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Opinion of students on online education during the COVID-19 pandemic

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Abstract

The COVID-19 pandemic forced universities around the world to shut down their campuses indefinitely and move their educational activities onto online platforms. The universities were not prepared for such a transition and their online teaching-learning process evolved gradually. We conducted a survey in which we asked undergraduate students in an Indian university about their opinion on different aspects of online education during the ongoing pandemic. We received responses from 358 students. The students felt that they learn better in physical classrooms (65.9%) and by attending MOOCs (39.9%) than through online education. The students, however, felt that the professors have improved their online teaching skills since the beginning of the pandemic (68.1%) and online education is useful right now (77.9%). The students appreciated the software and online study materials being used to support online education. However, the students felt that online education is stressful and affecting their health and social life. This pandemic has led to a widespread adoption of online education and the lessons we learn now will be helpful in the future.

KEYWORDS

assessment, content delivery, COVID-19, educational technology, health effects, interaction, online education, social effects

1 | INTRODUCTION

The coronavirus disease 2019 (COVID-19) was detected in China in December 2019, spread throughout the world within a few months and was declared a pandemic by the World Health Organization on 11th March 2020. Universities around the world had to close their campuses down in the spring of 2020 and shift all their academic programs online (Bao, 2020). Universities were not prepared for such a transition from classroom-based education to completely online education. Most universities initially lacked infrastructure and strategies (Zhang, Wang, Yang, & Wang, 2020).

There has been a lot of advances in educational technology in the last few decades and the same proved to be immensely useful during this pandemic (Chatterjee & Chakraborty, 2020; Dhawan, 2020). Several online platforms to support online education were available

(Nash, 2020). Nevertheless, it was a challenge for universities to map their educational activities in an online space. Additionally, professors and students faced a wide range of logistic, technical, financial, and social problems (Lassoued, Alhendawi, & Bashitalshaaer, 2020; Peters et al., 2020).

The pandemic and the lockdowns to contain it have affected the mental health of people around the world. Many students are suffering from stress and anxiety (Cao et al., 2020; Islam, Barna, Raihan, Khan, & Hossain, 2020). Such psychological issues often hinder students from adapting to online education. Moreover, not all students have equal access to, and expertise on, digital technologies. Although these inequalities existed earlier, the COVID-19 pandemic has exposed this digital divide (Jæger & Blaabæk, 2020).

Netaji Subhas University of Technology is a reputed university in India offering undergraduate and graduate programs in technology,

design and management. The university has three sophisticated urban campuses located in New Delhi and attracts students from different parts of the country and many international students. The university suspended regular classes from 13th March 2020 and later a nationwide lockdown began in India on 25th March 2020. The academic programs of the university are based on intense classroom- and laboratory-based activities. It was difficult to move all these academic activities online immediately. Moreover, it was assumed that the situation will normalize soon and the campuses could be reopened within weeks. As a temporary measure, professors recommended students to join massive open online courses (MOOCs) and study from other online resources. In the meantime, the university restructured its teaching-learning process and the academic activities were moved onto an online platform albeit with some modifications. The professors and students of the university gradually adapted to the scenario. The professors now use Google Classroom to dispense course material and information related to their courses, and deliver live lectures through Google Meet. The professors typically use presentation programs like PowerPoint and Prezi and note-taking programs like OneNote to disseminate information. Furthermore, depending on the nature of their courses, the professors use online tools to support problem solving, programming, and designing activities. The professors deliver lectures using their own computers often augmented with a digital pen. We surveyed the undergraduate students of the university and tried to understand their opinion on online education during the COVID-19 pandemic. In particular, we were interested in the students' opinion on content delivery and interaction in online education and the health and social effects of online education.

2 | RELATED WORK

2.1 | Online education strategies

The pandemic forced various organizations to suddenly modify their workflow strategies and adopt new technologies. In most cases, these organizations did not get enough time to reflect upon how the new strategies and the associated technologies should be introduced and integrated to their existing setup (Carroll & Conboy, 2020). Universities around the world were no exception. Bao (2020) was perhaps the first to describe how universities were moving from classroom-based education to online education because of the raging pandemic. Researchers have tried to understand the viewpoint of students on online education during the COVID-19 pandemic using empirical studies in India (Mishra, Gupta, & Shree, 2020), Serbia (Bojovic, Bojovic, Vujosevic, & Suh, 2020), and USA (Patricia, 2020).

There existed substantial infrastructure for online education in many countries before the pandemic (Mishra et al., 2020). However, no university was ready for a complete shift to online education. Empirical studies have found that students feel that they learn better in physical classrooms than through online education (Bojovic et al., 2020). Students miss the help they receive from their peers in

classrooms and laboratories and access to library (Patricia, 2020). Nevertheless, students feel that online education helped them to continue their study during the pandemic (Mishra et al., 2020). Universities are now using innovative strategies to ensure continuity of education for their students (Zhu & Liu, 2020).

Professors are now delivering course content through various platforms. Professors are using online educational platforms, video-conferencing software, and social media to teach their courses (Patricia, 2020). Online educational platforms, like Google Classroom and Blackboard, allow professors to share notes and multimedia resources related to their courses with students. The online educational platforms also allow students to turn in their assignments and professors to keep track of the progress of the students. Videoconferencing tools, like Google Meet, Zoom, and Microsoft Teams, help in organizing online lectures and discussion sessions. Such tools typically support slideshows and a chatbox. Some universities are also disseminating course material through their websites (Chatterjee & Chakraborty, 2020) and their own learning management system (Mishra et al., 2020). Additionally, professors are taking help of virtual laboratories to teach science courses (Ray & Srivastava, 2020). Virtual laboratories allow students to simulate experiments related to their courses online (Diaz & Walsh, 2020; Vasiliadou, 2020). Such tools were being used for simulation and data visualization for many years (Jain, Chakraborty, & Chakraverty, 2018), but their use have now become widespread.

There is a lack of studies on how efficiently students can interact with professors and fellow students through various online tools and how effective online assessment techniques are. Only a few researchers have covered these issues. For example, Patricia (2020) reported that students prefer face-to-face interaction with professors and Bojovic et al. (2020) reported that many professor lack confidence on online assessment techniques.

2.2 | Health and social issues

The COVID-19 pandemic and the closing down of the university campuses have affected the mental health of university students (Savage et al., 2020). Empirical studies conducted in Bangladesh (Khan et al., 2020), China (Jiang, 2020), France (Essadek & Rabeyron, 2020), Greece (Kaparounaki et al., 2020), UK (Savage et al., 2020), and USA (Copeland et al., 2020) found that a large proportion of students are suffering from mental disorders of varying severity. Many students reported suffering from depression, anxiety, distress (Essadek & Rabeyron, 2020), and even suicidal thoughts (Kaparounaki et al., 2020). The current situation is having a modest but persistent effect on the mental health of students (Copeland et al., 2020). Students are worried about both the pandemic in general and their careers (Hasan & Bao, 2020). Lack of motivation and negative emotions (Patricia, 2020) make it difficult for many students to focus on online education.

In a study conducted just before the outbreak of COVID-19, Lembani, Gunter, Breines, and Dalu (2020) observed that there

existed a digital divide between urban and rural areas, and students in rural areas often do not have adequate access to information and communication technology. Grishchenko (2020) also reported that economically disadvantaged people and people living in rural areas often have limited access to digital technologies. Steady access to digital technologies is a precondition for online education. Students with limited access to digital technologies and students who are less knowledgeable about those technologies are facing problem in adapting to online education. Beaunoyer, Dupéré, and Guitton (2020) opined that the digital divide existed before but the pandemic has exacerbated it. Furthermore, some students live in houses that are not enough spacious and face problem in attending online classes at their homes (Patricia, 2020).

3 | MATERIALS AND METHODS

3.1 | Questionnaire

We prepared a questionnaire with 20 statements related to online education during the COVID-19 pandemic (Table 1). A student had to respond to each statement on a 5-point Likert scale where a score of “1” represented “Strongly disagree” and a score of “5” represented “Strongly agree.” The statements were related to the teaching-learning process in general, content delivery, professor-student interaction, assessment and health and social impact of online education.

We asked the students to compare online education with physical classroom-based education (GE1) and MOOCs (GE2). We also asked them if they felt that the professors have improved their online teaching skills since the beginning of the pandemic (GE3) and online education is a viable alternative in the current circumstance (GE4). We wanted to know from the students if they felt that enough online resources are available now (CO1), and if the courses can be enriched by slideshows (CO2), note-taking programs (CO3), and more specialized online tools for problem solving, programming, and designing (CO4). We wanted to know what the students felt about their interaction with the professor through an online platform. We asked them if they could interact better with professors in a physical classroom than through online education (IN1). We asked them if they felt professor-student interaction improved when the professor used a digital pen (IN2), the professor and students showed their faces (IN3), and the professor allowed students to post messages in the chatbox (IN4) during the lectures. We asked the students if they believed that online tests and quizzes can effectively evaluate their knowledge (AS1) and weekly assignments and tests help them to learn (AS2).

We wanted to know whether the students felt that online education is impacting their health and social life. We asked them if online education is leading to the phobia of losing Internet connectivity (HE1) and overuse of digital technologies (HE2) among them. Furthermore, we asked them if excessive screen time is making them stressed and affecting their sleep (HE3). We wanted to know from the

TABLE 1 The questionnaire

Indicator	Statement
<i>General issues</i>	
GE1	Learning takes place better in physical classrooms than through online education.
GE2	Online education is however better than attending MOOCs.
GE3	Professors have improved their online teaching skills since the beginning of the COVID-19 pandemic.
GE4	Online education is a viable alternative during the COVID-19 pandemic.
<i>Content delivery</i>	
CO1	Adequate study materials are available online.
CO2	Slideshows make a lecture more informative.
CO3	Note-taking software helps in sharing course material between the professor and students.
CO4	Online tools for problem solving, programming and designing can enrich a course.
<i>Interaction</i>	
IN1	Professor-student interaction takes place better in physical classrooms than through online platforms.
IN2	Use of a digital pen makes a lecture more interactive.
IN3	If the professor and students show their faces, then a lecture becomes more interactive.
IN4	If the professor allows the students to post comments in the chatbox during a lecture, then it becomes interactive.
<i>Assessment</i>	
AS1	Online tests and quizzes effectively evaluate the knowledge of students.
AS2	Weekly assignments and tests help in the learning process.
<i>Health issues</i>	
HE1	Online education is leading to phobia of losing internet connectivity.
HE2	Online education is leading to overuse of digital technologies.
HE3	Excessive screen time is causing stress and affecting sleep.
HE4	Online assessment creates more anxiety than traditional forms of assessment.
<i>Social issues</i>	
SO1	Online education is affecting the daily life of students.
SO2	Online education is exposing the digital divide among students.

students if online assessment is creating more anxiety than traditional forms of assessment (HE4). Finally, we asked the students if online education is affecting their daily life (SO1) and exposing the digital divide among them (SO2).

We sent the questionnaire to 387 undergraduate students of the university on 15th September 2020 and continued to receive their responses for the next 2 days.

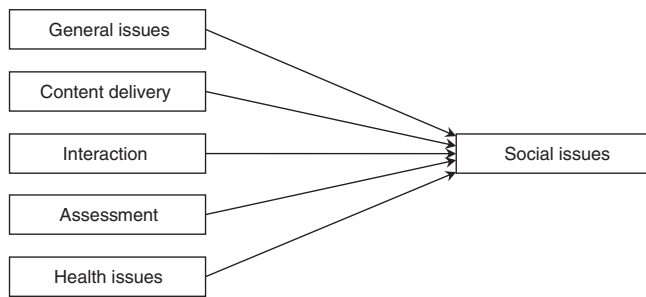


FIGURE 1 A model to examine the influence of various aspects of online education on social issues related to online education

3.2 | Data analysis

We analyzed the correlation and covariance between the different aspects of online education. Further, we constructed a model to examine the influence of the different aspects of online learning on the social issues related to online education (Figure 1). We used partial least squares structural equation modeling (PLS-SEM) using SmartPLS (version 3.2.8) to evaluate the model. The evaluation was done in two steps. In the first step, a measurement model to establish the reliability and validity of the latent variables, that is, constructs, was developed. In the second step, an assessment of the structural model to impute the relationship between the latent variables was performed.

4 | RESULTS

4.1 | Descriptive results

We received responses from 358 students. The mean age of the respondents was 20.09 years (*SD*: 1.13). Out of the respondents, 34 (9.5%) were female and 324 (90.5%) were male.

The students had a mixed opinion about online education during the COVID-19 pandemic. A majority of the students (65.9%) felt, that is, agreed or strongly agreed, that learning takes place better in physical classrooms than through online education and only a minority of the students (31.6%) felt that online education is better than attending MOOCs (Table 2). Nevertheless, the students felt that professors have improved their online teaching skills since the beginning of the pandemic (68.1%) and online education is a viable alternative in the current circumstance (77.9%).

The students appreciated the online resources and tools being used by the professors to disseminate information. The students (73.7%) felt that adequate study material is now available online. The students also felt that slideshows (58.7%) and note-taking programs (69.0%) are effective in disseminating information. The students (72.1%) felt that online tools for problem solving, programming, and designing can enrich courses.

The students expressed how they thought lectures can be made more interactive. The students (75.1%) felt that they can interact

better with professors in a physical classroom. The students (80.2%) felt that professors can make lectures more interactive using devices like a digital pen. Interestingly, only 36.0% students felt that the interaction can improve if professors and students show their faces during lectures. The students (76.3%) felt that communication between professors and students through chatbox during lectures will make them more interactive.

Almost half of the students felt that regular assessments can help in improving online education. We found that 48.0% students felt that online assessments can properly evaluate their knowledge and 45.2% students felt that weekly tests facilitate the learning process.

The students felt that online education is affecting their health. We found that 66.0% students felt that online education is causing phobia of losing Internet connectivity among them. A large majority of the students (82.7%) felt that online education is leading to overuse of digital technologies and 74.6% students felt that excessive screen time is causing stress and affecting their sleep. The students (54.2%) also felt that online assessment causes more anxiety than traditional forms of assessment.

The students also felt that online education has societal implications. We found that 67.9% students felt that online education is affecting their daily life and 63.6% students felt that online education is exposing the digital divide among them.

4.2 | Analytical results

The measurement model estimated the latent variables as a weighted sum of their manifest variables. Table 3 presents the result of factor loadings, average variance extraction (AVE), and composite reliability to test the internal consistency and the construct validity of the variables. All factor loadings on their respective constructs were found to be greater than 0.6 and significant at 1% level, except for the loading of CO3, which was 0.599 and significant at 5% level. The high factor loadings indicated that the measures have convergent validity. Further, the convergent validity was measured and found to be adequate based on its high composite reliability ($>.75$) for all constructs. Table 3 also presents the values for AVE for the latent variables to provide evidence for convergent validity. AVE of all constructs were higher than the recommended minimum estimate of 0.50 (Fornell & Larcker, 1981) supporting evidence for convergent validity. For the Interaction construct, AVE was slightly less (0.476) than the minimum recommended estimate (Fornell & Larcker, 1981). However, we found an adequate composite reliability (0.782) to support the convergent reliability. It can be concluded that the results of factor loading, composite reliability and average variance extracted for all the constructs indicate high internal consistency in all the indicators measuring their respective constructs.

Table 4 provides an assessment of discriminant validity to find evidence of dissimilarity among the measures of the constructs according to Fornell and Larcker (1981). The AVE for each construct, that is, the diagonal values of the matrix, was compared with the absolute correlations of the other constructs, that is, the nondiagonal

TABLE 2 Responses

Indicator	Percentage of respondents					Mean score	
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	SD
GE1	4.7	8.7	20.7	31.0	34.9	3.827	1.142
GE2	14.5	25.4	28.5	20.1	11.5	2.885	1.219
GE3	3.9	7.5	20.4	36.0	32.1	3.849	1.077
GE4	3.4	4.7	14.0	30.7	47.2	4.137	1.043
CO1	3.1	5.9	17.3	29.3	44.4	4.061	1.062
CO2	4.7	13.1	23.5	29.9	28.8	3.648	1.164
CO3	1.4	6.7	22.9	30.7	38.3	3.978	1.004
CO4	1.7	4.2	22.1	34.9	37.2	4.017	0.955
IN1	3.6	7.8	13.4	21.2	53.9	4.140	1.139
IN2	2.5	4.2	13.1	33.0	47.2	4.182	0.983
IN3	14.8	20.9	28.2	20.9	15.1	3.006	1.272
IN4	3.4	4.5	15.9	42.2	34.1	3.992	0.992
AS1	14.0	13.4	24.6	31.0	17.0	3.237	1.278
AS2	11.2	14.5	29.1	30.4	14.8	3.232	1.200
HE1	6.1	8.9	19.0	28.8	37.2	3.818	1.201
HE2	2.5	6.4	8.4	23.2	59.5	4.307	1.035
HE3	5.3	7.5	12.6	24.3	50.3	4.067	1.186
HE4	11.2	16.5	18.2	19.3	34.9	3.503	1.398
SO1	6.7	8.4	17.0	29.6	38.3	3.844	1.213
SO2	5.3	7.3	23.7	30.4	33.2	3.791	1.139

Note: Percentages may not total 100 due to rounding.

values. Since all diagonal values were higher than the absolute of non-diagonal values of the matrix, there was sufficient evidence of discriminant validity, that is, the measures of constructs were not related to each other.

Table 5 presents the heterotrait-monotrait ratio of correlations (HTMT) to assess the discriminant validity, which for all constructs is less than the threshold value 0.9 (Gold, Malhotra, & Segars, 2001). The PLS-SEM model evaluated the influence of General issues, Content delivery, Interaction, Assessment, Health issues on Social issues related to online education. The value of *r*-square equal to .427 indicates that 42.7% variation in the dependent variable, namely Social issues, is due to the independent variables, namely General issues, Content delivery, Interaction, Assessment, and Health issues, considered in the present study. We used three appropriate indices, namely chi-square, standardized root mean square residual (SRMR), and normed fit index (NFI) to measure the fitness of the model. We found the value of chi-square equal to 1951.32 ($p < .05$), the value of SRMR equal to 0.056 and the value of NFI equal to 0.892. Since the result of the chi-squared test was significant, the SRMR value was less than the cut-off value of 0.08 as suggested by Hooper, Coughlan, and Mullen (2008) and the NFI value was close to 1 as suggested by Bentler and Bonett (1980), the model is a good fit. The estimate of the standardized regression coefficient from Interaction ($\beta = .164$, $t = 3.288$, $p < .01$), Assessment ($\beta = -.092$, $t = 2.097$, $p < .05$), and Health issues ($\beta = 0.526$, $t = 10.878$, $p < .01$) indicated a significant influence on the

Social issues (Figure 2). In contrast, the regression coefficients from General issues ($\beta = -.089$, $t = 1.794$, $p > .05$) and Content delivery ($\beta = -.005$, $t = 0.104$, $p > .05$) were found to be insignificant on Social issues. This means that the modes of interaction and assessment being used in online education and the health of the students significantly ($p < .05$) influence their social wellbeing. However, general educational issues and content delivery approaches only have insignificant ($p > .05$) influence on the social wellbeing of students.

5 | DISCUSSION

We collected opinions of students on online education during the COVID-19 pandemic. We asked the students to compare online education with education in physical classrooms and education through MOOCs. We understand that the comparisons are somewhat uneven. The discussions and collaborative activities that occur in a physical classroom are difficult to replicate on an online platform. On the other hand, MOOCs provide students information on a wide range of topics and the latest technologies, which may not be available in their universities. Undergraduate engineering students typically like to attend MOOCs on subjects like computer programming and system designing (Sra & Chakraborty, 2018). However, online education can be better personalized because of smaller class size and homogeneous background of the students.

The students reported to have observed an improvement in the online teaching skills of the professors. Professors are accustomed to teach in physical classrooms and most of them had no experience of

TABLE 3 Results of factor loadings, composite reliability, and average variance extraction (AVE)

Construct	Indicator	Outer loadings	Composite reliability	Average variance extracted (AVE)
General issues	GE1	.716**	0.832	0.553
	GE2	.755**		
	GE3	.750**		
	GE4	.755**		
Content delivery	CO1	.729**	0.806	0.513
	CO2	.846**		
	CO3	.599*		
	CO3	.667**		
Interaction	IN1	.828**	0.782	0.476
	IN2	.652**		
	IN3	.611**		
	IN4	.647**		
Assessment	AS1	.899**	0.861	0.756
	AS2	.839**		
Health issues	HE1	.736**	0.859	0.605
	HE2	.813**		
	HE3	.836**		
	HE4	.722**		
Social issues	SO1	.874**	0.832	0.713
	SO2	.814**		

*Significant at $p < .05$.

**Significant at $p < .01$.

teaching online before this pandemic. They have learnt new techniques and adjusted to online teaching in the last 6 months (Mahmood, 2020). We believe that occasional peer-to-peer discussion on tools and techniques for online education will be beneficial to professors.

We found that professors typically use presentation programs and note-taking programs to disseminate information. PowerPoint is suitable if a professor wants to deliver a lecture following a pre-determined sequence. Prezi is suitable if a professor does not want to follow a fixed sequence of topics and wants to make the session more interactive. OneNote can help a professor and students to collaboratively accumulate knowledge. Educational technologies require supporting quality interaction (Singh, Adhikary, Gupta, & Singh, 2010). Devices like digital pen can make lectures more humane. We were surprised to learn that the students do not prefer showing their faces during lectures. We believe that this is because they are reluctant to actively participate in the class. Professors may post open-ended questions in the chatbox and solicit students' responses. Students can share their ideas on solving a problem, especially in courses related to computer programming and circuit designing.

Educational technologies have improved over the years. Today, there are several sophisticated online education platforms and many specialized educational resources for various courses. Some online educational tools also facilitate collaborative learning (Adhikary, Gupta, Singh, & Singh, 2010). However, self-reflection on the part of students is extremely important in online education. We found that students feel that there is a need for periodic assessment to keep the teaching-learning process on the right track. Professors may use innovative tools and techniques for the same. Some empirical studies have revealed that students are suffering from stress and anxiety during this pandemic (Arora, Chakraborty, Bhatia, & Mittal, 2020; Islam et al., 2020). Professors should try to provide some flexibility to students attending their online courses (Mahmood, 2020). We came to

TABLE 4 Discriminant validity according to Fornell and Larcker (1981)

	General issues	Content delivery	Interaction	Assessment	Health issues
General issues	0.744				
Content delivery	0.436	0.716			
Interaction	−0.186	0.015	0.690		
Assessment	0.414	0.325	0.023	0.870	
Health issues	−0.317	−0.163	0.288	−0.150	0.778

TABLE 5 Discriminant validity (HTMT)

	General issues	Content delivery	Interaction	Assessment	Health issues
General issues					
Content delivery	0.619				
Interaction	0.362	0.233			
Assessment	0.591	0.448	0.148		
Health issues	0.395	0.188	0.365	0.196	

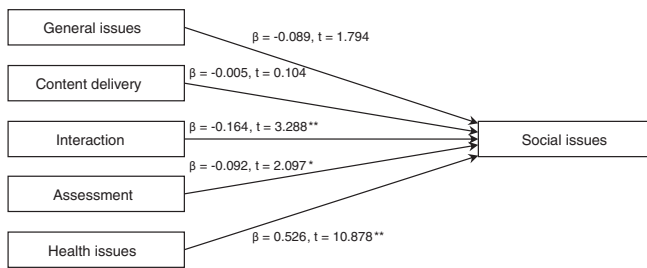


FIGURE 2 Structural model. *Significant at $p < .05$. **Significant at $p < .01$

know that there are many homes where there are a limited number of digital devices and more people need to use them simultaneously. This is a new form of digital divide. Our structural equation modeling showed that different constructs are influencing the social issues related to online education. The social impact of online education needs to be studied carefully (Toquero & Talidong, 2020).

6 | CONCLUSION

Online education has been on the fringe for a long time. The COVID-19 pandemic made it the mainstream. We conducted a survey to know the opinion of undergraduate students in a university in India on different aspects of online education during the COVID-19 pandemic. We found that the students considered online education a viable alternative under the current circumstances. We however think that there is scope for improvement. Professors should try to make online education better acceptable among students. Techniques like flipped classroom, case studies, and gamification may be introduced in online education and their effects may be studied. The COVID-19 pandemic has led to adoption of online education on a large scale around the world for the first time. The lessons we learn about online education during this pandemic will be useful during future exigencies (Chatterjee & Chakraborty, 2020; Skulmowski & Rey, 2020).

CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1002/hbe2.240>.

DATA AVAILABILITY STATEMENT

The dataset has been provided as online supplementary material.

ETHICS STATEMENT

This is a survey-based study and informed consent was taken from the respondents all of whom were more than 18 years old.

PATIENT CONSENT STATEMENT

The study is not clinical in nature and no patient was involved in this study.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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