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Risk perception, knowledge, attitude, and preventive practice towards COVID-19 outbreak: A cross-sectional online survey in Kerala

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Abstract

Introduction: The COVID-19 pandemic affects people of all ages; healthy and unhealthy. The only measure for prevention of the spread of infection is SMS (social distance, mask, and sanitation) in the absence of an effective drug or vaccine. The lockdown had affected people's mobility and livelihood. **Objectives:** This study assessed the risk perception, knowledge, attitude, and preventive practice of people of Kerala towards the COVID-19 outbreak and the association between the risk perception, knowledge, attitude and preventive practices and sociodemographic variables and the factors associated with risk perception. **Methods:** An online survey using Google Forms was conducted during the month of July 2020 among 451 persons from all the 14 districts of Kerala. **Results:** The majority of the study participants (60%) perceived their risk as low. Most of the participants (69.4%) had a very high level of knowledge with an overall correct rate of 86% regarding symptoms, risk factors, mode of spread, and treatment of COVID-19. The mean (SD) of knowledge, attitude, and preventive practice were 12.6 (1.8), 4.6 (1.2), and 9.3 (1.1) respectively. Most of the participants (94.9%) expressed a negative attitude about control of the outbreak and (93.1%) had good preventive practices. The risk perception was significantly associated with preventive practice ($p < .05$). Ordinal logistic regression analysis revealed that risk perception was significantly associated with living in a hotspot or containment zone, having comorbidities, occupation in government/semi-government/central government institutions, and source of income as salary. **Conclusion:** There is a need for effective health education programs aimed at enhancing positive attitude and adherence to strict practices of SMS (social distance, mask, and sanitation) and updated knowledge of COVID-19 are needed to contain the pandemic at the local level.

Keywords: COVID-19 pandemic, knowledge, risk perception, survey

Introduction

COVID-19 outbreak is a viral respiratory disease caused by a new coronavirus; SARS-CoV-2 reported from China in December 2019 (Dousari, 2020). It was declared as a Public Health Emergency of International Concern (PHEIC) by World Health Organization (WHO) on 30 December 2019 according to the recommendation of the International Health Regulations (IHR) Emergency

Committee and later on as a pandemic on 11 March 2020 (WHO, 2020).

Anybody can get infected with COVID-19 irrespective of age and health. Many recover without hospitalization, however, few develop serious and critical illnesses. Age above 60 years and having other comorbidities like high blood pressure, diabetes, heart and lung diseases, obesity, cancer are additional risk factors for developing serious illnesses (CDC, 2020). It spreads by direct person-to-person close contact within 6 feet, or through respiratory droplets and less commonly by airborne route within a closed environment and through contaminated surfaces. It can be prevented effectively by adopting simple preventive measures of wearing a mask, maintaining physical distance of a minimum of 6 feet, regular hand hygiene using soap and water or hand

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sanitizer, avoiding crowded places and close physical contact, touching of eyes, ears, nose, and mouth with unwashed hands, keeping rooms well ventilated, and maintaining cough hygiene. Frequent cleaning and disinfecting of surfaces and monitoring of symptoms like fever, cough, breathlessness, diarrhoea, headache, and anosmia will help health maintenance (CDC, 2020).

Studies from China had shown that the lockdown measures in Wuhan city were effective in containing the epidemic. WHO suggested that lockdown can slow down the transmission of COVID-19 by limiting movement and contact between people. Reports from France had shown that lockdown was effective in reducing the basic reproduction number of viruses from over three to less than one (Di Domenico, 2020).

The first case of COVID-19 in India was reported in Kerala on 30 January 2020, was a student who returned from Wuhan, China. Since March 2020, the Government of India initiated preventive measures in the form of prohibiting mass gathering, restricting international transport by closing land check posts which were appreciated by WHO as 'tough and timely' and issued various guidelines on the use of the mask, home quarantine, and social distancing. India had started the world's largest national lockdown on 25 March 2020 and extended it up to 31 May 2020, in different phases (Rai, Shukla, & Dwivedi, 2020).

On 14 March 2020, there were 22 reported cases and many persons were under surveillance. COVID-19 was declared as a notifiable disease by the Government of Kerala. The WHO had praised the Government of Kerala when it successfully achieved a recovery rate of 51.7% within five months. The measures that helped in this commendable success were active surveillance, monitoring, developing and strengthening frontline health workers, effective risk communication and good community engagement, and managing psychosocial issues of a vulnerable population. The experience gained through health system preparedness and outbreak response during floods in 2018 and the Nipah outbreak in 2019 helped in planning, resource mobilization, and collaboration with major stakeholders. When the lockdown ended on 31 May 2020, there were 61 new cases and 624 confirmed

cases of COVID-19 in Kerala (DHS.Kerala, 2020) As the number of cases was increasing gradually, the investigators attempted to assess the risk perception, knowledge, attitude, and preventive practice of people residing in Kerala towards COVID-19 outbreak during the immediate post-lockdown period and their association with sociodemographic variables and the factors associated with risk perception.

Objectives

In the present study, the objectives were to assess the risk perception, knowledge, attitude, and preventive practice of people of Kerala towards the COVID-19 outbreak. The study also intended to find the association between risk perception, knowledge, attitude and preventive practice and sociodemographic variables and the factors associated with risk perception.

Materials and Methods

Study design and sample

This cross-sectional online survey was conducted during July 2020. The practical difficulties of conducting an extensive state-level household survey during a fast-moving infectious disease outbreak makes rapid online surveys more helpful. The data were collected on a self-reported questionnaire using Google Forms. As the people of Kerala are highly literate and internet usage is common, the link to the Google Forms was given to the respondents via WhatsApp groups.

The sampling method followed in this online survey was convenience sampling using the snowball method and the link to the Google Form survey was sent to friends and acquaintances, who further shared it with their network members. The respondents were people who lived in Kerala during the month of June 2020, aged ≥ 18 years and who could read and write the Malayalam language. Health workers and COVID-19 infected people were excluded from the study.

The representative target sample size was calculated based on a study from Bangladesh (Rahman & Nusrat, 2020) and China (Zhong *et al.*, 2020; Dryhurst, *et al.*, 2020). The highest sample size obtained was 390 using precision $\pm 5\%$ with a 95% confidence interval. To get a representative sample from all over Kerala, it was decided to take a minimum of 20-25 participants from

all 14 districts. As the investigators had no control over the study instrument after being launched, a total of 454 respondents participated in the survey.

Measurement tools and data analysis

The self-reported questionnaire was prepared by the authors based on the guidelines by the Centres for Disease Prevention and Control (CDC), WHO, Government of India and Government of Kerala. The data were collected in the Malayalam language. The first page of the online questionnaire gave a clear description of the aims and objectives of the study which served as the participant information sheet. A question on the age of the participant was included to eliminate participants aged ≤ 18 years. The informed consent page explained clearly about the voluntary participation and those who had expressed willingness only can proceed further. Confidentiality and anonymity of the data were assured. The questionnaire contained four sections- risk perception, knowledge, attitude, and practice. All questions were made mandatory except one question on pregnancy. After completing the questionnaire, the participant submitted the form. It took around 20 minutes to complete the form filling.

Sociodemographic variables. There were 17 items in the sociodemographic tool. Mean (SD) age was calculated and the age was divided into five categories; gender into three; religion and marital status into four; education into seven; occupation and source of income into five. The data were collected from all 14 districts. The data were collected about whether the place of residence was in the hotspot of containment zone, whether on treatment for any chronic diseases, pregnancy status of female respondents, family members coming from places other than Kerala during the immediate period preceding the fourth phase of lockdown, whether the respondent or any family member was on quarantine, and whether using Aarogya Setu or Government of Kerala (GoK) direct mobile app. (First category for each variable on the table for association (Table 3) is the reference category for regression analysis).

Risk perception, knowledge, attitude, and preventive practice. The risk perception was assessed on a seven-point rating scale: 1 (extremely low) to 7 (extremely high). The Median (IQR) of the risk perception score was calculated. There were 15

questions on the knowledge including symptoms, risk factors, mode of spread, treatment, and prevention with two answer options -Yes/No. Each correct answer was scored as 1, maximum score 10, poor (0-5), average (6-12), and good (13-15) knowledge. There were 10 questions on attitude about control of the outbreak with two answer options - Yes/No. Each positive response was given a score of 1, maximum score of 10, good (≥ 7), and poor (< 7). There were 10 questions on preventive practices with two answer options - Yes/No, each correct preventive practice was given a score of 1, maximum score 10, poor (0-3), average (4-7), and good (8-10). Mean (SD) knowledge, attitude, and preventive practice scores were calculated.

Plan for data Analysis. Frequencies of sociodemographic variables and mean (SD) of risk perception, knowledge, attitude, and preventive practices were described. Association between variables was analyzed using Chi-square test, independent t-test, and one-way analysis of variance (ANOVA) which was appropriate. Ordinal logistic regression analysis was done using all sociodemographic variables having a p -value < 0.1 to identify factors associated with risk perception. The backward stepwise method was used for selecting factors. Non-standardized regression coefficients (β) and odds ratio (OR) with 95% confidence interval (CI) were used to quantify the association between sociodemographic variables and the risk perception. Data were analyzed using SPSS. The level of statistical significance was set at $p < .05$ (two-tailed).

Ethical approval. All the study procedures complied with the institutional and national ethical standards prescribed. The approval for the study was obtained from the Scientific Review Committee and Institutional Ethics Committee of Government College of Nursing, Thiruvananthapuram, Kerala.

Results

Sociodemographic variables

Out of 454 respondents, three were covid positive patients and were excluded from the study. The rest 451 respondents were included for data analysis. The sociodemographic characteristics of the study participants are described below.

Only 441 respondents had reported their age. The majority (35.1%) belonged to 18-29 years and the mean (SD) age was 36.7 (12.6) years. Most of them were males (55.6%), belonged to Hindu religion (61%), married (67.8%), graduate-level education (36.6%), employed (62.5%), in Government/Semi-Government/Central Government Institutions (28.8%), and had salary as a source of income (52.5%). Participants from Thiruvananthapuram district constituted the majority (29.9%), from hotspot or containment zone (22%), had some family members came from places other than Kerala during the month of May 2020 (10.2%), 12.6% reported that they or a family member was on quarantine, 22.7% were on treatment for some chronic diseases and only 1.3% had three or more chronic diseases. Among the women participants, 4.6% were pregnant. 34.4% of the respondents were using Aarogya Setu or GoK (Government of Kerala) direct mobile App.

Risk perception, knowledge, attitude, and preventive practice towards COVID-19 outbreak

The median (IQR) risk perception score was 3 and the majority perceived their risk as extremely low (22.8%). The mean (SD) scores of knowledge, attitude, and practice were 12.6 (1.8), 4.6 (1.2), and 9.3 (1.1) respectively. The majority of the participants (69.4%) had a very high level of knowledge, most of the participants (94.9%) had a negative attitude, and the majority (93.1%) had good preventive practice regarding the COVID-19 outbreak. The sample characteristics and scores of risk perception, knowledge, attitude, and preventive practice towards the COVID-19 outbreak are described in Table 3 along with the association between risk perception, knowledge, attitude and preventive practice and sociodemographic variables.

The rate of the correct answer on the knowledge questionnaire was 58.8-98.9% with an overall correct rate of 86% (12.9/15*100). The responses to the knowledge, attitude, and preventive practice are given in Table 1.

Table 1
Questionnaire of Knowledge, Attitude, and Preventive Practice towards COVID-19

		N=451		
Questions				
Knowledge (correct rate, % per total sample)		True (f)	Don't know (f)	False (f)
K1	The main symptoms of COVID-19 are dry cough, fever, inability to sense smell, fatigue, muscle pain, and shortness of breath (93.3).	421	6	24
K2	If someone gets a cold, fever, and cough; it is due to COVID-19 infection (81.8).	39	43	369
K3	All persons with COVID-19 will not develop severe disease. Those who are very young, elderly, or have chronic diseases are more likely to have a severe disease (95.6).	431	14	6
K4	The COVID-19 virus can enter the body through the eyes, nose, and mouth (95.3).	430	10	11
K5	The COVID-19 virus cannot survive outside the human body (58.8).	118	71	262
K6	The COVID-19 infected patients, who are healthy and without manifestations will not spread the virus to others (90.0).	14	31	406
K7	All people who have contact with COVID-19 infected patients need to be quarantined for a period of 14 days (96.7).	436	6	9
K8	At present, there is no definitive treatment for COVID-19 (86.3).	389	28	34
K9	The first-ever case of COVID-19 in India was reported in Kerala (72.5).	327	41	83
K10	COVID-19 is a preventable disease (82.0).	370	42	39
K11	Wearing an ordinary mask by the general public gives sufficient protection against COVID-19 (53.9).	243	30	178

Table 1 Cont...
Questionnaire of Knowledge, Attitude, and Preventive Practice towards COVID-19

		N=451		
Questions		True (f)	Don't know (f)	False (f)
K12	Isolation and treatment of people infected with the SARS-CoV-2 are effective ways to reduce the spread of the virus (98.9).	446	5	0
K13	Eating healthy food and drinking adequate water increase the body's immunity and resistance to COVID-19 (83.1).	375	34	42
K14	Avoiding crowded places and public transport are effective in preventing the transmission of COVID-19 (98.4).	444	4	3
K15	Washing hands or using hand sanitizers frequently is a good practice to prevent COVID-19 (99.3).	448	2	1
Attitude (correct rate, % per total sample)		Yes	No	
A1	Do you think that the COVID-19 will be finally under control?	92.2	7.8	
A2	Do you think that the strategies adopted by the Govt. of Kerala are sufficient?	59.2	40.8	
A3	Do you feel embarrassed on hearing the daily official COVID-19 report?	22.2	77.8	
A4	Do you think that the preventive measures taken by you are adequate?	70.3	29.7	
A5	Are you following the preventive measures only because of strict enforcement of the law?	95.1	4.9	
A6	Do you think that lockdown measures should be continued further to prevent the spread of COVID-19?	16.9	83.1	
A7	Do you feel worried if there are some people in quarantine in your neighbourhood?	98.7	1.3	

Table 1 Cont...
Questionnaire of Knowledge, Attitude, and Preventive Practice towards COVID-19

		N=451	
Attitude (correct rate, % per total sample)		Yes	No
A8	Do you think that the responsibility to prevent the spread of COVID-19 is with the government only?	83.1	16.9
A9	Do you feel that people in Kerala are unnecessarily panicked because of COVID-19?	46.1	53.9
A10	Do you feel hostile towards health workers because they may potentially spread COVID-19?	99.1	0.9
Preventive Practice - During the last one month (correct rate, % per total sample)		Yes	No
P1	Wear a mask covering the nose and mouth.	91.1	8.9
P2	Wash hands with soap and water/alcohol sanitizer whenever returning home.	98.4	1.6
P3	Maintain safe distance with people (3 feet) when going outside the home.	86.0	14.0
P4	Attended any crowded social gathering.	17.7	82.3
P5	Wash the mask with soap and water and dry in sunlight and iron after each use.	86.7	13.3
P6	Shake hands with or hug when meet friends.	2.4	97.6
P7	Going out of the house unless it is necessary.	4.4	95.6
P8	Take care to avoid touching door handles and staircase railing in public places.	97.6	2.4
P9	Strictly complied to lock down regulations.	94.5	5.5
P10	Dispose of your face mask carelessly.	2.0	98.0

Note. f = Frequency.

Association between risk perception, knowledge, attitude, and preventive practice towards COVID-19 outbreak

The association of risk perception with knowledge, attitude, and preventive practice scores are given in Table 2. The risk perception is categorized into undecided, low (combining extremely low, very low, and low) and high (combining high, very high, and extremely high)

Table 2
Association between Risk Perception, Knowledge, Attitude and Preventive Practice towards COVID-19 outbreak

Variables	Risk perception			df	χ ²	p-value
	Undecided	Low	High			
N=451						
Knowledge						
Poor	0	5	0			
Average	24	80	29	4	4.924	.295
Good	70	187	56			
Attitude						
Negative	91	255	82			
Positive	3	17	3	2	1.884	.390
Preventive Practice						
Poor	0	0	1			
Average	3	16	11	4	11.939	.018*
Good	91	256	73			

Note. χ² = Chi-square; df = Degree of freedom; *p <.05 = Level of significance.

A significant association ‘p < .05’ was observed between risk perception and preventive practice towards the COVID-19 outbreak of the participants.

Association of risk perception, knowledge, attitude, and preventive practice towards COVID-19 outbreak with sociodemographic variables

Association between risk perception, knowledge, attitude, and preventive practice and selected sociodemographic factors is given in Table 3.

A statistically significant association (p < .001) was found between gender and attitude and slightly better knowledge, attitude, and preventive practice scores were given by females. Slightly better knowledge and attitude

scores were given by those belonging to the Muslim religion, while a slightly better preventive practice score was reported by Hindus, which was statistically significant (p < .01). Higher scores for knowledge, attitude, and preventive practice were reported by widowed people and the association of marital status and knowledge and preventive practice were statistically significant (p < .01 and < .05 respectively). Those having technical education reported slightly higher statistically significant knowledge (p < .05). With respect to occupation, all groups reported their risk as low, but there was a statistically significant (p < .01) association between risk perception and occupation. There was a statistically significant (p < .05) association between risk perception and source of income. Knowledge and attitude scores were highest for those who were supported by children, but the preventive practice score was lowest for them. The preventive practice score was highest for participants who were pensioners. There was a significant association (p < .05) between risk perception and residence in hotspot or CZ areas.

Factors associated with risk perception

Ordinal logistic regression analysis was done for risk perception using all sociodemographic variables having a p-value < .1 to identify factors associated with the risk perception. The backward stepwise method was used for selecting factors. Non-standardized regression coefficients (β) and odds ratio (OR) with 95% confidence interval (CI) were used to quantify the association between independent variables and the risk perception. The variables included in the final model were risk perception (low as 0, undecided as 1 and high as 2), marital status (Married v/s Unmarried), residing in hotspot or containment zone (No v/s Yes), comorbidity (No v/s Yes), age (18-29 years v/s Others), occupation (Government v/s Others) and source of income (Salary v/s Others). The variables: residing in hotspot/containment zone (β 0.603, OR 1.83, 95% CI 1.17 to 2.85, p < .01), having comorbidity (β 0.804, OR 2.24, 95% CI 1.38 to 3.62, p < .01), occupation in non-governmental organizations (β 0.513, OR 1.67, 95% CI 1.02 to 2.72, p < .05) and source of income other than salary (β 0.595, OR 1.812, 95% CI

Table 3 Association between Risk Perception, Knowledge, Attitude, and Preventive Practice towards COVID-19 outbreak and Sociodemographic Variables

N = 451

Variables	n	%	Risk perception					Knowledge					Attitude					Practice				
			Low	Un decided	High	χ^2	p-value	Mean	SD	t/F value	p-value	Mean	SD	t/F value	p-value	Mean	SD	t/F value	p-value			
Age (years, n=441)																						
18-29#	155	35.1	99	39	17		12.7	1.9		4.7	1.2			9.2	1.2							
30-39	107	24.3	64	18	25		12.8	1.9		4.4	1.2			9.3	1.0							
40-49	105	23.8	55	24	26	13.467	13.0	1.4	0.734	4.6	1.2	1.451	.216	9.3	1.1	1.354	.249					
50-59	57	12.9	36	10	11		13.0	1.7		4.8	1.3			9.5	0.8							
≥60	17	3.9	12	2	3		12.8	1.7		4.4	1.1			9.3	1.3							
Gender																						
Female#	201	44.6	129	40	32		12.9	1.6		4.8	1.2			9.4	1.1							
Male	250	55.6	143	54	53	2.702	12.8	1.9	0.664	4.4	1.2	3.733	<.001***	9.2	1.0	1.792	.074					
Religion																						
Hindu	275	61.0	173	51	51		12.9	1.6		4.6	1.2			9.4	0.9							
Christian	113	25.1	65	32	16	11.128	12.6	2.0	1.07	4.7	1.3	2.095	.100	9.0	1.3	5.936	.001**					
Muslim	41	9.1	20	9	12		13.0	1.4		4.8	1.1			9.3	1.0							
No religion	22	4.9	14	2	6		12.7	2.5		4.0	1.2			8.7	1.6							
Marital status																						
Unmarried#	133	29.5	88	28	17		12.7	2.1		4.7	1.2			9.1	1.3							
Married	306	67.8	176	64	66	7.955	12.9	1.6	4.362	4.6	1.2	1.167	.322	9.3	1.0	2.910	.034*					
Separated	4	0.9	4	0	0		10.3	4.1		4.0	1.4			8.8	1.5							
Widowed	8	1.8	4	2	2		13.8	1.0		5.1	1.1			10.0	0.0							
Educational status																						
Up to high school	25	5.5	19	0	6		11.9	2.2		4.5	1.3			9.1	1.2							
Higher secondary	57	12.6	39	10	8	16.311	12.6	2.0	2.597	4.7	1.1	0.702	.622	9.2	1.2	0.859	.509					
Graduate	165	36.6	97	36	32		13.0	1.6		4.7	1.3			9.4	0.9							
Technical	43	9.5	28	8	7		13.3	1.7		4.4	1.0			9.4	1.4							
Postgraduate	151	33.5	84	35	32		12.8	1.8		4.5	1.3			9.3	1.0							
Others	10	2.2	5	5	0		12.9	0.9		4.5	0.8			8.8	2.0							

Table 3 Cont...
Association between Risk Perception, Knowledge, Attitude, and Preventive Practice towards COVID-19 outbreak and Sociodemographic Variables

N = 451

Variables	n	%	Risk perception				Knowledge				Attitude				Practice							
			Low	Un decided	High	χ^2	p-value	Mean	SD	t/F value	p-value	Mean	SD	t/F value	p-value	Mean	SD	t/F value	p-value			
Occupation																						
Govt/Semi Govt/ Central#	130	28.8	59	34	37		13.0	1.4		4.5	1.3			4.5	1.3			9.4	0.9			
Private sector	104	23.1	59	25	20	26.540	13.1	1.4	1.023	.395				4.5	1.2	2.298	.058	9.2	1.0	2.323	.056	
Self employed	48	10.6	30	9	9		12.6	2.5		4.5	1.1			4.5	1.1			9.4	1.1			
Unemployed	123	27.3	90	18	15		12.7	2.0		4.9	1.2			4.9	1.2			9.1	1.3			
Others	46	10.2	34	8	4		12.7	2.0		4.6	1.1			4.6	1.1			9.5	0.8			
Source of income																						
Salary#	237	52.5	123	59	55		13.0	1.4		4.5	1.2			4.5	1.2			9.3	1.0			
Pension	22	4.9	16	3	3		12.8	1.8		4.5	1.2			4.5	1.2			9.6	0.7			
Others	74	16.4	50	10	14	19.218	12.7	2.3	1.083	.364				4.7	1.1	2.505	.042*	9.4	0.9	3.121	.015*	
No income	116	25.7	82	22	12		12.6	2.0		4.9	1.2			4.9	1.2			9.1	1.3			
Supported by children	2	0.4	1	0	1		13.5	0.7		5.0	1.4			5.0	1.4			7.5	3.5			
District																						
Trivandrum	135	29.9	73	30	32		12.8	2.0		4.5	1.3			4.5	1.3			9.3	1.0			
Kollam	23	5.1	6	11	6		13.1	0.9		4.5	0.9			4.5	0.9			9.3	1.1			
Pathanamthitta	15	3.3	12	1	2		13.5	1.2		4.8	1.3			4.8	1.3			9.1	1.4			
Alappuzha	46	10.2	32	5	9		13.1	1.4		4.3	1.0			4.3	1.0			9.4	0.8			
Kottayam	39	8.6	30	7	2		12.7	2.0		4.7	1.4			4.7	1.4			9.1	1.4			
Idukki	54	12.0	35	10	9		12.7	1.4		4.7	1.2			4.7	1.2			9.2	1.1			
Ernakulam	43	9.5	25	11	7	34.940	12.7	2.3	1.135	.327				4.8	1.3	1.012	.438	9.3	1.3	0.858	.598	
Thrissur	13	2.9	8	2	3		12.7	2.2		4.3	1.0			4.3	1.0			9.6	0.5			
Palakkad	12	2.7	7	2	3		11.9	1.8		4.8	1.5			4.8	1.5			9.0	1.6			
Malappuram	14	3.1	8	3	3		12.7	1.4		5.0	0.9			5.0	0.9			9.2	0.7			
Kozhikode	12	2.7	6	2	4		12.8	1.7		5.0	1.3			5.0	1.3			9.5	0.8			
Kannur	14	3.1	9	3	2		12.7	1.9		4.1	1.0			4.1	1.0			9.4	0.6			
Wayanad	9	2.0	8	1	0		13.0	1.0		4.8	1.1			4.8	1.1			8.6	2.1			
Kasaragod	22	4.9	13	6	3		13.8	1.0		4.6	1.2			4.6	1.2			9.3	0.6			

Table 3 Cont...
Association between Risk Perception, Knowledge, Attitude, and Preventive Practice towards COVID-19 outbreak and Sociodemographic Variables

N = 451

Variables	n	%	Risk perception				Knowledge				Attitude				Practice				
			Low	Un decided	High	χ^2	p-value	Mean	SD	t/F value	p-value	Mean	SD	t/F value	p-value	Mean	SD	t/F value	p-value
Hotspot																			
No#	352	78.0	225	68	59	8.954	.011*	12.9	1.8	0.354	.377	4.6	1.2	0.366	.714	9.3	1.1	0.363	.716
Yes	99	22.0	47	26	26			12.8	1.5			4.6	1.4			9.2	1.0		
Treatment for chronic diseases																			
No disease	344	76.3	219	72	53			12.9	1.8			4.6	1.2			9.2	1.1		
One disease	87	19.3	45	16	26	14.230	.027*	12.7	1.6	1.063	.364	4.6	1.3	0.443	.722	9.4	1.2	0.848	.468
Two diseases	14	3.1	5	4	5			13.5	1.1			4.6	1.2			9.3	1.0		
Three diseases	6	1.3	3	2	1			13.2	1.5			5.2	0.8			9.8	0.4		
Pregnancy (n=201)																			
Yes	9	4.6	124	37	31	1.100	.577	13.2	1.3	-0.578	.564	4.8	1.2	0.157	.876	9.4	1.0	1.182	.239
No	192	95.4	5	3	1			12.9	1.6			4.8	1.4			9.0	0.5		
Any family member coming from places other than Kerala during May 2020																			
No	405	89.8	241	88	76	1.935	.380	12.8	1.8	-0.944	.346	4.6	1.2	1.258	.209	9.3	1.1	-0.325	.745
Yes	46	10.2	31	6	9			13.1	1.3			4.4	1.4			9.3	1.0		
Quarantine																			
No	394	87.4	238	81	75	0.184	.912	12.8	1.8	-1.471	.131	4.6	1.2	0.873	.383	9.3	1.1	-0.027	.979
Yes	57	12.6	34	13	10			13.2	1.2			4.5	1.3			9.3	1.1		
Aarogya Setu/GoK Direct App																			
Yes	155	34.4	92	30	33	1.035	.596	13.0	1.9	1.61	.108	4.5	1.1	-1.289	.198	9.2	1.2	-1.288	.198
No	296	65.6	180	64	52			12.8	1.7			4.7	1.3			9.3	1.0		

Note. % = Percentage; χ^2 = Chi-square; SD = Standard deviation; * $p < .05$, ** $p < .01$, *** $p < .001$ = Level of significance; # - Reference category for regression analysis of Table 4.

Table 4
Result of Ordinal Logistic Regression Analysis on Factors Associated with Risk Perception towards COVID-19 outbreak

Parameter	β	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp (β)	95% Wald Confidence Interval for Exp (β)	
			Lower	Upper	Chi-Square	df	Sig.		Lower	Upper
Marital status	-0.101	0.3055	-0.7	0.498	0.109	1	.742	0.904	0.497	1.645
Hotspot	0.603	0.2258	0.161	1.046	7.135	1	.008**	1.828	1.174	2.845
Comorbidity	0.804	0.2456	0.323	1.286	10.716	1	.001**	2.235	1.381	3.617
Age	0.166	0.3081	-0.438	0.77	0.289	1	.591	1.18	0.645	2.159
Occupation	0.513	0.248	0.027	0.999	4.279	1	.039*	1.67	1.027	2.716
Source of income	0.595	0.2447	0.115	1.074	5.907	1	.015*	1.812	1.122	2.927

Note. **= Significant.

1.12 to 2.93, $p < .05$) were associated with high risk perception. The results are tabulated in Table 4.

Discussion

The majority of the present study participants (60%) perceived their risk as low. The risk perception was significantly associated with preventive practices. Most of the people had very high knowledge of preventive practices; hand hygiene practices (99.3%), isolation as a method of prevention (98.9%), and avoiding crowded places (98.4). The least knowledge was reported for questions on the viral survival outside the human body (58.8%) and whether an ordinary mask can give protection (53.9%). Most of the participants (94.9%) expressed a negative attitude about control of the outbreak. Most of the people (92.2%) were hopeful that the pandemic will be under control and 59.2% were satisfied with the control measures adopted by the state government. But 95.1% of the respondents were following the preventive measures only because it was enforced by law. They (98.7%) were worried that if there were COVID-19 patients around their neighbourhood, 83.1% of the participants felt that the prevention of the spread of infection is the responsibility of the government. The majority of (53.9 %) them had the feeling that people are panicking unnecessarily and 99.1% reported that they were feeling hostile to health workers as they are potential spreaders of the infection. Most of them had a correct practice of wearing a mask (91.1%) and washing hands after returning home (98.4%). Though the majority had reported good practice, 14% reported they were not maintaining social

distance, 17.7% attended social gatherings, and 13.3% were not washing mask with soap and water after each use and dry in sunlight or ironing it.

At the time of lifting of lockdown, on 31 May 2020, the number of cases reported was only 61. But one month after the lifting of lockdown the cases crossed more than doubled and reached 131, on 30 June 2020. There was reporting of the first death due to COVID-19 during this time. Exactly one month after, the number of cases soared up more than ten times and crossed 1300. The negative attitude of people like prevention of infection is the responsibility of the government and they are following preventive practices because of the enforcement of law and some unhealthy practices like not maintaining social distance and attending social gathering might have contributed to this.

The mean (%) scores of knowledge, attitude, and practice were 21.26 (82%), 9.37 (92%), and 10.32 (86%), respectively as reported from a South Indian study (Christy et al., 2020). A KAP cross-sectional online study among Indian residents reported the mean COVID-19 knowledge score as 16.28 (74%), 84.42% of participants were optimistic that India would win the war against COVID-19, 97.6% agreed about frequent hand washing, and only 77.9% confirmed about washing hand ≥ 20 seconds (Karthek, Gara, & Vanamali, 2020).

The regression analysis reported that risk perception was significantly associated with living in a hotspot or containment zone, having comorbidities, occupation

in government/semi-government/central government institutions, and source of income as salary.

Knowledge was found to be significantly associated with marital status and education and the highest knowledge score was found among widowed people and those who were having technical education. Gender was associated with attitude and preventive practice and females have a slightly better attitude and good preventive practice scores. Source of income was found to be associated with attitude and preventive practice. Those who were supported by children had a better attitude and those who have a pension as their source of income had slightly better preventive practice scores.

Studies have reported that the factors associated with good knowledge regarding prevention of COVID-19 were higher educational status, urban residence, being married, healthcare workers, upper socio-economic class, adherence to appropriate preventive practice, female gender, and good preventive practices (Banik et al., 2020; Kartheek et al., 2020; Pal et al., 2020). Good knowledge and attitude were associated with the better practice of COVID-19 health measures (Rabbani et al., 2020). Age above 30 years and good knowledge was found to be associated with a positive attitude (Banik, Rahman, Sikder, Rahman, & Pranta, 2020). Age above 30 years, female gender, government or private job, residence in an urban area, and good knowledge were found to be associated with good practice (Banik, Rahman, Sikder, Rahman, & Pranta, 2020).

The study has some limitations. The study was conducted on the online platform which may not be a true representative of a cross-sectional survey as the people having access to social media platforms only could participate in the study. The study subjects were selected by convenience sampling which is a threat to the reliability of the study findings. The data collection technique was self-reporting which might have resulted in socially desirable responses and memory bias.

Conclusion

As there was no effective treatment or vaccine available at the time of lockdown, the most effective mitigation measures were prevention alone. This study provides

a comprehensive assessment of risk perception, knowledge, attitude, and preventive practice of people of Kerala towards the COVID-19 outbreak during the immediate post-lockdown period. The study findings suggested that the people had perceived their risk as low, had good knowledge and preventive practice regarding the COVID-19 outbreak, but the attitude was negative in general. Effective health education programs aimed at enhancing positive attitude as it is an individual and social responsibility and adherence to strict practices of SMS (social distance, mask, and sanitation) and updated knowledge of COVID-19 are needed to contain the pandemic at the local level.

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