there is a positive correlation between living with family and the level of anxiety among subjects. Moreover, anxiety scores in subjects who had a history of mental illnesses were significantly higher. Consistent with our results other studies found an association between anxiety and having a history of psychiatric disorder; however unlike these studies we didn't find any association between anxiety/depression and gender(Brooks et al., 2020; Wathelet et al., 2020).

Our study had a few limitations but these limitations open new areas for further research on this topic. One of our study limitations was the recruitment of solely medical students which might cause different results than the general population. Another limitation could be the use of a Beck questionnaire which is a self-assessment rather than a clinical interview, however, considering that our subjects were medical students can minimize the error rate when answering. Furthermore, due to the cross-sectional approach, no causal assumptions can be made, and for observing a broader variety of meaningful correlations bigger sample size may be needed. However Regardless of the direction of the association, these results could be valuable for clinicians and public health

practitioners to identify maladaptive patterns of use that may contribute to mood disorders.

Conclusion

We are in a mental health crisis that necessitates novel means for early detection and treatment. More studies are warranted for determining the cause of this crisis but one possible explanation could be the rise of social media. On the other hand, social media presents new opportunities for early detection of mental health conditions and providing appropriate intervention.

Conflict of interest

the authors declare that there is no conflict of interest.

Financial support

This study received no specific grant from any funding agency in the public commercial or not-for-profit sectors.

Ethical statements

Ethical approval was obtained from the Ethical Committee of Tehran University of Medical Sciences, with the reference number: IR.TUMS.MEDICINE.REC.1400.294. The aim and method of study was explained to the subjects. In our survey forms we used de-identifiers(based on HIPPA 18 identifiers), so personal information was not compromised.

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