

# Awareness, Perception, and Practice of Obese Patients toward COVID-19: A Study from Tertiary Care Center, India

Ranveer Singh Jadon\*, Divya Tripathi, Swati Allen, Mayank Pandey, Karishma Gupta, Tanveer Kaur, Amulya Gupta, Animesh Ray, Piyush Ranjan, Prayas Sethi, Naval Kishore Vikram

## ABSTRACT

**Introduction:** COVID-19 has emerged as a global health crisis. It has been established that people with obesity are prone to develop severe manifestations of COVID-19. Since there is no established treatment of the disease, yet, it is essential to increase public awareness toward prevention of infection. This study was aimed to assess the awareness, perception, and practices of obese subjects toward COVID-19 infection. **Methods:** This cross-sectional study was conducted among 260 obese patients between August 2020 and November 2020 who were enrolled in obesity and metabolic disorders clinic at our institute. A structured questionnaire consisting of 23 questions (15 of knowledge, four of perception, and four of practices) was administered by telephonic interview with the patients. Multiple regression analyses were conducted to identify factors associated with poor knowledge and practice toward COVID-19. **Results:** The mean age of the participants was  $41.7 \pm 10.2$  years, with 166 (64%) females. Mean awareness score obtained by subjects was  $9.1 \pm 2.2$  out of 15. The scores were categorized into good, moderate, and poor. Subjects with poor awareness constituted 36% of study population. Mean perception score of participants was  $14.0 \pm 2$  out of 20. Majority of patients (69.2%) had moderate perception score. Mean score obtained in practices was  $18.5 \pm 2.1$  out of 20 and 92% of subjects reported good practices. Age was negatively associated with awareness score. Gender and educational qualification had a significant impact on awareness score with males having better awareness than females. Graduates and above had higher awareness score. Increase in awareness score was found to be associated with improved practices but not with perception. **Conclusion:** The prevalence of good practices toward COVID-19 among obese patients was high (92%) although poor awareness was also highly prevalent (36%). Increasing the awareness through various means should be considered.

**Keywords:** Awareness, COVID-19, India, Obesity, Perception, Practice  
*Asian Pac. J. Health Sci.*, (2022); DOI: 10.21276/apjhs.2022.9.3.14

## INTRODUCTION

The COVID-19 viral infection pandemic has affected millions across the world with significant morbidity and mortality. The causative agent is a single-stranded, positive-sense ribonucleic acid virus which is referred as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2).<sup>[1]</sup> Clinical symptoms of SARS-CoV-2 include fever, cough, and shortness of breath along with an incubation period of 14 days following exposures to the virus.<sup>[2]</sup> Obesity has been reported to be an important risk factor for severe disease in the current COVID-19 pandemic.<sup>[3-5]</sup> Along with obesity, individuals with other comorbidities such as diabetes, cardiovascular diseases, and chronic respiratory disease have been reported to be at a higher risk of developing severe disease.<sup>[6]</sup>

In India, the initial rise in the numbers of cases was at a low rate which may be attributed to several strict government policies and their implementation of a nation-wide lockdown at an early stage of the pandemic in 2<sup>nd</sup> quarter of 2020. India is the second-most populous country and the fight against COVID-19 is still continuing. To curb the spread of the novel coronavirus, government has taken several preventive measures such as quarantine of exposed individuals, isolation of suspected/confirmed cases, sensitization of the general public, use of masks, hand sanitizer, and social distancing. However, despite the various action plans, the total number of confirmed cases continues to rise since the outbreak began.<sup>[7,8]</sup> The success of battle against COVID-19 is greatly affected by public awareness and adherence to infection control measures using their awareness, perception, and practices toward the COVID-19 pandemic. To promote the preventive measures for widespread of coronavirus, it is a need of the hour to understand

Department of Medicine, All India Institute of Medical Sciences, New Delhi, India

**Corresponding Author:** Ranveer Singh Jadon, Department of Medicine, All India Institute of Medical Sciences, New Delhi, India. E-mail: rsjadonaiims@gmail.com

**How to cite this article:** Jadon RS, Tripathi D, Allen S, Pandey M, Gupta K, Kaur T, Gupta A, Ray A, Ranjan P, Sethi P, Vikram NK. Awareness, Perception, and Practice of Obese Patients toward COVID-19: A Study from Tertiary Care Center, India. *Asian Pac. J. Health Sci.*, 2022;9(3):65-70.

**Source of support:** Nil

**Conflicts of interest:** None

**Received:** 11/12/21

**Revised:** 13/01/22

**Accepted:** 15/02/22

people's awareness, perception, and practice about the COVID-19 pandemic.<sup>[7]</sup> While restricting the movement of people can limit the viral spread, empowering citizens with the right information and encouraging their strict adherence to government advisories can play a significant role in management of COVID-19 pandemic.

In the present study, we assessed the relationships among awareness, perceptions, and practices toward COVID-19 among obese patients who are highly vulnerable group of people for this disease.

## METHODS

Obese patients (body mass index [BMI]  $\geq 25$  Kg/m<sup>2</sup>) with or without comorbidities (hypertension, diabetes mellitus, heart disease, chronic lung disease, etc.) who attended the Obesity and Metabolic Disorders Clinic at All India Institute of Medical Sciences,

New Delhi, and willing to participate were included in the study. Patients with pre-existing psychiatric illness were excluded from the study. The study was conducted between August 2020 and November 2020. The study was approved by the Institutional Ethics Committee and was conducted by administering the questionnaire using telephonic interview with participants.

### Sample Size

Proportion of persons following desirable preventive practice is likely to be less than the proportion having correct awareness or proportion having desirable perception. Therefore, we have calculated sample size based on desirable practices to prevent COVID-19 infection based on the following assumptions: a. Anticipated percentage of individuals following desirable practices = 80% (p), b. Absolute precision =  $\pm 5$  (d), and c. Confidence level = 95%. Thus, the formula used to calculate the sample size was  $n = 4 * P * (100 - p) / d^2$ . This gave us sample size of 256. We enrolled 260 subjects to be included for final data analysis.

### Study Implementation

The data were collected using a structured interviewer-administered questionnaire. The questionnaire included sociodemographic characteristics, awareness, perception, and practices toward COVID-19 and effect of nationwide lockdown on health-care practices of patients. The questionnaire assessing awareness (15 questions) was answered on a multiple option and true/false basis and an additional "I don't know" option was added. A correct answer was assigned 1 point and an incorrect/do not know answer was assigned 0 point. The total awareness score ranged from 0 to 15. Bloom's cutoff point was used to categorize the scores as good if the score was between 80 and 100% (12–15 points), moderate if the score was between 60 and 79% (9–11 points), and poor if the score was less than 60% (<9 points). Perception of participants toward COVID-19 was assessed by four questions which were answered using Likert scale ranging from strongly agree, agree, no opinion to disagree, to strongly disagree. Similarly, the questions assessing practices (four questions) were answered using Likert scale as always, very often, sometimes, rarely, and never, the points assigned were from 5 for correct practices to 1 for extremely incorrect practices. Bloom's cutoff was utilized to categorize the good moderate and poor perception and practices.

### Data Processing and Analysis

The data were analyzed using appropriate descriptive statistics and summarized by frequency, percentage, and mean. Both linear and multiple regression analyses were performed to identify determinants of poor awareness. The analyzed data were organized and presented in the tabular and narrative form accordingly. Statistical analysis was done using STATA version 12 statistical software and  $P < 0.05$  was considered statistically significant.

## RESULTS

### Sociodemographic and Clinical Characteristics of Study Participants

A total of 260 study participants were enrolled in this study. The mean age of the study participants was  $41.7 \pm 10.2$  years and

majority 166 (64%) of them were female. Out of the total study participants, about 38.6% were graduates or had higher education. Majority of the participants belongs to lower middle-income group according to modified Kuppuswamy scale of sociodemographic scale.<sup>[9]</sup> Most of the participants had a BMI between 25 and 30 kg/m<sup>2</sup> (35.4%). Regarding the clinical background of the study participants, 77 (30%) of obese patients were diabetic while 80 (31%) of the study participants were hypertensive [Table 1].

### Awareness of Obese Subjects about COVID-19 Infection

Subjects with good awareness constituted 13% of study population. One hundred and thirty-three (51%) subjects had moderate level of awareness while significant number of patients 93 (36%) had poor awareness [Table 2]. One hundred and ninety-four (74%) study participants were aware of all the symptoms of COVID-19, 44 (16.9%) were aware about at least two symptoms, and 24 (9.2%) were about at least one symptom of COVID-19. The majority 225 (86%) of the study participants expressed that coming in close contact with SARS-CoV-2-infected person and touching infected objects and surfaces may cause this infection. Two hundred and fifty (96%) patients were aware that infected respiratory droplets may cause transmission of COVID-19 infection. Proper hand washing with soap was reported as one major means of protection by 237 (91%) patients although only 67 (26%) were aware about the duration of hand washing with soap which required to eliminate the virus (20 s). Participants were less aware about the risk of severity of COVID-19 infection associated with obesity 109 (42%) and hypertension 38 (15%) [Table 3]. It was observed that patients were aware of the general information regarding COVID-19 like its origin, symptoms, and causes but when asked about specific information such as optimum duration for hand wash, concentration of sanitizer to be used, and risk factors of COVID-19 infection severity then they reported low level of awareness.

### Factors Associated with Poor Awareness of COVID-19 [Table 4]

The sociodemographic variables associated with poor awareness were age, educational status, sex, and educational qualification ( $P < 0.05$ ). It was observed that the score was poor with increasing age with the coefficient of  $-0.04$  ( $-0.06$ – $-0.02$ ). In addition, gender had a significant impact on awareness with males having better awareness than females with coefficient of  $-0.9$  ( $-1.4$ – $-0.4$ ). As the educational qualification increased, the awareness score also improved with coefficient of  $0.3$  ( $0.14$ – $0.4$ ). Awareness score was not significantly associated with occupation or monthly family income.

### Perception of the Study Participants toward COVID-19 Infection

One hundred and thirty-seven (53%) of the participants perceived that one should take preventive measures because there is no treatment of COVID-19 infection. About 43.8% of participants had the opinion that if they are obese and have any comorbid condition, then they will definitely get infected with COVID-19. This reflected the poor perception toward preventive measures for COVID-19 infection in this subset of population. Majority of

**Table 1:** Sociodemographic characteristics of study population (n=260)

Gender	n (%)
Male	94 (36)
Female	166 (64)
Age in years (Mean±SD)	41.7±10.2
Age range (years)	
18–30	34 (13.1)
31–40	94 (36.1)
41–50	83 (32)
51–60	37 (14.2)
≥61	12 (4.6)
Educational qualification	
Profession or honors	16 (6.2)
Graduate	84 (32.4)
Intermediate or diploma	46 (17.6)
High school certificate	44 (16.9)
Middle school certificate	27 (10.5)
Primary school certificate	23 (8.8)
Illiterate	20 (7.6)
Occupation of head of the family	
Legislators, senior officials, and managers	24 (9.2)
Professionals	14 (5.4)
Technicians and associate professionals	16 (6.2)
Clerks	15 (5.8)
Skilled workers and shop and market sales workers	61 (23.5)
Skilled agricultural and fishery workers	35 (13.5)
Craft and related trade workers	19 (7.3)
Plant and machine operators and assemblers	14 (5.4)
Elementary occupation	32 (12.3)
Unemployed	30 (11.4)
Monthly household income from all sources	
≥199,862	2 (0.8)
99,931–199,861	3 (1.2)
74,755–99,930	2 (0.8)
49,962–74,755	14 (5.3)
29,973–49,961	72 (27.7)
10,002–29,972	127 (48.8)
≤10,001	40 (15.4)
Socioeconomic class	
Lower	7 (2.6)
Upper-lower	80 (30.7)
Lower-middle	126 (48.5)
Upper-middle	45 (17.4)
Upper	2 (0.8)
BMI (Mean±SD)	33.5±6.1
BMI ranges 25–30	92 (35.4)
30.1–35	74 (28.4)
35.1–40	52 (20)
≥40.1	42 (16.2)
Comorbid conditions (percentage may not add up to 100 as some participants have multiple comorbidities)	
Hypertension	80 (31)
Heart diseases	9 (3.4)
Dyslipidemia	36 (14)
Liver diseases	25 (9.6)
T2DM	77 (30)
Sleep apnea	37 (14.2)
Osteoarthritis	40 (15.4)
Hypothyroidism	40 (15.4)

BMI: Body mass index, SD: Standard deviation

participants (82.3%) expressed that there is no need for undue fear of COVID-19 infection if one takes all precautions. Around two-third of the participants had the belief that if they boosted their immunity, they can beat COVID-19 infection [Table 5].

Association of sociodemographic variables with perception was determined and only age was found to be associated statistically significant with  $P < 0.05$ . It was observed that with

**Table 2:** Awareness, perception, and practice score of study subjects (n=260)

Score name	Total score (%)	Obtained score (mean ± SD)
Awareness questionnaire	15	9.1 ± 2.2
Good level awareness (12–15)	34 (13)	
Moderate level awareness (9–11)	133 (51)	
Poor level awareness (<9)	93 (36)	
Perception score	20	14.02 ± 2
Good perception (16–20)	61 (23.5)	
Moderate perception (12–15)	180 (69.2)	
Poor perception (≤11)	19 (7.3)	
Practice score	20	18.5 ± 2.1
Good practice score (16–20)	240 (92)	
Moderate practice score (12–15)	19 (7.3)	
Poor practice score (≤11)	1 (0.7)	

**Table 3:** Responses to COVID-19-related awareness items (n=260)

S.no	Question	Correct answer, n (%)	Incorrect answer, n (%)
1	First case of COVID-19 was detected in which country?	256 (98)	4 (2)
2	Primary symptoms of COVID-19	192 (74)	68 (26)
3	People may have COVID-19 infection without any symptoms.	152 (58)	108 (42)
4	Causes of COVID-19 infection	225 (86)	35 (14)
5	Corona virus infection can spread by coughing and sneezing through infected droplets.	250 (96)	10 (4)
6	One should consult nearby health facility whenever develops symptoms suggestive of COVID-19.	245 (94)	15 (6)
7	Washing hands with water and soap can eliminate the corona virus.	237 (91)	23 (9)
8	Sanitizing hands with appropriate sanitizer eliminate the coronavirus	228 (88)	32 (22)
9	Minimum duration for washing hands with soap and water to eliminate coronavirus.	67 (26)	193 (74)
10	An appropriate sanitizer to kill the coronavirus must contain the alcohol at least in which concentration?	41 (16)	219 (84)
11	Type of face mask considered best for prevention of getting COVID-19 virus infection	117 (45)	143 (55)
12	Individuals with ≥60 years of age are more prone for severe COVID-19	178 (68)	82 (32)
13	Obesity is considered as one of the risk factors for severe COVID 19 diseases.	109 (42)	151 (58)
14	Individuals who have raised blood pressure (hypertension) are not prone for severe COVID-19 disease.	38 (15)	222 (85)
15	Individuals infected with coronavirus should always be isolated in hospital.	36 (14)	224 (86)

increasing age, the perception score was getting better with the coefficient of  $-0.006$  ( $-0.0001-0.12$ ). All other factors such

as gender, educational qualification, occupation, and monthly household income were not associated with perception toward preventive measures against COVID-19 infection.

### Practice Level of COVID-19 Prevention among Study Participants

About 92% of study participants had good practice. Nineteen patients reported moderate practice and only one patient reported poor practice [Table 2]. The majority 180 (69.2%) of the respondents always avoided going out of home when not necessary. About 209 (80.3%) of the study participants always used face mask when went out of their home. Other frequently practiced preventive measures like washing hands after touching any possible infected surface were taken by 196 (75.4%) of respondents. The distance of 2 m at all times when outside home was also followed by majority of subjects 188 (72.3%). These good practices may be attributed to mandatory practice guidelines implemented by the government [Table 6].

### Association between Awareness, Perception, and Practices

On performing multiple regressions [Table 7], it was observed that perception is not correlated with the increase in awareness score but practices are significantly correlated with awareness. The coefficient of change in practices is 0.3 (–0.2–0.4).

## DISCUSSION

To the best of our knowledge, this is the first study on awareness, perception, and practice of obese subjects about COVID-19

**Table 4:** Factors associated with awareness among obese patients on multiple regressions

Variables	Coefficient	Standard error	P-value	Confidence interval
Age	–0.04	0.01	0.001*	–0.06–0.02
Sex	–0.9	0.26	0.001*	–1.4––0.4
Educational qualification	0.3	0.07	0.001*	0.14–0.4
Occupation	0.2	0.04	0.05	–0.6–0.1
Monthly income	0.09	0.08	0.279	–0.08–0.3

infection. Some studies are conducted on patients with chronic and non-communicable diseases such as diabetes and hypertension. COVID-19 is a public health problem spreading across the world with an alarming pace. The best way to tackle this problem is to be aware about the preventive and therapeutic guidelines and practicing COVID-19 appropriate behavior. In this study, awareness, perception, and practices of obese subjects toward COVID-19 were assessed. Since no study on awareness, perception, and practice toward COVID-19 in obese adults was found, thus we compared the findings with studies conducted on patients with chronic diseases and healthy population.

In our study, we observed that a total of 36% of adults with obesity had poor awareness about COVID-19 which is comparable to the other studies which also indicated high prevalence {33.9% ( $n = 404$ ) and 30.3% ( $n = 413$ )} of poor awareness among patients with chronic diseases such as hypertension, diabetes mellitus, heart disease, and chronic lung diseases.<sup>[10,11]</sup> However, this is higher than studies done in Southwest Ethiopia (17.0%) on patients with chronic diseases (hypertension, diabetes mellitus, heart disease, chronic lung diseases, etc.) and healthy adults in China (10%).<sup>[12,13]</sup> In our study, an increasing age was found to be associated with poor awareness. This is supported by some other studies, which reported that older respondents showed poor knowledge of COVID-19.<sup>[10,14,15]</sup> This could be due to higher availability, accessibility, and being technology friendly of younger population with the internet, social media platforms, television, and other modern electronic means. Obesity and hypertension as a risk factor for increased severity of COVID-19 infection were perceived by 42% and 14% of participants, respectively, in our study which is different from one study which stated that 79.2% of the participants reported that diabetes and hypertensive patients were more at risk of death because of COVID-19.<sup>[16]</sup>

Lower educational qualification was associated with poor awareness and the awareness score improved as education qualification increased. This corroborates with one study in Ethiopia ( $n = 416$ ) suggesting that low educational status was significantly associated with poor awareness and poor practice among the participants.<sup>[17]</sup> One study conducted in Malaysia ( $n = 3640$ ) and indicated that awareness score decreases as monthly income decreases<sup>[18]</sup> but in our study, monthly income was not significantly associated with awareness score. This can be due

**Table 5:** Perception of subjects toward COVID-19

S. No.	Statement	Strongly agree, n (%)	Agree, n (%)	No opinion, n (%)	Disagree, n (%)	Strongly disagree, n (%)
1	Treatment of COVID-19 infection is easily available so there is no need to take any preventive measures.	21 (8)	57 (22)	45 (17)	69 (26.6)	68 (26.4)
2	If I have any comorbid condition, then I will definitely get infected by COVID-19.	23 (8.8)	91 (35)	84 (32.4)	52 (20)	10 (3.8)
3	There is no need for undue fear or stress if one takes all preventive measures.	41 (15.8)	173 (66.5)	38 (14.6)	7 (2.7)	1 (0.4)
4	I can beat COVID-19 infection if I keep mine immunity boosted	58 (22.3)	137 (52.6)	59 (22.7)	3 (1.2)	3 (1.2)

**Table 6:** Practices of subjects toward COVID-19 disease

S. No.	Statement	Always	Very often	Sometimes	Rarely	Never
1	I avoid to go out of home until it is very necessary	180 (69.2)	54 (20.8)	14 (5.4)	8 (3.1)	4 (1.5)
2	I wear face mask covering my nose and mouth properly all the time whenever went outside home	209 (80.3)	42 (16.2)	8 (3.1)	1 (0.4)	0
3	I wash or sanitize my hands whenever touching anything which could be a possible source of infection.	196 (75.4)	48 (18.5)	14 (5.4)	2 (0.8)	0
4	I maintain at least 2 guz distance from everyone when go outside my home.	188 (72.3)	53 (20.4)	18 (6.9)	1 (0.4)	0

to impactful advertisement of COVID-19-related information and guidelines by effective means in all the areas irrespective of income group of people.

The present study found that a large majority of participants had positive perceptions toward overcoming COVID-19. It also indicated that majority of the participants (82.3%) believe that if they are following COVID appropriate behavior and taking precautions, then there is no need to fear. This is consistent with the study indicating that after the pandemic was officially announced, there is a behavioral shift in perception of the people.<sup>[19]</sup> Participants stopped unnecessary traveling from one place to another and stopped non-essential shopping to reduce the chances of getting infection with COVID-19 virus.<sup>[19]</sup> In the present study, age was found to be significantly associated with perception. It was observed that perception score increases with increase in age. This can relate to a study conducted in Sudan on 987 healthy adults which indicated that the mean perception score was significantly associated with older groups.<sup>[20]</sup> Other parameters such as gender, education qualification, occupation, and monthly income were not significantly associated with COVID-19. In the present study, 43.8% of participants believed that having any comorbidity along with obesity may increase the severity of COVID-19 infection which is close to some other studies which reported this percentage as 52.5% and 53.7% in patients with chronic diseases.<sup>[10,16]</sup>

We observed that 92% of the study subjects reported good practices to prevent COVID-19 infection. This is in contrast with a study on subjects with chronic diseases where only 25.9% of study participants had a good practice<sup>[10]</sup> but is consistent with the studies done on adults in China ( $n = 6910$ ) which reported nearly 98% compliance to practices among healthy Chinese participants.<sup>[13]</sup> In the present study, the subjects were very careful about preventive practices as around 80% of people always wear face mask covering face and mouth properly when they went outside home which is similar to a study conducted in India on 967 adult participants where 79.14% of participants wear mask covering both noses and when they went outside.<sup>[21]</sup> Around 75.4% of participants wash or sanitize their hands regularly which are more than another study conducted in India on healthy adults where 63.59% followed this practice regularly.<sup>[21]</sup>

In contrast to this, in another study conducted in Ethiopia ( $n = 423$ ), only 33.1% of patients with hypertension and Type-2 diabetes washed their hands regularly.<sup>[16]</sup> This result is also good in comparison of the study conducted in Sudan which suggested that more than half of the participants (51.2%) reported wearing a face mask when going out in public.<sup>[20]</sup> The period in which this study was conducted, strict compliance to preventive practices was enforced by the government for prevention of spread of COVID-19 infection which may contribute to this satisfactory level of good practices.

The study results showed that practices were associated with awareness score while perception not. Hence, attention should be paid to population with low level of awareness. Awareness plays a crucial role in making people understand the importance of preventive measures taken by the government. The increase in awareness must be reflected in the perceptions of the people with high risk (those with obesity), who are more prone to develop severe COVID-19-related complications. The good practice which is observed in the study may also be attributed to strict implementation of COVID-19-related restrictions on general public

**Table 7:** Association between awareness, perception, and practice

Awareness as determinant	Coefficient	Standard error	P-value	Confidence interval
Perception	0.03	0.06	0.5	-0.08-0.2
Practice	0.3	0.06	0.001*	-0.2-0.4

by government authorities. In today's scenario, all the health care workers and public health communication sectors are working to identify the level of awareness, perception, and practice among public to design public health policies and campaign to spread awareness among the population. This study provides the evidence that awareness is the predictor of practices to be followed along with restrictions imposed by government which may be beneficial for planning and implementing different strategies and policies in context of COVID-19 pandemic.

### Strengths and Limitations

This is the first study assessing awareness, perception, and practices about COVID-19 in obese subjects in India. Thus, this information will help in better understanding of areas which requires greater attention for increasing awareness of obese subjects.

The study has one limitation that data used in the analysis of this study were self-reported, which might suffer from reporting bias.

### CONCLUSION

The study revealed that most of obese subject have moderate level of awareness regarding general information but are less aware about the specific information regard to the prevention of COVID-19 infection. Most of them have moderate perception, but surprisingly good practices. These good practices may be attributed to strict restrictions imposed by government and not solely to the awareness level. Thus, increase in awareness about COVID-19 infection may be disseminated amongst the public to adopt COVID-19 appropriate behavior and restoration of social distance and hand hygiene practices by strict measures to prevent further increase in the incidence of COVID-19 and related complications.

### REFERENCES

1. World Health Organization. Covid 19 Pandemic. Geneva: World Health Organization; 2020. Available from: [https://www.who.int/health-topics/coronavirus#tab=tab\\_1](https://www.who.int/health-topics/coronavirus#tab=tab_1) [Last accessed on 2021 Jun 17].
2. Ministry of Health and Family Welfare G of I. Ministry of Health and Family Welfare, Government of India. Available from: <https://www.mohfw.gov.in> [Last accessed on 2021 Jun 03].
3. Kwok S, Adam S, Ho JH, Iqbal Z, Turkington P, Razvi S, *et al.* Obesity: A critical risk factor in the COVID-19 pandemic. *Clin Obes* 2020;10:e12403.
4. Kassir R. Risk of COVID-19 for patients with obesity. *Obes Rev* 2020;21:e13034.
5. Ranjan P, Kumar A, Chowdhury S, Pandey S, Choudhary A, Bhattacharya A, *et al.* Is excess weight a risk factor for the development of COVID 19 infection? A preliminary report from India. *Diabetes Metab Syndr* 2020;14:1805-7.
6. Bornstein SR, Rubino F, Ludwig B, Rietzsch H, Schwarz PE, Rodionov RN, *et al.* Consequences of the COVID-19 pandemic for patients with metabolic diseases. *Nat Metab* 2021;3:289-92.
7. Ghosh A, Nundy S, Mallick TK. How India is dealing with COVID-19 pandemic. *Sensors Int* 2020;1:100021.

8. Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE, Li F. Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions. *J Sport Heal Sci* 2020;9:103-4.
9. Saleem S. Modified Kuppuswamy Socioeconomic Scale Updated for the Year 2020. *Preventive Medicine: Securing our Future*; 2020.
10. Akalu Y, Ayeleign B, Molla MD. Knowledge, attitude and practice towards COVID-19 among chronic disease patients at Addis Zemen hospital, Northwest Ethiopia. *Infect Drug Resist* 2020;13:1949-60.
11. Addis SG, Nega AD, Miretu DG. Knowledge, attitude and practice of patients with chronic diseases towards COVID-19 pandemic in Dessie town hospitals, Northeast Ethiopia. *Diabetes Metab Syndr Clin Res Rev* 2021;15:847-56.
12. Kebede Y, Yitayih Y, Birhanu Z, Mekonen S, Ambelu A. Knowledge, perceptions and preventive practices towards COVID-19 early in the outbreak among Jimma university medical center visitors, Southwest Ethiopia. *PLoS One* 2020;15:e0233744.
13. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, *et al.* Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. *Int J Biol Sci* 2020;16:1745-52.
14. Wolf MS, Serper M, Opsasnick L, O'Connor RM, Curtis L, Benavente JY, *et al.* Awareness, attitudes, and actions related to COVID-19 among adults with chronic conditions at the onset of the U.S. outbreak: A cross-sectional survey. *Ann Intern Med* 2020;173:100-9.
15. Qutob N, Awartani F. Knowledge, attitudes and practices (KAP) towards COVID-19 among Palestinians during the COVID-19 outbreak: A cross-sectional survey. *PLoS One* 2021;16:e0244925.
16. Melesie Taye G, Bose L, Beressa TB, Tefera GM, Mosisa B, *et al.* COVID-19 knowledge, attitudes, and prevention practices among people with hypertension and diabetes mellitus attending public health facilities in Ambo, Ethiopia. *Infect Drug Resist* 2020;13:4203-14.
17. Adhena G, Hidru HD. Knowledge, attitude, and practice of high-risk age groups to coronavirus disease-19 prevention and control in korem district, tigray, Ethiopia: Cross-sectional study. *Infect Drug Resist* 2020;13:3801-9.
18. Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. *PLoS One* 2020;15:e0233668.
19. Chan HF, Skali A, Savage DA, Stadelmann D, Torgler B. Risk attitudes and human mobility during the COVID-19 pandemic. *Sci Rep* 2020;10:19931.
20. Mohamed AA, Elhassan EA, Mohamed AO, Mohammed AA, Edris HA, Mahgoop MA, *et al.* Knowledge, attitude and practice of the Sudanese people towards COVID-19: An online survey. *BMC Public Health* 2021;21:274.
21. Chakrawarty A, Ranjan P, Thrinath A, Aggarwal E, Isaac JA, Berry P, *et al.* Assessment of preventive practices followed by general public during COVID-19 pandemic a cross-sectional survey from India. *Cureus* 2020;12:e11274.