



Research Article

Depression risk of older people caused by social isolation during COVID-19 outbreak: A cluster analysis

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Abstract

COVID-19 pandemic required compulsory social isolations to control the transmission of infection, so people had to stay at home for months in most part of the world. Turkish government has imposed curfew for the people aged 65 and over, who are most affected by the devastating effects of COVID-19 disease. Curfew was imposed to protect the older people, but staying at home for months can cause negative psychological effects like depression. Here, we aimed to establish the depression tendency by using depression indicators such as insomnia, poor appetite, despair, weariness, anxiety/fear, dereliction, lack of concentration, anger and trashiness, in people aged 65 and over, who were exposed to curfew during COVID-19 outbreak. The participants (n: 119) of this study were the students of Tazelenme University, a third age university, of Antalya Campus. Cluster analyses recovered two clusters. Statistically significant differences were found between the two clusters by mean comparison of values, according to age, years of education and household factors, while no statistically significant differences were found in the distribution of the two clusters by gender. Participants of Cluster 2 (average age 64,40) appeared to be more affected than participants of Cluster 1 (average age 68,61) by the curfew during outbreak and were more tend to be depressive. The results indicated a relationship between curfew and depression.

Introduction

During the COVID-19 pandemic (outbreak), social distance practices and isolation have become essential precautions to provide the protection and safety of older people. This situation has not only caused anxiety but also psychological problems for older people [1]. In this study, we reached the results which indicates depression tendency in people aged 65 and over during COVID-19 outbreak. These results are based on comparison of two groups analysed by cluster analysis method.

Description of Problem

Does a person tend to depression when subjected to compulsory isolation? In this study, we will try to answer this question in empirical way. But, how this question was emerged? Isolating the older people might reduce transmission, but decline of belief in isolation strategies is quite likely over time. Older people who do not have close family or friends, and depended on the support of voluntary services or social care, could be faced with additional risks [2].



Turkish government has imposed curfew for the people aged 65 and over, supposedly the most vulnerable group against of COVID-19 outbreak. The curfew restrictions lasted approximately two months. Without indicating any logical reason, the older people in specified age group have been subjected to compulsory social isolation named curfew, while others who may be in the risky group in terms of COVID-19 were not affected by curfew. Considering that joy of life usually results from living with others [3], "The effects of curfew may reduce joy of life and increase related depressive tendency" seems to be a reasonable assumption.

The question raised in the first paragraph, will be answered by using cluster analysis method in this study. The aim of this method is to classify "n" objects into "m" clusters [4]. By grouping the participants into clusters regarding the answers given to research question, we will try to find out whether the curfew has a depressive effect on older people. Based on the assumption that all older people are not affected from curfew in the same way and degree, the data obtained will be subjected to cluster analysis.

Participants (objects) will be combined into clusters as homogeneous as possible in the context of certain characteristics (variables associated with the possible effects of the curfew), while the clusters will be distinguished from each other by their heterogeneous characteristics and then obtained clusters will be examined and interpreted. It is hoped that, findings of this study will open a way for other similar studies.

The statistical hypothesis (null hypothesis) of this study is that "the curfew-imposed older people has not experienced depression tendencies or risks due to curfew". In order to test this hypothesis, two groups will be compared: affected and unaffected older people from curfew. As sample consists of people aged 60 and over, two groups have been constituted in a simple way: the people aged between 60-64 aged and aged 65 and over. However, it has proven over and over again that classifications based on age only, are a very weak scheme to explain aging and phenomena of aging. This is frequently emphasized in many gerontology publications [5].

Literature

There will be a range of long-term mental health consequences of COVID-19 outbreak. The mental health impacts and stress behaviours are consequences of social distancing and isolation measures taken by governments around the world and this situation may also increase vulnerability to mental health issues [6]. Curfews has been defined as mandatory social isolation during outbreak in many countries. The links between social isolation and social deprivation and depression have been frequently noted [7,8]. Social deprivation is the lack of routine social relationships and the lack of attention of people to social relationships [9] and it can cause stress on people. The pressure created by the society on older people who do not obey or resist to curfew, has turned the older people into "scapegoats". Due to curfew, legal and social pressures are also quite likely to put stress on older people.

Stress is a non-specific alarm reaction that guarantees the organism's sensitivity and resistance to environmental pressures. The frequency and type of stress factors, duration, intensity of stress and subjective assessment of people, determine the stress-dose. The person under stress often feels uncomfortable, bored, unmotivated, underperforming, makes mistakes due to carelessness, and experiences a variety of cognitive, emotional, vegetative-hormonal and muscular responses [10]. The more changes occur over a period of time, the more intense the stress appears [9].

Epidemiological studies conducted in various countries have shown that approximately 17% of the population will experience depression at some point of their lives. The prevalence among those over age 60 is around 15%. This rate becomes doubled for the people who live in nursing homes or have to stay in hospital for a long time [11]. Since depressive symptoms in old age are generally attributed to physiological causes, the problem is trivialized. Many older people are ashamed of their depressive symptoms and tend to dissimulation [11]. Depression is linked to feelings of emotional loneliness, isolation, and exclusion [12]. There is some evidence that when curfew imposed to people, during the outbreak, younger people are more likely to experience anxiety [13], depression, and stress [13]. On the other hand, the social isolation particularly was prominent among older people during outbreak, they have been recognised as risky groups in terms of depression or suicide [14,15].

Older people live not only with family members but also with others. Participation in social roles outside of the family is always an important precondition for well-being. Today, many single or married people find the social relationships they need, not only in the family, but also with friends and neighbours in clubs, sports groups or congregations [16]. Santini and colleagues [17], recently demonstrated that, social disconnectedness predicts higher level of perceived isolation, and thus, the risk of depression and anxiety symptoms increases. Conversely, depression and anxiety symptoms predicted higher amounts of perceived isolation, and related social disconnectedness. Thus, the curfew has suddenly cut off or decreased the participation of older people in social roles outside the family, significantly. In this context, the concept of loneliness comes into mind. However, isolation and loneliness are clearly distinguished from each other [18,19]. The concept of isolation targets objective conditions in the field of social relations, and the concept of loneliness targets the subjective experience of the social interaction structure. The feeling of loneliness is not determined by the objective contact frequency. Some people can feel lonely but not isolated. On the other hand, some people who have relatively little social contact and seem lonely, may not feel lonely. That is a chosen isolation [20,21].

The degree of loneliness is a function of expectations about parent-child relationship and other social contacts rather than a function of actual social contact. Moreover, the relationship is found between the feeling of loneliness and being passive and boredom ("Loneliness as a function of boredom" and "boredom caused by lack of rhythm"). Results of a comparative study in Europe show that loneliness is also a problem related

with nations or cultures [16]. There are complex and partly incompatible findings between isolation and loneliness. There is also no empirical information on the possible consequences of forced isolation for people aged 65 and over, which can be explained not only by loneliness but also by the concept of dependency. The older people in compulsory isolation process in Turkey, has become dependent on others (for shopping, healthcare service access, social interaction etc.). It seems that “dependent people are need to others more; therefore, it is understandable that reduced social contact causes them to feel lonelier” [16].

Indicators

In the Berlin Aging Survey (Berliner Altersstudie) it is showed that depression risk increasing for the people suffering from physical diseases significantly. In Vienna, almost 20% of the population aged 65 and over showed weakness, feelings of loneliness and negative prospects for the future. Almost a third of older people living alone also showed significantly more often decreased activity [11]. Various studies have shown that 30 – 50% of all depressive patients have anxiety in extraordinarily high level and depression comorbidity, and also one-fourth of all anxiety patients are depressed [11].

According to ICD-10, depressive syndromes are divided into main syndromes and other common syndromes. Main syndromes; depressed mood, loss of interest, and reduced impulse. Other common syndromes are lack of concentration, decreased self-esteem, feelings of guilt, feelings of worthlessness, pessimistic expectations for the future, suicidal thoughts, sleep disorders, decreased appetite, fatigue, weakness, lack of energy, lack of interest, exaggerated worries and fears, negative thoughts, cognitive deficits and exaggerated sense of pain [11]. In this study following depression indicators were used: insomnia, poor appetite, despair, weariness, anxiety / fear, dereliction, lack of concentration, anger, trashiness.

Materials and methods

Participants

To answer the question of whether the curfew led to depression in older people, a mobile phone questionnaire was conducted in scope of this study. The total number of participants was 119 including 57 male and 62 female who are students of 60+ Tazelenme University of Antalya Campus. Tazelenme University, a 3rd age university, has been set up as a social responsibility project that provides free 4-year education since 2016 with the principle of 60+ years of lifelong learning [22]. The connection with participants was established through WhatsApp software during data collection. The questions were sent to the participants in written and the participants conveyed their answers same way. 49 of the participants (41.2%) were between the ages of 60–64 (the group exempted from curfew) and 70 (58.8%) were 65 and over (the group imposed to curfew) Figure 1.

Analyses and statistics

Clustering methods are used to classify similar objects or cases into relative groups. Cluster methods starts with a kind

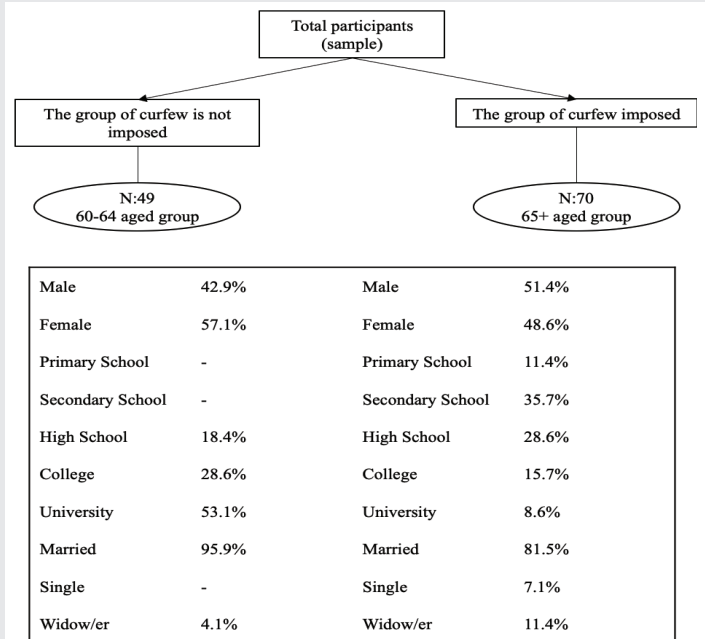


Figure 1: Some demographical information of participants.

of data mining procedure requiring no prior information about the group or cluster membership for any of the objects. Several clustering methods differ from each other in terms of the proximity criteria (similarity or dissimilarity between objects). The main feature of clustering procedures is that all properties of the objects to be examined are used simultaneously. Cluster analysis is one of the exploratory methods within the scope of multivariate data analysis methods [4]. The operation steps of the cluster analysis are partially determined according to chosen clustering method (segmentation and hierarchical methods). The main steps of process are the same for all type methods: identification of similarities, choosing the combination algorithm and determining the number of clusters [23].

In order to perform a cluster analysis, features of the "n" objects of interest is collected. This can be performed by searching object properties on each "p" object to obtain a data matrix for the objects. However, only the similarities of the objects, i.e. the distance matrix of objects, is sufficed [4]. Therefore, the starting point of cluster analysis is the raw matrix defined by these variables. In the first step, the raw matrix is converted into a distance or similarity matrix to measure similarities between objects [23]. The larger the similarity measurements that reflect the similarity between two objects, the more similar two objects are. The larger the distance measurements that reflects difference between two objects, the more different the two objects are [23].

Most commonly used agglomerative algorithms in practice are: single linkage, complete linkage, average linkage, centroid linkage, median, and Ward. All of these procedures are explained by the following general procedural steps [23]: (a) the smallest item, that is, each object represents a cluster, (b) the distance or similarity of the objects is calculated for each object, (c) two clusters with the greatest similarity / smallest distance are searched, (d) the most similar two groups are merged into a new cluster; thus, the number of groups is reduced by one,

(e) when the distance between groups is re-calculated, the distance matrix is reduced, (f) steps 3-5 are repeated until all objects have been collected in clusters in targeted number.

The differences between agglomerative methods arise from the method of determining the distance between an R object and the new cluster (P+Q). In case of combination of two objects (P and Q), the distance of between any group and the new group of P and Q which is D (R; P Q), is calculated from the following transformation [23].

But, some of the clustering methods have apparent disadvantages (closest neighbour, furthest neighbour) and some of them are not clear and understandable. Inter-cluster linkage method is advised because they are more understandable and clearer [24]. In this study, we have preferred the "inter-cluster linkage" method and the "squared Euclidean distance" measurement level [23,24].

The nature of questions could be important: Ideally, the older people curfew-imposed, should answer questions by saying "often". On the other hand, others who are not curfew-imposed, should answer by saying "no" or "rare". It was assumed that the characteristics considered as indicators of depression had not been existed in participants before the curfew. However, this assumption not needs to be accurate. We have tried to control this ambiguity by question style. Questions has been asked in following way: "If you think generally, compared to before the curfew, have you never, rarely or often experienced the problem of insomnia after the start of the curfew" (Answer: often, rare, no). The level of significance has been chosen as "alfa = 0.05" since it is a common practice in social studies. PASW 17 (replaces SPSS Statistics) is used for statistical analysis.

Marginal normalization

In this study, an ordinal-scale questionnaire was utilised to find out depression tendency. Due to uncertain distance between answers, ordinal-scale data is not suitable for

clustering method. Ordinal-scaled data were adapted to the standard normal distribution by using marginal normalization method.

According to Marginal Normalization method of Fechner's [1860], first of all relative frequency and cumulative frequency of features of k ordinal-value were determined [4]:

$$h_i = \frac{n_i}{n} \quad i = 1, \dots, k$$

$$\alpha_i = \sum_{j=1}^i h_j \quad i =, \dots, k$$

Afterwards, for i = 1, ..., k -1, α(i)-quantiles of standard normal distribution were determined as

$$u_{\alpha_i} = \phi^{-1}(\alpha_i)$$

And values of intensity function of normal distribution are calculated:

$$z_i = \varphi(u_{\alpha_i}) = \frac{1}{\sqrt{2\pi}} \cdot e^{-\frac{u_{\alpha_i}^2}{2}}$$

Results and Discussion

General findings

Cluster 1 included 78 participants (65.5%) while Cluster 2 recovered 41 participants (34.5%) (Supplement 1). The average age was 64.40 years (Figure 2) in Cluster 1 (SD 3.54) and 68.61 years in Cluster 2 (SD 3.36). The curfew-imposed participants were mostly present in Cluster 2 while, Cluster 1 constituted mostly curfew-exempted participants. But there were also curfew-imposed participants in Cluster 1. Within the clusters these average ages compared by t-test and statistically significant difference was found (t = -0.276, df=117, p < 0,001).

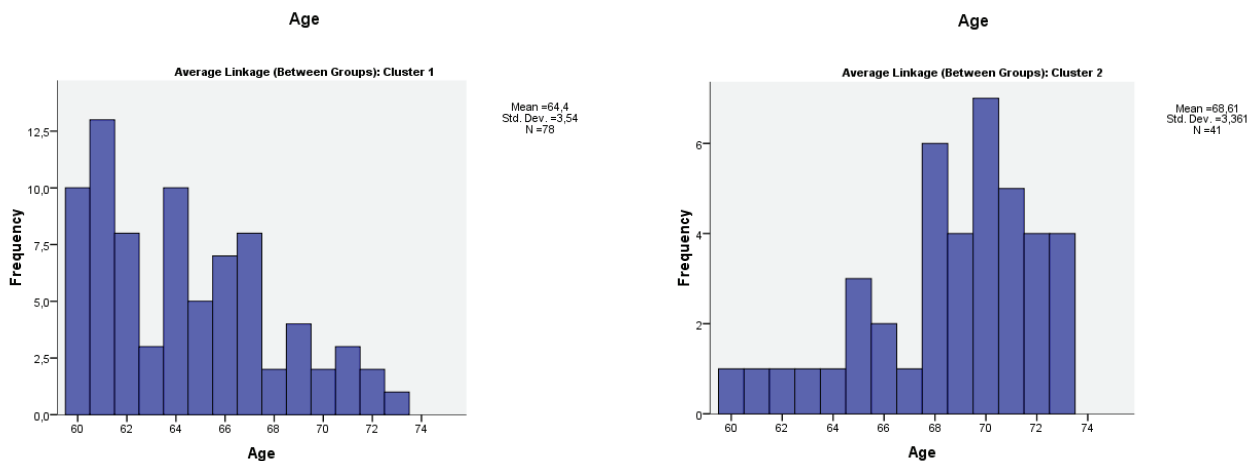


Figure 2: Distribution of Age in Cluster 1 and Cluster 2.



Among participants who stated that they "never" (said no) experienced the problems were approximately between 30-60%, whereas the percentage of those experienced problems "often" varies between 15-35% (Table 1). The gender has not been statistically significant in general but showed statistically significant difference (Table 2) according to one of the nine indicators (The question of "Trashiness" Chi-Square = 12.015; df=2; p=0,002). According to study conducted in India [25], female gender showed higher psychological impact to

Table 1: Answers to questions on depression tendency.

	Often (%)	Rare (%)	No (%)
Insomnia	23,5	44,6	31,9
Poor appetite	16,0	32,7	51,3
Despair	19,3	21,0	59,7
Weariness	29,4	26,1	44,5
Fear	27,7	30,3	42,0
Dereliction	15,1	37,0	47,9
Lack of concentration	18,5	32,8	48,7
Anger	31,1	22,7	46,2
Trashiness	34,5	24,3	41,2

Table 2: Distribution of Depression Tendency Answers according to Gender.

	Male			Female		
	Often (%)	Rare (%)	No (%)	Often (%)	Rare (%)	No (%)
Insomnia	21,1	50,8	28,1	25,8	38,7	35,5
Poor appetite	19,3	33,3	47,4	12,9	32,3	54,8
Despair	19,3	26,3	54,4	19,4	16,1	64,5
Weariness	24,6	33,3	42,1	33,9	19,3	46,8
Fear	36,8	26,4	36,8	19,4	33,8	46,8
Dereliction	19,3	36,8	43,9	11,3	37,1	51,6
Lack of Concentration	21,1	35,1	43,8	16,1	30,7	53,2
Anger	38,6	21,1	40,3	24,2	24,2	51,6
Trashiness**	28,1	38,6	33,3	40,3	11,3	48,4

Abbreviations: ** P < 0.01

outbreak. But in the same study the younger people were also more vulnerable against mental impacts of outbreak. We can assume that gender sensitivity disappears with the old age.

Cluster analysis

No statistically significant difference was found in the distribution of the two clusters by gender, obtained by clustering method (linkage between clusters). There are 78 participants in Cluster 1 (42.3% male, 57.7% female), and 41 (58.5% male, 41.5% female) participants in the Cluster 2.

On the other hand, statistically significant difference was found between the clusters by mean comparison of values by t-test, according to age, years of education and household factors. Cluster 1 consists of younger and more educated participants with more crowded households (Figure 3, Table 3).

Ordinal values were converted to standard normal distribution by marginal standardization method while forming clusters. Since "1 = often" and "3 = no" for the answers given by ordinal scale, negative values in the normal distribution are closer to "often"; positive values are closer to be "rare" or no". According to Table 4 below, average values of Cluster 1 are positive, and the average values of Cluster 2 are mostly negative. Therefore, participants of Cluster 2 are those who may be more affected by the curfew during outbreak and are more tend to be depressive.

Considering that the participants of Cluster 2 who curfew-imposed are the majority and the statistical findings according to clusters are in significant level, the hypothesis that "the older people curfew-imposed has not experienced tendency or risk of depression due to the curfew" was rejected and placed by hypothesis that "the older people curfew-imposed has become more tend to be depressive".

A significant statistical difference was found when clusters were compared according to the answers given to the depressive indicator questions. However only for one question ("insomnia"), no difference was found between clusters (Table

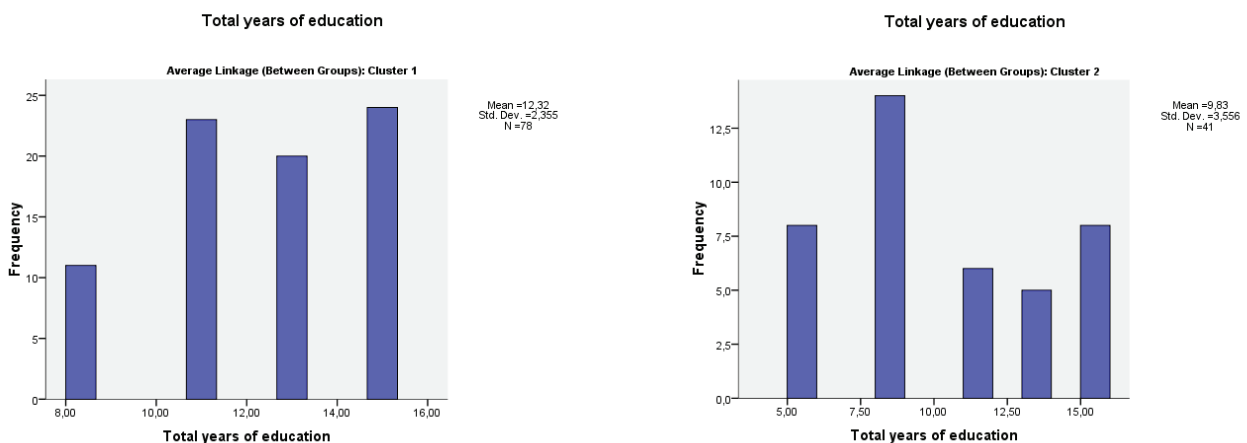


Figure 3: Distribution of total education year in Cluster 1 and Cluster 2.

5). Sleep disorders/ disturbance has been linked to perceived social isolation [7] and/or effected by social isolation [8]. However, these studies did not conducted during compulsory curfews of outbreak. Moreover, no similar outbreaks like COVID-19, have been experienced before by participants of this study. We assume that sleep disorders are linked to depression when it is experienced for the first time. Additionally, individuals in Cluster 1 (which relatively constitutes younger aged) got more positive scores and consequently more tendency to experience insomnia symptoms.

Since there are older individuals in Cluster 2, it may be assumed that the depression tendency in this cluster is related to age. However, gerontologists often point out that age is not a strong factor on depression. But, different dimensions of social exclusion have different effects on depression [26]. The present study revealed that age is not an important factor in depression tendency. Correlation coefficients of clusters according to age factor, has been calculated in terms of depression indicators (Table 6). In Cluster 1, a statistically significant correlation was found for 6 out of 9 questions in terms of age. On the other hand, in Cluster 2, statistically significant correlation was found only for one question. This clearly indicate that the curfew has significant impact on older people in terms of depression tendency. Rather, the age factor plays a strong

Table 3: The Mean, Standard Deviation (SD) and T-test Values of clusters according to Age, Duration of Schooling, and Number of Household Members.

CLUSTER	Age		Total years of education		Number of Household Member	
	Mean	SD	Mean	SD	Mean	SD
Cluster 1	64,40	3,54	12,32	2,36	2,58	1,00
Cluster 2	68,61	3,36	9,83	3,56	2,20	0,84
Total	65,85	4,01	11,46	3,05	2,45	0,96
T-test value / P value (df:117)	-6.276 / 0.000**		4.574 / 0.000**		2.085 / 0.039*	

Abbreviations: * $p < 0,05$ ** $p < 0,001$

Table 4: Mean and Standard Deviation Values of Clusters.

Depression indicators	X±SD	Cluster 1	Cluster 2	Total
Insomnia	Mean	0.068	-0.130	0.000*
	SD	0.848	0.996	0.902
Poor appetite	Mean	0.505	-0.960	0.000*
	SD	0.521	0.529	0.872
Despair	Mean	0.251	-0.477	0.000*
	SD	0.761	0.785	0.841
Weariness	Mean	0.154	-0.293	0.000*
	SD	0.913	0.731	0.877
Fear	Mean	0.179	-0.342	0.000*
	SD	0.888	0.785	0.886
Dereliction	Mean	0.411	-0.782	0.000*
	SD	0.658	0.703	0.880
Lack of Concentration	Mean	0.460	-0.876	0.000*
	SD	0.586	0.643	0.878
Anger	Mean	0.245	-0.465	0.000*
	SD	0.784	0.844	0.870
Trashiness	Mean	0.114	-0.218	0.000*
	SD	0.901	0.796	0.877

Abbreviations: ** $p < 0,001$

Table 5: Comparison of Clusters according to Depression Indicators by using T-test.

	T-test value	df	P Value
Insomnia	1.138	117	0.258
Poor appetite	14.512	117	0.000***
Despair	4.909	117	0.000***
Weariness	2.711	117	0.008**
Fear	3.163	117	0.002**
Dereliction	9.181	117	0.000***
Lack of Concentration	11.434	117	0.000***
Anger	4.574	117	0.000***
Trashiness	1.990	117	0.049*

Abbreviations: * $p < 0,05$ ** $p < 0,01$ *** $p < 0,001$

Table 6: Correlation coefficients of age, according to clusters and depression indicators.

Depression Indicators	Cluster 1		Cluster 2	
	Pearson Correlation	Sig. (2-tailed)	Pearson Correlation	Sig. (2-tailed)
Insomnia	-0.538**	0.000	-0.212	0.184
Poor appetite	0.351**	0.002	-0.065	0.686
Despair	-0.133	0.245	-0.302	0.055
Weariness	-0.338**	0.002	-0.095	0.556
Fear	-0.352**	0.002	-0.143	0.373
Dereliction	-0.297**	0.008	-0.299	0.058
Lack of Concentration	0.105	0.358	-0.338*	0.031
Anger	-0.204	0.073	-0.292	0.064
Trashiness	-0.364**	0.001	-0.103	0.521

** $p < 0,05$ sig. Correlation.

role in Cluster 1, which was not affected by the curfew. It was also found that five of the answers with a significant negative correlation, (increased answer of "often" with increasing age). However, considering that participants of this cluster were not affected by the curfew, there must be other factors rather than age.

Conclusion

The COVID-19 outbreak arouses considerable worry, concern, fear, stress and anxiety in large populations including older adults in the world. The various impacts on daily activities, routines and livelihoods of ordinary people have caused various emotional effects like loneliness feeling, depression etc [27-30]. Some of the older people in Turkey has experienced "compulsory social isolation" during COVID-19 outbreak. The older people who were suddenly cut off from ordinary social relations, has experienced the curfew as a process of pressure, exclusion and accusing of social environment. The findings of the questionnaire conducted in this study showed that older people have a tendency to depression. Behind this finding is that keeping away older people from their social roles, i.e. daily out-of-home routines, is assumed to be effective. It was seen that not only the older people but also the experts had no solutions about overcoming this isolation process, since no similar situation had never been faced before.

The older people have been more dependent during curfew. It has become compulsory for others to do the out-of-home



works of older people. Well-meant "aids", such as the bringing water and medicine by police, could only be seen as publicity rather than helping them for some time. Such kind of aids has been also vanished as soon as they get access to street. What to do with a likely new curfew is still unclear in Turkey. However, this type of "curfew" is meaningless. Locking the older people into home has not stopped outbreak. And it is also unclear whether the curfew really protects the older people from COVID-19.

Five of Tazelenme University students who were imposed to a curfew, died during the outbreak. While the older people who live with family members were forced to stay at home, who can guarantee that other family members who can go out will not bring COVID-19 to home? Although this research depicts that there is an association between depression and curfew, it should be bared in mind that this is a limited and narrow study that represents only student population of The Tazelenme University of Antalya Campus.

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