Risk Perception, Behavior Change and Perceived Impact due to COVID-19 Pandemic among General Population in Tamil Nadu, India: A Cross-Sectional Study

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) has affected countries all over the world. Assessment of risk perception and scaling up appropriate behavioral practices are of utmost importance for its prevention and control. The objectives of this study were identifying risk perception, behavioral changes and perceived impact as a result of COVID-19 and its associated factors among general population.

Methods: A cross-sectional study was done during the first wave of COVID-19 among general population in Tamil Nadu, India. A semi-structured questionnaire was prepared in Google forms and circulated using WhatsApp during April and June 2020. The sample size was calculated at 384. Data were analyzed using SPSS software version 21.0. Association between the variables was analyzed using Chi-square test. P-value <0.05 was considered significant.

Results: Mean age was 38.4 ±13.8, and 52.1% of the participants were females. Almost 2/3rd had perceived risk of catching COVID-19, which was more among respondents aged 20-39 and residing in urban area. Among the behavior change measures, wearing mask in public places was practiced by 95%, followed by hand washing (90.4%) and social distancing (80%). More than 50% had some form of psychological stress that included inability to perform their daily routines, anxiously browsing media for information about COVID-19, not going to work .etc.

Conclusion: General public staying in rural areas have not completed secondary school education, and the elderly have to be targeted to provide appropriate information about COVID-19 and its preventive measures.

Key words: Behavior, COVID-19, Perception, Population, Practice, Risk

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Introduction

Emerging infectious diseases are not a new phenomenon. Many emerging and reemerging diseases have been reported from many countries across the globe. Spanish flu, Asian flu, SARS, H1N1 influenza are few among these emerging infectious diseases (1). Most of these diseases have originated as zoonosis, and then, transmitted from human to human (2). COVID-19 was initially reported as cluster of pneumonia cases in Wuhan city in Hubei province of China (3). The viral genome was identified as beta coronavirus strain which had not been reported in humans before. It was initially named as SARS-CoV-2, and then, as COVID-19 on February 11, 2020.The disease was announced as public health emergency of international concern (PHEIC) on January 30, 2020 and a pandemic disease on March 11, 2020 by World Health Organization (WHO) (4). On April 15th 2020, 213 countries were affected by COVID-19 (5). On the same date, 1240 cases were reported positive in Tamil Nadu (6). First, there was a country-wide lockdown for 21 days in India starting from March 25th, 2020 to control COVID-19 (7). Rapid and widespread behavioral changes including social distancing, avoiding public gatherings, wearing mask, respiratory etiquettes, appropriate hand washing are the critical elements in reducing the transmission of COVID-19 in the community (8, 9). Risk perception plays a major role in behavior modification of an individual. Risk perception and the resulting behavior change from unhealthy to healthy behavior depends on health literacy, risk perception, motivation, and various social, cultural and institutional mechanisms (10, 11). Identifying the risk perception patterns among the general population and the influencing factors are key components in risk communication process. Interpreting and understanding information about a specific disease provided to the community depends on various social processes, and behaviors adopted by them may not always lead to disease prevention (12). Studies have reported that unrealistic optimism towards any risk would lead to lower motivation of that individual towards healthy behavior, which results in negative health outcomes (13- 16). Unless the factors determining risk perception are identified and targeted, achieving the desired behavior would be difficult. Population of India has never experienced such a pandemic and lockdown for such a long period. With a population of 1.2 billion, it would be difficult to achieve desired behavior patterns unless targeted information, education and communication strategies are planned. Since COVID-19 is an emerging infection due to a new variant of coronavirus disease, there are no studies available to assess the way people perceive their risk of developing COVID-19 and how they behave. Hence, the present study was done to identify risk perception and behavioral modifications which the general population in Tamil Nadu adopted to prevent them from acquiring COVID-19 infection.

Objectives
The followings concern general population:

1.To find the risk perception and behavior change due to COVID-19

2.To identify the factors associated with their perceived risk and behavior change

3.To find out the perceived impact of COVID-19

Methods

A cross-sectional study was conducted among the general population in Tamil Nadu. The study was conducted from April to June 2020 when India was experiencing the initial phase, and country's wide lockdown was implemented. A semi-structured questionnaire was prepared which included socio-demographic details of the study participants, awareness of COVID-19 and its symptoms, their perceived risk of getting affected and the behavioral modifications which they perceived to be protective against the disease. The questionnaire was prepared both in English and local language Tamil. Content validity and face validity were assessed by experts in the field of community medicine. Pilot testing of the

questionnaire was done among 15 individuals with necessary modifications. Content validity was carried out by experts. The questionnaire was divided into 3 sections.

Section 1: Socio-demographic details; for example, age, gender, education and occupational status, etc.

Section 2: Risk perception of COVID-19; for example who is at high risk of getting COVID-19? How does the virus spread from one person to another? What are the symptoms of the disease? etc.

Section 3: Behavior change for COVID-19; for example, how have you modified your social movements after COVID-19 pandemic started in India? Do you use any protective wear? And if yes, what type of protective gears you are using? Is there any change in your hand washing practice? Have you modified your dietary/cooking practices due to fear of corona virus disease?

The sample size was calculated using the formula $Z^2_{1-\alpha/2}p(1-p)/d^2$. Since this is a new version of infection and previous research studies are not available, prevalence was assumed to be 50%. With P-value as 50%, a confidence level of 95% and an absolute precision of 5%, the calculated sample size was 384, and convenience sampling method was used. Due to COVID-19 pandemic, face to face interview was not possible; hence, the questionnaire was prepared in Google forms and the link was sent through WhatsApp. Data collection was done till the required sample size was achieved. Inclusion criteria consisted of individuals aged more than 18 with an android phone; they gave their consent to participate in the study and provided the required information. Exclusion criteria consisted of those who were not willing to participate, and were automatically excluded as the Google form questions can be

viewed only after giving consent. Similarly, those who did not complete the questionnaire due to various reasons like dissatisfaction, Internet issues, and time constraints were excluded. The study was approved by institutional Ethics Committee of Trichy SRM Medical College Hospital and Research Centre (TSRMMCH&RC/ ME-1/2020-IEC No.54). The data received through Google forms were downloaded in the form of Microsoft Excel and analyzed. The association between variables was analyzed using Chi-square test and the P-value <0.05 was statistically significant.

Results

384 individuals participated in the study, and 52.1% (200) were females. The mean age of the participants was 38.4 ±13.8. The majority (46.1%) had undergraduate degree. The researchers received responses from 18 districts of Tamil Nadu, mostly from Tiruchirappalli. 75.3% were from urban areas and 24.7% from rural areas. Table 1 presents the details regarding the subjects. All the participants were aware that country-wide lockdown was implemented to control COVID-19. Television (80.4%) was the major source of information for COVID-19, followed by WhatsApp (54.7%), newspaper (44.2%), friends (36.2%), healthcare workers (24%), Facebook (23%), magazine (9.3%) and others (6.7%) like neighbors, relatives and family members. Of 384 respondents, 61.2% had a perceived risk of catching the disease if they did not follow the protective measures. Perceived risk was also found to be high among participants aged 20-39 who resided in urban areas. Gender and education were not significantly associated with perceived risk of getting COVID-19 as described in Table 2.

Table 1. Description of the Socio-Demographic Details of the Participants of the Study

	N	%
Age		
20-39	193	50.3
40-59	168	43.7
≥ 60	23	6
Gender		
Female	200	52.1
Male	184	47.9
Education		
Lower than 11th grade	22	5.7
11th and 12th grades	56	14.6
College graduate	306	79.7
Residence		
Urban	289	75.3
Rural	95	24.7
District		
Tiruchirappalli	118	30.7
Chennai	51	13.3
Thanjavore	25	6.5
Dindigul	21	5.5
Pudukottai	21	5.5
Others (Coimbatore, Cuddalore, Dharmapuri, Erode, Kanyakumari, Karur, Krishnagiri, Madurai, Nagercoil, Namakkal, Nilgiris, Perambalur, Salem, Tirunelveli)	148	38.5

Perceived risk was found to be high among participants aged 20-39 and among those who resided in urban areas. Gender and education were not significantly associated with perceived risk of getting COVID-19 as described in Table 2.

Table 2. Factors Associated with Perceived Risk of Catching COVID-19

	Perceived Risk of COVID-19		Total	Chi square	p- value
	Yes N (%)	No N (%)			
Age					
20-39	133 (56.6)	60 (40.3)	193		
40-59	88 (37.4)	80 (53.7)	168	10.33	0.005*
≥ 60	14 (6.0)	9 (6.0)	23		
Gender					
Female	122 (51.9)	78 (52.3)	200	0.006	0.933
Male	113 (48.1)	71 (47.7)	184		
Education					
Lower than 11th grade	10 (4.3)	12 (8.1)	22		
11th and 12th grades	37 (15.7)	19 (12.7)	56	2.86	0.23
College graduate	188 (80.0)	118 (79.2)	306		
Place of residence					
Urban	188 (80.0)	101 (67.8)	289	7.3	0.006*
Rural	47 (20.0)	48 (32.2)	95		
Total	**235 (100.0)**	**149 (100.0)**	**384**		

One hundred and seventy four (45.3%) participants responded that if they develop fever with cold and cough, they would consider it COVID-19. 85.4% perceived travelling to affected areas as the most common risk factor for getting the infection, followed by contact with travelers from other countries (77%). They also considered healthcare workers (66.4%), sanitary workers (52.1%) and police officers (49.7%) at high risk of infection. Almost 40% considered general public at risk of the disease too. With regards to the mode of transmission, coughing and sneezing were the most common (95.5%) symptoms. Other known modes were objects handled by the infected person (78.6%) and visiting crowded places (73.4%). Almost 10% and 7% believed that the infection may also spread through drinking water and mosquito bites respectively. Except for 0.7%, the rest were aware of the symptoms of COVID-19. Fever (92%), difficulty in breathing (90%), cough/cold (88.8%), throat pain (79.7%) and diarrhea (36.4%) were the symptoms they knew about. With the exception of 4.9%, others responded that they were wearing mask whenever they were in public places. Participants with undergraduate/ postgraduate degree, those who had perceived risk of catching COVID-19 and resided in urban areas wore masks in comparison with their counterparts (Table 3). Increased frequency of washing hands either with soap and water or alcohol-based hand sanitizers was reported by 90.4%. Participants with undergraduate/ postgraduate degree and those who had a perceived risk of being infected by the disease were frequently washing their hands compared to others (Table 4). Nearly 80% reported maintaining social distancing while they were in public place. Participants aged 40-59 with undergraduate/postgraduate degree who resided in urban areas observed social distancing more than others (Table 5). Of 384 participants, 42.4% had increased the frequency of household cleaning using regular chemical-based cleaner, and 28.6% used water mixed with neem leaves/turmeric respectively; 59.3% stopped eating out to avoid the disease; 40.9% consumed more fruits and vegetable while 31.5% started consuming more spices and natural immunity booster such as neem andtulsi ; 14.3% started consuming alternative medicine such as siddha medicine even without prescription by AYUSH practitioner; 9.3% increased cooking time which might destroy the heat sensitive nutrients. Changes in social movements were noticed among the participants in order to reduce their exposure. Almost 45% were not even stepping out of their house and 32.3% restricted their visits to meeting neighbors. Due to the perceived risk of COVID-19, 19% avoided going to health centers for other problems. Among the respondents, 42.2% had difficulty going to work, 29.1% had difficulty in providing essential goods; 15.6% faced problems in buying medicines and 24.4% in receiving healthcare; 22.4% could not meet their kids/parents which was stressful for them. About 14% of the participants had sleep disturbance thinking about the pandemic. Figure 1 describes the proportion of participants reported to have psychological stress.

Table 3. Factors Affecting the Wearing Masks in Public Places

	Wearing mask in public places N (%)	Not wearing masks in public places N (%)	Total	Chi-square	P-value
Age					
20-39yrs	183 (50.1)	10 (52.6)	193		
40-59	160 (43.9)	8 (42.1)	168	0.05	0.97
≥ 60	22 (6.0)	1 (5.3)	23		
Gender					
Female	191 (52.3)	9 (47.3)	200		
Male	174 (47.7)	10 (52.7)	184	0.178	0.67
Education					
Lower than 11th grade	16 (4.4)	6 (31.6)	22		
11th and 12th grades	51 (14.0)	5 (26.3)	56	28.74	0.00001*
College graduate	298 (81.6)	8 (42.1)	306		
Fear of getting COVID-19					
Yes	229 (62.7)	6 (31.6)	235		
No	136 (37.3)	13 (68.4)	149	7.38	0.006*
Place of residence					
Urban	285 (78.1)	4 (21.0)	289		
Rural	80 (21.9)	15 (79.0)	95	31.5	0.00001*
Total	**365 (100.0)**	**19 (100.0)**	**384**		

* P-value is significant

Table 4 describes factors associated with handwashing practice. Increased frequency of washing hands either with soap and water or alcohol-based hand sanitizers was reported by 90.4%. Participants with undergraduate/ postgraduate degree and those who had a perceived risk of being infected by the disease were frequently washing their hands compared to others.

Table 4. Factors Associated with Hand Washing

	Increased the frequency of washing hands		Total	Chi-square	P- value
	Yes N (%)	No N (%)			
Age					
20-39	175 (50.4)	18 (48.7)	193		
40-59	151 (43.5)	17 (45.9)	168	0.08	0.95
≥ 60	21 (6.1)	2 (5.4)	23		
Gender					
Female	183 (52.7)	17 (45.9)	200		
Male	164 (47.3)	20 (54.1)	184	0.61	0.43
Education					
Lower than 11th grade	15 (4.3)	7 (18.9)	22		
11th and 12th grades	50 (14.4)	6 (16.2)	56	13.63	0.001*
College graduate	282 (81.3)	24 (64.9)	306		
Fear of catching COVID-19					
Yes	218 (62.8)	17 (45.9)	235		
No	129 (37.2)	20 (54.1)	149	4.01	0.04*
Place of residence					
Urban	265 (76.4)	24 (64.8)	289		
Rural	82 (23.6)	13 (35.2)	95	2.3	0.12
Total	**347 (100.0)**	**37 (100.0)**	**384**		

* P-value is significant

Factors affecting behavior change towards social distancing is given in table 5. Nearly 80% reported maintaining social distancing while they were in public place. Participants aged 40-59 with undergraduate/ postgraduate degree who resided in urban areas observed social distancing more than others.

Table 5. Factors Affecting Behavior Change towards Social Distancing

| | Following social distancing | | | | |
	Yes N (%)	No N (%)	Total	Chi-square	P- value
Age					
20-39	158 (51.5)	35 (45.4)	193		
40-59	142 (46.2)	26 (33.8)	168	37.8	0.00001*
≥ 60	7 (2.3)	16 (20.8)	23		
Gender					
Female	158 (51.5)	42 (54.5)	200	0.23	0.62
Male	149 (48.5)	35 (45.5)	184		
Education					
Lower than 11th grade	9 (2.9)	13 (16.9)	22		
11th or 12th grade	38 (12.4)	18 (23.4)	56	30.8	0.00001*
College graduate	260 (84.7)	46 (59.7)	306		
Fear of getting COVID-19					
Yes	189 (61.6)	46 (59.7)	235	0.008	0.76
No	118 (38.4)	31 (40.3)	149		
Place of residence					
Urban	247 (80.5)	42 (54.5)	289	22.1	0.00001*
Rural	60 (19.5)	35 (45.5)	95		
Total	**307 (100.0)**	**77 (100.0)**	**384**		

* P-value is significant

Of 384 participants, 42.4% had increased the frequency of household cleaning using regular chemical-based cleaner, and 28.6% used water mixed with neem leaves/turmeric respectively; 59.3% stopped eating out to avoid the disease; 40.9% consumed more fruits and vegetable while 31.5% started consuming more spices and natural immunity booster such as neem and tulsi; 14.3% started consuming alternative medicine such as siddha medicine even without prescription by AYUSH practitioner; 9.3% increased cooking time which might destroy the heat sensitive nutrients. Changes in social movements were noticed among the participants in order to reduce their exposure. Almost 45% were not even stepping out of their house and 32.3% restricted their visits to meeting neighbors. Due to the perceived risk of COVID-19, 19% avoided going to health centers for other problems.

Figure 1, describes the reasons of psychological stress. Majority (57.3%) were upset of not being able to do their routine work. While 42.2% had difficulty going to work, 29.1% had difficulty in providing essential goods; 15.6% faced problems in buying medicines and 24.4% in receiving healthcare; 22.4% could not meet their kids/parents which was stressful for them. About 14% of the participants had sleep disturbance thinking about the pandemic.
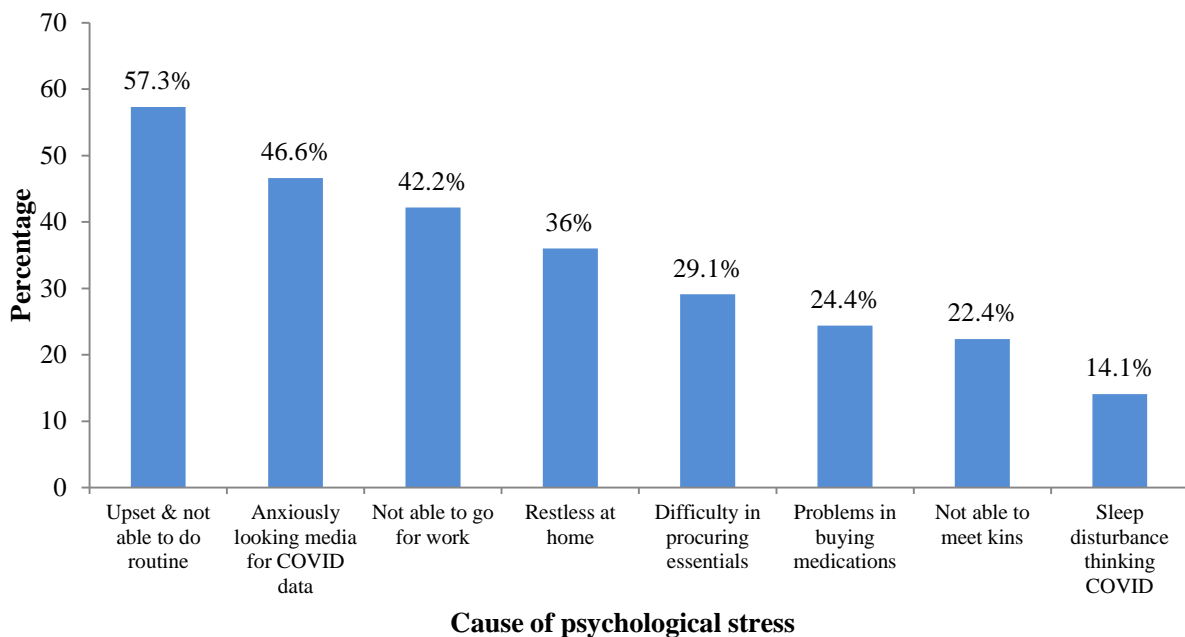
Figure 1. Proportion of participants reported to have psychological stress due to COVID-19.

Discussion

This was the first study in India which assessed risk perception regarding COVID-19 and behavior change adopted by general public to prevent COVID-19. This study was performed in the early phase of pandemic during lockdown. The results would thus reflect their understanding about the disease and provide information on favorable and unfavorable behaviors practiced by the general population. Health information should also be provided regarding preventive measures during next wave of COVID-19 and also for possible future pandemics.

38.8% of the subjects perceived no risk of getting COVID-19. A similar study conducted in Tamil Nadu showed that 60% perceived no risk of being infected by corona virus and 23% perceived low risk (17). Another study done among general population in the Middle Eastern countries (Saudi Arabia, Egypt, and Jordan) found 40.7% perceived no risk of catching the disease in near future (18). On the other hand, in a study done in Iran, only 4.9% and 22.5% perceived no risk and low risk respectively (19). There is a wide variation in proportion of individual's perceived risk of catching the infection among these studies. The large amount of not perceiving any risk during pandemic is a

cause of concern, where everyone is at risk, though with different level of severity. According to the health belief model, perceived susceptibility and severity among individuals play a key role in determining the adherence to preventive practices (20). Factors significantly associated with perceived risk of COVID-19 in the present study were age groups less than 39 and greater than 60, and individuals residing in urban area. Gender and educational status did not influence risk perception in the present study. A study from Tamil Nadu done among Peri-urban population found no association between age and gender regarding risk perception. However, those with formal education had greater risk perception of infection compared with those without education (17).

Over 99% of the subjects were aware of the common symptoms of COVID-19. Other studies conducted in India (17, 21, 22, 23), Bangladesh (24) and South Korea (25) also reported similar findings. A study in Iran stated that only 4.8% of the participants knew about the common symptoms (19). It is difficult to compare these finding since the type of question asked and format of reply documented was different in each of these studies. But overall, the knowledge of symptoms was satisfactory in most of the studies.

The most common source of information in this study was television and cell phone followed by newspaper. Similar results were also obtained from other Pan India (22, 23) and international studies (19). In the current scenario, most people had access to both television and mobile phone, but the reliability of such information should be emphasized. A great deal of myths and misinformation regarding COVID-19 was circulated through various media regarding the spread of disease, food and drugs which cure the diseases, methods which prevent infections, and COVID-19 vaccination etc. These myths have been noted and the correct information is updated by the government of India (26) and also World Health Organization (27). The general public should be made aware of the official authenticated websites which they should look for regarding the necessary information.

80%, 90% and 95% practiced social distancing, frequent hand washing and wearing facemask regularly. This was similar to a study conducted in India (22). A study in Iran found association between risk perception of getting COVID-19 and willingness to follow preventive measures (19). A South Korean study found that the knowledge regarding COVID-19 was the most influential factor in adopting preventing behaviors (25). Around 2/3rd of individuals were willing to observe hand hygiene and quarantine protocol if advised in a study conducted among the Middle Eastern countries. Some studies collected data on the preventive measure or willingness to practice through interview or the self-administered questionnaire. Though this was the most feasible method during pandemic, it would be more appropriate to assess observing protocols by direct observation. Future research in this aspect is needed to confirm the proportion of individual with appropriate COVID-19 preventive measure. 61.2% of participants showed a perceived risk of getting Covid-19, while another paper (17) documented a rate of 45.7%.In the present study 42.2% had difficulty going to work, and in one study, 62.1% feared losing job or income (17).

Higher level of education, perceived risk of COVID-19, and residing in urban areas reported better practice of wearing masks. This is while only education and perceived risk of COVID-19 was significantly associated with hand washing and not the residence. Social distancing was more prevalent among the younger age group, higher education and urban areas. From this study, it can be concluded that education alone was significantly associated with all the three measures i.e. frequent hand washing, wearing mask and social distancing. Other studies on KAP survey towards COVID-19 also reported similar associations (25, 28). Therefore, general population with low educational status needs to be given more emphasis in providing health information during future pandemics.

Conclusion

Proportion of people following appropriate preventive measures was more among residents of urban areas and those who completed at least undergraduate degree. Hence, the information, education and communication measures have to be targeted among the population residing in rural areas and those who did not complete school education. More than half of the respondents had reported some form of psychological stress. Thus, providing emotional support would be of great help in reducing those issues.

Limitations

The study was conducted using Google forms. Those who belong to low economic status and could not afford an android mobile phone were not able to participate in the study. Hence, the results were not generalizable. Due to the same reason, participation of the elderly in this study was little. Even though the questionnaire was prepared in local language Tamil and circulated, researchers observed low level of participation from individuals who completed primary and secondary school education.

Conflict of interest

The authors declared no conflict of interest.

Authors' contribution

K. H; contributed to designing the study, P. T; collected and analyzed data, K. H and P. T; prepared the manuscript, reviewed and made final corrections, P. T; submitted the manuscript to the journal.

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