

# Adherence to Infection Control Measures and the Psychological Effects of Quarantine during COVID-19 Pandemic in Dibrugarh District of Assam, India: A Cross-sectional Study

KAVERY BORA<sup>1</sup>, BITUPAN KALITA<sup>2</sup>, GOURANGIE GOGOI<sup>3</sup>

## ABSTRACT

**Introduction:** Quarantine is an important means of controlling the spread of Coronavirus Disease-2019 (COVID-19) and it is essential to maintain strict adherence to infection control measures during this period. However, long periods of quarantine may be quite challenging by themselves especially in a pandemic of a new infection which might lead to emotional, psychological and financial difficulties. Hence, understanding the psychological impact of COVID-19 on the quarantined people and how they have adhered to the infection control measures will help to formulate better prevention strategies.

**Aim:** To assess the infection control measures among the people who were placed in quarantine and to understand its psychological effects during the COVID-19 pandemic in Dibrugarh District of Assam, India.

**Materials and Methods:** This study was a community based cross-sectional study conducted among the people placed in quarantine in Dibrugarh District of Assam and was conducted from April 2020 to March 2021. During the COVID-19 pandemic, quarantine centres were set up in various educational institutions in the urban areas of Dibrugarh District of Assam. There were six such centres under the supervision of district health authorities. Taking three of these centres located at Chabua, Jokai and Lesai under Dibrugarh district, 159 quarantined subjects were enrolled for the study. Centre for Epidemiologic Studies Depression (CES-D) scale was applied for assessment of depressive symptoms and the post-traumatic stress symptoms were assessed using The Impact of Event Scale-Revised (IES-R). The adherence to infection control measures were assessed by using a predesigned, pretested questionnaire prepared for the

purpose of the study, which was applied using online Google platform. Of the total 159 responses, 23 were incomplete and finally 136 were analysed. Descriptive analysis was done for the socio-demographic data. To find the association between quarantine and the psychological effects, Chi-square test was applied and p-value <0.05 was considered as significant.

**Results:** Majority of the study subjects, 96 (70.59%) belonged to 10-29 years, 103 (75.74%) were males, and 126 (92.64%) were Hindu. About half of the participants were from urban area 72 (52.94%) and 48 (35.29%) were graduate. Majority of the participants 125 (91.91%) could manage to stay in separate room but arrangement of separate toilet was difficult. Similarly, about one-third 48 (35.29%) did not have a designated family member to look after them. Majority of the participants 135 (99.26%) practiced regular handwashing, wearing of mask 123 (90.44%) and regular disinfection of the items used by them 111 (81.62%). About 47 (34.56%) of the participants had sign and symptoms of post-traumatic stress, out of which females were affected more 14 (42.42%) and younger age group participants in the age range of 10 to 29 years 35 (36.46%) had more post-traumatic stress symptoms than the older adults. About one-third of participants 51 (37.5%) were depressed, 17 out of 33 females (51.52%) were found to be depressed and the younger age group in the age range of 10 to 29 years 42 (43.75%) were found to be more affected.

**Conclusion:** Quarantine is an effective public health measure to control the spread of infection when people practice appropriate infection control measures. However, long periods of quarantine can cause psychological impact on the quarantined people which needs to be properly addressed.

**Keywords:** Depression, Outbreak, Prevention, Public health

## INTRODUCTION

COVID-19 pandemic shook the healthcare system with its sudden devastating impact. The prevention and control strategies were focused on quarantine to break the chain of transmission. People found themselves in unprecedented situation with added behaviour changes advocated for infection control measures. To be quarantined and practicing infection control methods had its impact on the psychological health of the study subjects.

Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2), a novel coronavirus was first identified in an outbreak in Wuhan, Hubei province of China in December 2019 [1]. COVID-19 is a highly infectious disease caused by this novel virus that spread quickly throughout the world affecting millions of people causing a devastating pandemic. COVID-19 spreads easily from person to person in close contacts and through other ways like coughing and

sneezing [2]. Most infected people suffer mild flu like symptoms but some develop severe respiratory and other serious complications leading to death. Therefore, to reduce the spread of infection people who were exposed to COVID-19 cases or have history of travel to areas where COVID-19 cases were reported were isolated and their movement was restricted. This separation and isolation of persons with history of exposure to contagious disease is known as quarantine [3]. Quarantine is imposed to control the spread of disease by separating healthy individual who has contact with a contagious disease and has chances of spreading the disease. People without symptoms keep physical distance from each other known as social distancing. With quarantine, there is decrease in occurrence of new cases from minimum of 44% to a maximum of 96% [4]. Similarly; there is reduction in the number of deaths from minimum of 31% to maximum of 76% [4]. Public health measures

like maintaining social distance and closure of schools were more effective when combined with quarantine at reducing the spread of COVID-19 than quarantine alone [4,5].

World Health Organisation (WHO) and the Centre for Disease Control and Prevention (CDC) recommended 14 days of quarantine for people with history of direct contact with COVID-19 patients, based on the incubation period of the virus [6]. In 1127, quarantine was first used in Venice for leprosy patients and was later widely practiced to prevent Black Death. However, it was properly begun to impose quarantine in response to plague in the United Kingdom after about 300 years later [7].

During the outbreak of SARS, quarantine was imposed in Canada and in some parts of China in 2003. Many villages were quarantined during the Ebola outbreak in Western Africa in 2014 [8]. Quarantine is often distressing for many people. Uncertainty over disease status, separation from loved ones and restriction on free movement causes significant distress to the quarantined people. Even suicide has been reported previously among quarantined people [9]. Quarantine has also provoked anger and litigations were reported following its imposition [10]. Therefore, possible psychological harm should be kept in mind while imposing mandatory mass quarantine [11]. Longer durations of quarantine (more than 10 days) were significantly associated with post-traumatic stress symptoms, avoidance behaviour and overall poor psychological health even after six months of release, than those quarantined for less than 10 days [12,13].

Infection control activities include the development of meaningful and effective policies on hand and respiratory hygiene etc., Hand hygiene reduces healthcare associated infections. Well controlled and carefully implemented infection control programs, reduce illness and prevents death [14]. A recent review reported that improved hand hygiene was associated with significant reductions in hospital acquired infections [15]. Alcohol and Chlorhexidine sanitisers can effectively remove germs from hands though soap and clean water remain important alternative [16]. However, adherence to hand hygiene practices are usually low with rates of adherence between 40 and 60% only [17,18]. Quarantine may pose tremendous psychological, emotional and financial difficulty for some individual though it is an essential measure to control spread of infection which also demands proper observation of infection control practices by the people who were quarantined. Knowledge and understanding of the experiences of quarantined persons are important to enhance infectious disease containment and to reduce the negative effects on those quarantined, their families and social networks. With the emergence of a new infection which soon turned into a pandemic, there was a lot of challenge to public health. Quarantine was one of the first strategies adopted to check the transmission of COVID-19. However, quarantine period was also to ensure adherence to infection control measures. Again, if the period was long there could be added psychological effects of being separated from family and friends. The novelty of this study was to find the adherence to infection control measures and the psychological effects of quarantine on the study subjects.

Therefore, the aim of this study was to assess the adherence to infection control measures of persons during quarantine and the psychological effects of quarantine on them during the COVID-19 pandemic in Dibrugarh district of Assam, India.

## MATERIALS AND METHODS

This study was a community-based cross-sectional study conducted among the people placed in quarantine in the Dibrugarh District of Assam during the COVID-19 pandemic. Institutional Ethics Committee (H) clearance of Assam Medical College and Hospital (Ethical clearance No. AMC/EC/1604 was taken before the start of the study. The study was conducted from April 2020 to March 2021. During the COVID-19 pandemic, quarantine centres were set

up in various educational institutions in the urban areas of Dibrugarh District of Assam. There were six such centres under the supervision of district health authorities. Among these six centres three centres at Chabua, Jokai and Lesai under Dibrugarh district were selected for data collection. Adherence to infection control measures were assessed using a predesigned, pretested questionnaire prepared for the purpose of the study and applied using online Google platform creating a link ([https://docs.google.com/forms/d/e/1FAIpQLSe7t5KdgAyJw0Yd0zP7gEOoKFUaPvc1zhY5fSbSZQsQs\\_ikrk\\_fA/viewform](https://docs.google.com/forms/d/e/1FAIpQLSe7t5KdgAyJw0Yd0zP7gEOoKFUaPvc1zhY5fSbSZQsQs_ikrk_fA/viewform)) which was sent via WhatsApp or SMS. At first the list of quarantined people were collected from the district administrative authority. Then the questionnaires were circulated through the link which was sent via WhatsApp or text message mentioning about the study. Informed consent was taken from the participants. It was also mentioned that their responses will be anonymous and their identity will not be breached.

A total of 159 quarantined subjects were enrolled during the study period. However, some responses were incomplete and finally 136 were analysed. Socio-demographic profile of the study subjects in context of age, gender, religion, education and place of residence etc., were obtained.

**Inclusion criteria:** People who were diagnosed with COVID-19 using Reverse Transcription-Polymerase Chain Reaction (RT-PCR) and then quarantined during the COVID-19 Pandemic in Dibrugarh District, Assam from April 2020 to March 2021 were included in the study.

**Exclusion criteria:** People with past history of psychiatric illness. People who have not given consent or with incomplete responses have been excluded from the study.

**Sample size:** As the present study was done during the beginning of the pandemic, when COVID-19 care centres were set up, there was no reference study to calculate the sample size. Therefore, 50% of the block in Dibrugarh district which amounts to three block and all the COVID-19 care centres of those block were taken as study universe and all the subjects in these three blocks were recruited as study subjects. Hence, purposive sampling was done for including the subjects in the study.

### Tools used:

1. Socio-demographic datasheet mentioning the socio-demographic variables of the study subjects like age, gender, domicile, marital status, educational qualification, occupation etc., on the basis of Modified Kuppaswamy Socio Economic Status Scale [19].
2. Self-report questionnaire on quarantine. This is a 19 item self-report questionnaire ([https://docs.google.com/forms/d/e/1FAIpQLSe7t5KdgAyJw0Yd0zP7gEOoKFUaPvc1zhY5fSbSZQs\\_ikrk\\_fA/viewform](https://docs.google.com/forms/d/e/1FAIpQLSe7t5KdgAyJw0Yd0zP7gEOoKFUaPvc1zhY5fSbSZQs_ikrk_fA/viewform)). On quarantine and adherence to infection control measures during the quarantined period, designed and tested for the purpose of the study. CES-D scale was applied for assessment of depressive symptoms and the IES-R was applied for assessment of post-traumatic stress symptoms [20-22].
3. **Impact of Events Scale- Revised (IES-R):** The IES-R is used to assess the post-traumatic stress symptoms. This is a 22-item rating scale rated on a 0 (not at all) to 4 (extremely) scale with respect to how distressing each item has been during the past week. There are three subscales- intrusion (8 items), avoidance (8 items), and hyper arousal (6 items), and there is high degree of intercorrelation ( $r_s = .52$  to  $.87$ ) among them. High degree of internal consistency reported (Intrusion: Cronbach's  $\alpha = 0.87-0.94$ , Avoidance: Cronbach's  $\alpha = 0.84-0.87$ , Hyperarousal: Cronbach's  $\alpha = 0.79-0.91$ ). Test-retest reliability ranged from 0.89 to 0.94 [20,21].

**1. Centre for Epidemiologic studies- Depression Scale (CES-D):** The CES-D scale is a brief self-report scale designed to measure self-reported symptoms associated with depression experienced

in the past week. The CES-D scale includes 20 items comprising six scales reflecting major symptoms of depression: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. High internal consistency has been reported with Cronbach's alpha coefficients ranging from 0.85 to 0.90 across studies [22]. The items are scored from 0-3 point, total score range 0-60, a score of  $\geq 16$  points is considered depressed.

**Setting and design:** Quarantined persons were traced and contacted after completion of their quarantined period of 14 days. Then they were given the above mentioned tools in English and Assamese (forward and backward translation was conducted) and were asked to fill it and return back. Those with incomplete responses were excluded. All study tools were given via a Google link created for the purpose of the study.

## STATISTICAL ANALYSIS

Statistical Package for the Social Sciences (SPSS) version 20.0 was used for the statistical analysis. Socio-demographic variables of gender, residential area, education and occupation based on Modified Kuppuswamy classification and infection control data were analysed as percentages. Chi-square test was done to find the association between quarantine and psychological effect as given by the scores of The CES-D and the IES-R scales.

## RESULTS

During the study, 159 responses were received, out of which 23 responses were incomplete. All the incomplete responses were excluded from the analysis. All the data were checked for duplicacy. Finally, 136 responses were found to be eligible for analysis.

[Table/Fig-1] shows the socio-demographic variables of the study participants, majority of the participants belongs to 10-29 years of age 96 (70.59%), 126 (92.64%) of the participants were Hindu followed by Christian and Muslim. A total of 72 (52.94%) of the participants were from urban area. Forty eight (35.29%) of the participants were graduate followed by high school passed 37 (27.21%) and Professionals 17 (12.5%).

A total of 108 (79.41%) of the participants were advised quarantine by health worker [Table/Fig-2]. Ninety four (87.04%) of the participants were explained about the process of quarantine, where they were told about the duration of quarantine, have to keep themselves isolated from other people, cannot go out of the quarantine place [Table/Fig-3] and 89 (82.41%) of the participants were explained about infection control measures like wearing face mask, repeated handwashing, regular washing of the cloths, repeated sanitisation of the touched object at the time of imposing quarantine [Table/Fig-4].

Analysis of the responses regarding the adherence to infection control measures shows that 125 (91.91%) of the participants used separate room for the quarantine period. However, only 86 (63.24%) of the participants could manage separate toilet. A total of 110 (80.88%) of the participants kept themselves isolated from the family member, while 26 (19.12%) of the participants could not manage to keep themselves isolated. Only 88 (64.71%) of the participants had designated family member to look after them. Majority of the participants 135 (99.26%) practiced regular handwashing, 123 (90.44%) wore mask regularly and 126 (92.65%) washed their cloths daily. While 111 (81.62%) of the participants practiced regular disinfection of the frequently touched items such as phone, door handle, table, chair etc., A 6.62% of the participants went outside during the period of quarantine and in 8.09% of the participants outsider came to meet them during the quarantine period [Table/Fig-5].

IES-R score of  $>24$ , which means 47 (34.56%) of the participants were found to have symptoms of post-traumatic stress. IES-R score is shown in [Table/Fig-6].

Variables		N	%
Sex	Male	103	75.74
	Female	33	24.26
Age (years)	10-29	96	70.59
	30-49	32	23.53
	$\geq 50$	8	5.88
Religion	Hindu	126	92.64
	Muslim	3	2.21
	Christian	6	4.41
	Others	1	0.74
Residence	Rural	33	24.26
	Urban	72	52.94
	Semi urban	31	22.79
Education	Illiterate	4	2.94
	Primary school	5	3.68
	Middle school	10	7.35
	High school	37	27.21
	Diploma	15	11.03
	Graduate	48	35.29
	Profession	17	12.5

[Table/Fig-1]: Socio-demographic profile of the study participants. Educational groups were based on Modified Kuppuswami scale 2020.

Who asked for quarantine	N	%
Self	28	20.59
Health worker	108	79.41

[Table/Fig-2]: Proportion of participants who were self-quarantined/asked by healthcare worker.

Explanation about the process of quarantine given to the people	N	%
Yes	94	87.04
No	14	12.96

[Table/Fig-3]: Proportion of participants according to explanation about procedure of quarantine.

Explanation about infection control measures given to the quarantined people	N	%
Yes	89	82.41
No	19	17.59

[Table/Fig-4]: Proportion of participants according to explanation given about infection control measures.

Question no.	Participants who adhered to control measures	Participants who did not adhere to control measures	% of adherence
5. Did you stayed in a separate room during the time of quarantine?	125	11	91.91
6. Did you use a separate toilet during the time of quarantine?	86	50	63.24
7. If home quarantined, did you completely isolate yourself from other family member?	110	26	80.88
8. Was there a particular family member to look after you during the period of quarantine?	88	48	64.71
9. If yes, the assigned person of the family caring for the quarantined person wore mask and hand gloves while giving care?	72	16 (Out of 88)	81.81
10. Did you practice repeated handwashing with soap and water properly during that period?	135	1	99.26
11. Did you wear a mask during that period?	123	13	90.44

12. Did you wash your cloth and bed linen regularly and separately from others?	126	10	92.65
13. Did you use completely separate utensils during that period?	114	22	83.82
14. Did you regularly disinfect the frequently touched items such as mobile phone, spectacles, pen etc., and places like door handle, table, chair etc.,?	111	25	81.62
15. Did you regularly disinfect the bathroom and toilet used by you during that period?	123	13	90.44
16. Have you gone outside for some purpose during the quarantined period?	127	9	93.38
17. Did any outsider come to visit you at home during that period?	125	11	91.91

**[Table/Fig-5]:** Adherence to infection control measures by the study participants (n=136).

The Impact of Event scale- Revised (IES-R) score	No.	%
<24	89	65.44
≥24	47	34.56

**[Table/Fig-6]:** The Impact of Event scale-Revised (IES-R) Score of study participants.

Though there was no significant association between the IES-R score of ≥24 in different age groups of the study participants. Younger participants had more post-traumatic stress disorder symptoms than the older adults [Table/Fig-7].

Age (in years)	Participants with The Impact of Event scale-Revised (IES-R) score ≥24	Participants with The Impact of Event scale-Revised (IES-R) score <24	Total
10-29	35	61	96
30-49	10	22	32
≥50	2	6	8
Total	47	89	136

$\chi^2=0.631, p=0.729$

**[Table/Fig-7]:** Proportion of participants with IES-R score ≥24 in different age groups. Chi-square test applied, level of significance at p-value <0.05

The association of the IES-R score of >24 was studied in both genders, residential status and with educational status of the study participants. Though significant association could not be established, participants from urban areas and females (73.68%) had more post-traumatic stress than male (47.14%) subjects [Table/Fig-8-10].

Sex	Participants with The Impact of Event scale- Revised (IES-R) score ≥24	Participants with The Impact of Event scale- Revised (IES-R) score <24	Total
Male	33	70	103
Female	14	19	33
Total	47	89	136

$\chi^2=1.192, p=0.275$

**[Table/Fig-8]:** Proportion of participants with IES-R score ≥24 according to sex. Chi-square test applied, level of significance at p-value <0.05

Residential areas	Participants with The Impact of Event scale-Revised (IES-R) score ≥24	Participants with The Impact of Event scale-Revised (IES-R) score <24	Total
Rural	10	23	33
Urban	29	43	72
Semiurban	8	23	31
Total	47	89	136

$\chi^2=2.356, p=0.308$

**[Table/Fig-9]:** Proportion of participants with IES-R score ≥24 in different residential areas. Chi-square test applied, level of significance at p-value <0.05

Education	Participants with The Impact of Event scale-Revised (IES-R) score ≥24	Participants with The Impact of Event scale-Revised (IES-R) score <24	Total
Illiterate	2	2	4
Primary school	2	3	5
Middle school	3	7	10
High school	15	22	37
Diploma	6	9	15
Graduate	15	33	48
Profession	4	13	17
Total	47	89	136

$\chi^2=1.043, p=0.984$

**[Table/Fig-10]:** Proportion of participants with IES-R score ≥24 according to education. Chi-square test applied, level of significance at p-value <0.05

In this study, 51 (37.5%) of the participants were found to be depressed [Table/Fig-11]. CES-D score >16, which indicates presence of depression was found in 16 out of 31 (51.61%) of participants from semi urban areas, 25 out of 72 (34.72%) of participants from urban areas and 10 out of 33 (30.30%) of rural domicile participants. Though there was no significant association between presence of depression and residential status of the study participants [Table/Fig-12].

Centre for Epidemiologic Studies Depression (CES-D) score	No.	%
<16	85	62.5
≥16	51	37.5

**[Table/Fig-11]:** CES-D score of study participants.

Residential areas	Participants with Centre for Epidemiologic Studies Depression (CES-D) score ≥16	Participants with Centre for Epidemiologic Studies Depression (CES-D) score <16	Total
Rural	10	23	33
Urban	25	47	72
Semiurban	16	15	31
Total	51	85	136

$\chi^2=3.601; p=0.165$

**[Table/Fig-12]:** Proportion of participants with CES-D score ≥16 in different residential areas. Chi-square test applied, level of significance at p-value <0.05.

In this study, presence of depression (CES-D score >16) was found in 17 out of 33 (51.52%) of females and 34 out of 103 (33.01%) of male participants which was found to be statistically significant (p-value 0.056) [Table/Fig-13].

Sex	Participants with Centre for Epidemiologic Studies Depression (CES-D) score ≥16	Participants with Centre for Epidemiologic Studies Depression (CES-D) score <16	Total
Male	34	69	103
Female	17	16	33
Total	51	85	136

$\chi^2=3.652; p=0.056$

**[Table/Fig-13]:** Proportion of participants with CES-D score ≥16 according to sex. Chi-square test applied, level of significance at p-value <0.05

In the present study, depression was found in 42 out of 96 (43.75%) of participants who were in the age range of 10-29 years, followed by 8 out of 32 (25%) in 29-49 years age group and eight out of one (12.5%) in participants more than 50 years of age. The presence of depression in the younger age group of 10-29 years was statistically significant with a p-value of 0.053 [Table/Fig-14].

[Table/Fig-15] shows the proportion of study subjects with CES-D Score of >16 according to educational status where 20 out of 48 (41.67%) of participants were graduate followed by 4 out of 10 (40%)

of participants whose educational status was up to middle school. However, there was no statistical significance between presence of depression and educational status in the present study.

Age (in years)	Participants with Centre for Epidemiologic Studies Depression (CES-D) score $\geq 16$	Participants with Centre for Epidemiologic Studies Depression (CES-D) score $< 16$	Total
10-29	42	54	96
29-49	8	24	32
$\geq 50$	1	7	8
Total	51	85	136

$$\chi^2=5.867; p=0.053$$

**[Table/Fig-14]:** Proportion of participants with CES-D score  $\geq 16$  in different age groups.

Chi-square test applied, level of significance at p-value  $< 0.05$

Education	Participants with Centre for Epidemiologic Studies Depression (CES-D) score $\geq 16$	Participants with Centre for Epidemiologic Studies Depression (CES-D) score $< 16$	Total
Illiterate	1	3	4
Primary school	1	4	5
Middle school	4	6	10
High school	14	23	37
Diploma	5	10	15
Graduate	20	28	48
Profession	6	11	17
Total	51	85	136

$$\chi^2=0.371, p=0.999$$

**[Table/Fig-15]:** Proportion of participants with CES-D score  $\geq 16$  according to education.

Chi-square test applied, level of significance at p-value  $< 0.05$

## DISCUSSION

Though quarantine is an effective measure of containing infectious diseases, it should be accompanied by proper infection control measures to become successful. In this study, only 86 (63.24%) of the participants could manage separate toilet during quarantine period. For those people who were home quarantined in this part of the country may not have access to separate toilet facilities. A total of 110 (80.88%) of the participants kept themselves isolated from the family member, while 26 (19.12%) of the participants could not manage to keep themselves isolated. A study conducted by Tseng CW et al., in Hawaii found that 46% of the participants could not complete the quarantine period for buying groceries, visiting others and for some other reasons [23].

A study done by Azene ZN et al., in Ethiopia found that 73.84% of the respondent practice regular handwashing and 32.42% used face mask [24]. However, in the present study majority of the participants practiced regular handwashing, wearing of mask and regular washing of cloths and 81.62% of the participants practiced regular disinfection of the frequently touched items such as phone, door handle, table, chair etc.

In the present study, 47 (34.56%) of the participants were found to have features of post-traumatic stress and However, there was no significant association of post-traumatic stress features with different age group and gender. Earlier studies on healthcare workers who had been quarantined during SARS had more severe symptoms of post-traumatic stress than members of the general public. A study of hospital staff during SARS outbreak found that immediately after the quarantine period of nine days, reported symptoms of acute stress disorder and having been quarantined was the most predictive factor. Quarantined staff was significantly more likely to report exhaustion, detachment from others, anxiety when dealing with febrile patients, irritability and insomnia, poor concentration, deteriorating work performance or consideration of resignation [25].

In another study, the effect of being quarantined was a predictor of post-traumatic stress symptoms in hospital employees even three years later. This study also reported fears about participants own health or fears of infecting others and was more likely to fear infecting family members than those not quarantined [26]. Hawryluck L et al., in their study on quarantine that surveyed the psychological effect of quarantine have found 28.9% of respondent to have symptoms of post-traumatic stress and 31.2% respondent to be depressed which was similar to the present study [27]. A study comparing post-traumatic stress symptoms in parents and children quarantined with those not quarantined found that the mean post-traumatic stress scores were four times higher in children who had been quarantined than in those who were not quarantined. A 28% (27 of 98) of parents quarantined in this study reported sufficient symptoms to warrant a diagnosis of a trauma related mental health disorder, compared with 6% (17 of 299) of parents who were not quarantined [28].

Quarantine exerts negative effect on psychological health of quarantined individuals [29]. In the present study, 37.5% of the participants were found to be depressed out of which 51.52% females had CES-D score of  $> 16$ . Depression was found to be more common among younger age group people and females outnumbered males. Isolation is associated with anxiety and depressive symptoms and this has been reflected in the current pandemic too [30-33]. In COVID-19 pandemic unpredictable circumstances lead to psychological and emotional consequences [34].

## Limitation(s)

As this was a cross-sectional study it lacked follow-up. The study was done in only three quarantine centres, so the results may not be generalisable.

## CONCLUSION(S)

Quarantine is an important public health measure to effectively control the spread of infection especially when infection control measures are properly maintained. However, quarantine can cause significant psychological impact on those who were quarantined in the form of depression, post-traumatic stress symptoms etc., To improve people's psychological health during quarantine, proper mental health counseling can be of help to great extent. Providing adequate information about infection control measures and motivating people to practice them properly will go a long way in controlling a highly contagious pandemic like COVID-19.

**Authors' contributions:** K B conceived the idea, developed the study objectives. K B & B K submitted protocol and took permission of the institutional ethics committee (H). GG designed the study and calculated the sample size. K B and B K worked in data collection and data analysis. K B worked in writing of paper, screened titles and drafted the manuscript. K B, B K and G G reviewed and finalised the manuscript.

## Acknowledgement

Authors specially thank Hiranya Saikia for helping in the statistical analysis.

## REFERENCES

- Sharma A, Tiwari S, Deb MK, Marty JL. Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2): A global pandemic and treatment strategies. *Int J Antimicrob Agents*. 2020;56(2):106054. Published online 2020 Jun 10. Doi: 10.1016/j.ijantimicag.2020.106054.
- World Health Organization, Q&A: How is COVID-19 transmitted? 14 July 2020 Feature story. <https://www.who.int/vietnam/news/detail/14-07-2020-q-a-how-is-covid-19-transmitted>. Date of last accessed: 23.12.20
- Center for Disease Control and Prevention. Quarantine and isolation. <https://www.cdc.gov/quarantine/index.html>. Google scholar. Date last accessed: 23. 12. 20.
- Streit B N, Mayr V, Dobrescu A L, Chapman A, Persad E, Klerings I, Wagner G, Siebert U, Christof C, Zachariah C, Gartlehner G. Quarantine alone or in combination with other public health measures to control COVID-19: a rapid review. *Cochrane Database Syst Rev*. 2020;9(9):CD013574. doi: 10.1002/14651858.CD013574.pub2.

- [5] Streit B N, Mayr V, Dobrescu A L, Chapman A, Persad E, Klerings I, Wagner G, Siebert U, Christof C, Zachariah C, Gartlehner G. Quarantine alone or in combination with other public health measures to control COVID-19: a rapid review. *Cochrane Database Syst Rev.* 2020;4(4):CD013574. doi: 10.1002/14651858.CD013574.
- [6] World Health Organization. (2020). Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19): Interim guidance. World Health Organization. <https://apps.who.int/iris/handle/10665/331497>. Date last accessed: 24.6. 2021
- [7] Newman K. Shutt up: Bubonic plague and quarantine in early modern England. *J Sol Hist.* 2012;45:809-34.
- [8] Barbisch D, Koenig KL, Shih FY. Is there a case of Quarantine? Perspectives from SARS to Ebola. *Disaster Med Public Health Prep.* 2015;9:547-53.
- [9] Kahil K, Cheaito MA, Hayek RE, Nofal M, Halabi SE, Kudva KG. Suicide during COVID-19 and other major international respiratory outbreaks: A systematic review. *Asian J Psychiatr.* 2021;56:102509. Published online 2020 Dec 26. Doi: 10.1016/j.ajp.2020.102509.
- [10] Gulbahar G, Sidhu GS. The hidden face of quarantine. *International Journal of Medical and Dental Sciences.* 2020;9(2):1874-75 Doi: 10.18311/ijm/2020/25699, July 2020ISSN (Print): 2454-8952ISSN (Online): 2320-1118.
- [11] Rubin GJ, Wessely S. The psychological effects of quarantining a city. *BMJ.* 2020;368:m313.
- [12] Reynolds DL, Garay JR, Deamond SL, Moran MK, Gold W, Styra R. Understanding compliance and psychological impact of the SARS quarantine experience. *Epidemiol Infect.* 2008;136:997-1007.
- [13] Marzanovic Z, Greenglass ER, Coffey S. The relevance of psychological variables and working conditions in predicting nurses coping strategies during the SARS crisis: An online questionnaire survey. *Int J Nurs Stud.* 2007;44:991-98.
- [14] Catherine G, Jeffrey T, Schouten. Infection Control Best Practices in Clinical Research in Resource -Limited Settings. *Journal of acquired immune deficiency syndrome (1999).* Date last accessed: 12.5.2021.
- [15] Allegranzi B, Pittet D. Role of hand hygiene in healthcare associated infection prevention. *The Journal of Hospital Infection.* 2009;73(4):305-15.
- [16] WHO [WHO guidelines on hand hygiene in health care. 2009] [http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf).
- [17] Allegranzi B, Sax H, Pittet D. Hand hygiene and healthcare system change within multi -modal promotion: A narrative review. *The Journal of Hospital Infection.* 2013;83(Suppl 1):S3-10.
- [18] Reisinger HS, Yin Y, Radonovich L, Knighton VT, Martinello RA, Hodgson MJ, et al. Comprehensive survey of hand hygiene measurement and improvement practices in the Veterans Health Administration. *Am J Infect Control.* 2013;41(11):989-93.
- [19] Saleem SM. Modified Kuppupswamy socioeconomic scale updated for the year 2019. *Indian J Forensic Community Med.* 2019;6(1):01-03.
- [20] Creamer M, Bell R, Failla S. Psychometric properties of the impact of event scale-revised. *Behaviour Research and Therapy.* 2003;41:1489-96.
- [21] Weiss DS, Marmar CR. The impact of event scale-revised. In: Wilson JP, Keane TM, editors. *Assessing psychological trauma and PTSD.* New York: Guilford Press; 1997. pp. 399-411.
- [22] Radloff LS. The CES-D scale: A self report depression scale for research in the general population. *Applied Psychological Measurement.* 1977;1:385-401.
- [23] Tseng CW, Roh Y, DeJong C, Kanagusuku LN, Soin KS. Patients' compliance with quarantine requirements for exposure or potential symptoms of COVID-19. *Hawaii J Health Soc Welf.* 2021;80(11):276-82.
- [24] Azene ZN, Merid MW, Muluneh AG, Geberu DM, Kassa GM, Yenit MK, et al. Adherence towards COVID-19 mitigation measures and its associated factors among Gondar City residents: A community-based cross-sectional study in Northwest Ethiopia. *PLoS ONE.* 2020;15(12):e0244265. <https://doi.org/10.1371/journal.pone.0244265>.
- [25] Bai Y, Lin CC, Lin CY, Chen JY, Chue CM, Chou P. Survey of stress reactions among health care workers involved with the SARS outbreak. *Psychiatry Serv.* 2004;55:1055-57.
- [26] Wu P, Fang Y, Guan Z, Fan B, Kong J, Yao Z, et al. The psychological impact of the SARS epidemic on hospital employees in China: Exposure, risk perception and altruistic acceptance of risk. *Can J Psychiatry.* 2009;54:302-11.
- [27] Hawryluck L, Gold WL, Robinson S, Pogorski S, Galea S, Styra R. SARS control and psychological effects of quarantine, Toronto, Canada. *Emerg Infect Dis.* 2004;10:1206-12.
- [28] Ieraci A, Mallei A, Popoli M. Social isolation stress induces anxious-depressive-like behaviour and alterations of neuroplasticity-related genes in adult male mice. *Neural Plasticity.* 2016;2016:6212983. Date last accessed: 27.4.2021.
- [29] Sprang G, Silman M. Posttraumatic stress disorder in parents and youth after health-related disasters. *Disaster Med Public Health Prep.* 2013;7:105-10.
- [30] Shigemura J, Ursano RJ, Morganstein, JC, Kurosawa M, Benedek DM. Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: Mental health consequences and target populations. *Psychiatry and Clinical Neurosciences.* 2020;74(4):281.
- [31] Brooks SK, Webster RK, Smith LE, Woodland L, Greenberg N, Rubin GJ. The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet.* 2020;395(10227):912-20. [http://doi.org/10.1016/S0140-6736\(20\)30460-8](http://doi.org/10.1016/S0140-6736(20)30460-8).
- [32] Ozamiz-Etxebarria N, Dosal-Santamaria M, Picaza-Gorrochategui M, Idoaga-Mondragon N. Stress, anxiety, and depression levels in the initial stage of the COVID-19 outbreak in a population sample in the northern Spain. *Cadernos de Saude Publica.* 2020;36(4):e00054020.
- [33] Liu X, Kakade M, Fuller CJ, Fan B, Fang Y, Kong J, et al. Depression after exposure to stressful events: Lessons learned from the severe acute respiratory syndrome epidemic. *Compr Psychiatry.* 2012;53:15-23.
- [34] Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate Psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health.* 2020;17(5):1729.

#### PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Psychiatry, Assam Medical College, Dibrugarh, Assam, India.
2. Assistant Professor, Department of Psychiatry, Lakhimpur Medical College Hospital, Lakhimpur, Assam, India.
3. Associate Professor, Department of Community Medicine, Assam Medical College, Dibrugarh, Assam, India.

#### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Bitupan Kalita,  
Assistant Professor, Department of Psychiatry, Lakhimpur Medical College  
Hospital, Lakhimpur-787051, Assam, India.  
E-mail: bitupan@gmail.com

#### PLAGIARISM CHECKING METHODS: [\[Jain H et al.\]](#)

- Plagiarism X-checker: Jun 12, 2022
- Manual Googling: Feb 15, 2023
- iThenticate Software: Mar 01, 2023 (13%)

#### ETYMOLOGY: Author Origin

#### AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jun 08, 2022**

Date of Peer Review: **Sep 07, 2022**

Date of Acceptance: **Mar 03, 2023**

Date of Publishing: **Jun 01, 2023**