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Original Research Article

Knowledge, attitude and practice towards COVID-19 among the general public in Tamil Nadu, India

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ABSTRACT

Background: COVID-19 has caused around a million deaths throughout the world and despite the prompt lockdown and rigorous efforts from the government and health authorities, the case numbers in India were still staggering. To explore this furthermore, our study was formulated and aimed to find out the knowledge, attitude and practice (KAP) among the public in Tamil Nadu.
Methods: A cross-sectional, online survey on the COVID-19 pandemic was conducted among the public from 21st July 2020 to 3rd August 2020. The survey questionnaire was semi-structured with questions split into four categories on bio-social variables and questions assessing the KAP towards COVID-19. The data analysis was done using RStudio and Jamovi software and a p-value of less than 0.05 was considered statistically significant.
Results: Among the 1008 valid responses, the knowledge was higher among the degree holders, the HCWs and those living in apartments, compared to their respective counterparts. With the increase in age, the attitude was more positive. Degree holders, HCWs and working participants had better practice habits than their respective peers. Knowledge, attitude and practice were significantly correlated with each other.
Conclusions: It is evident from our study that better knowledge leads to a positive attitude and in turn reflects on better practice. Our study also revealed how education can be an effective tool in awareness and timely adaptation which might help health authorities to formulate plans based on the areas of improvement.

Keywords: Attitude, COVID-19, Knowledge, Practice, Survey, Tamil Nadu

INTRODUCTION

In the 21st century, the human race has seen a number of outbreaks including SARS in 2003, H1N1 in 2009-2010, Ebola in 2014-2016 and in 2018-2019, and Zika in 2015-2016.[1] But the current ongoing pandemic, coronavirus disease or COVID-19 (previously known as 2019 novel coronavirus), has caused around a million deaths and has affected the lives of plenty of people from varied backgrounds throughout the world.[2] This has precipitated into a huge blow to the global economy causing the fastest and steepest recession since 1990.[3] In India, this situation has magnified the pre-existing risks due to economic background.[4]

COVID-19 is caused by an RNA virus, SARS-CoV-2, belonging to the *Coronoviridae* family and it usually causes mild to severe respiratory infections.[5] At the end of 2019, pneumonia of unknown cause started spreading in Wuhan city in Hubei province, China which was later identified as COVID-19.[6] The disease then majorly spread to Italy, Spain, France, The United States of America, Germany, Iran and The United Kingdom by the end of March.[6] WHO declared COVID-19 as 'public health emergency of international concern' on 30th January 2020 and was characterized as a 'pandemic' on 11th March 2020.[6] As of September 2020, there have been around 30 million confirmed cases throughout the world.[2] Among these the vulnerable groups were the most

affected, developing severe forms of the disease and complications.[5]

Predicting the catastrophe early, the Indian government enforced immediate nationwide lockdown on 24th March 2020 for a period of 21 days which restricted 1.3 billion people from leaving their homes.[7] WHO praised this effort as 'tough and timely'.[7] The Indian government also mobilized additional HCWs from different sources, considering the pre-existing shortage.[7] The lockdown was then extended, which helped the health authorities to gain adequate time to formulate health plans. Both the national and state governments created awareness among the general public using news and social media through posters and guidance documents. Emphasis was particularly placed on hand hygiene, social distancing, respiratory hygiene, mask etiquettes and home quarantine for mild symptoms.[8] These guidelines were in line with WHO and CDC.[5,9]

Despite the prompt lockdown and rigorous efforts from the government and health authorities, the case numbers in India are still staggering. There are around five million confirmed cases of COVID-19 with around eighty thousand deaths in India as of September 2020.[2,8] Lack of appropriate knowledge and awareness, negative attitude, and poor adherence to precautionary measures among the public could be the reasons for the high numbers. To explore these reasons furthermore, our study was formulated and aimed to find out the knowledge, attitude and practice (KAP) among the public in Tamil Nadu, India, and their associations within each other and other bio-social variables.

METHODS

A cross-sectional, online survey on the COVID-19 pandemic was conducted among the people in Tamil Nadu from 21st July 2020 to 3rd August 2020. The survey questionnaire created using Google forms was semi-structured with questions split into four categories on bio-social variables and questions assessing the KAP towards COVID-19. The content of the questionnaire was majorly framed using the information given in WHO, national policies and regional guidelines. Few questions were picked based on local beliefs. Snowball sampling technique was used where the initial participants were chosen and in turn, these participants recruited more responders. Informed consent regarding privacy was attached at the beginning of the questionnaire. A pilot study was conducted by sending the online forms to 30 participants and a team of experts in the field. Feedback was collected through telephone calls and necessary alterations were made to the questionnaire. The questions were primarily designed in English with Tamil translations to each question.

The first category collected details regarding biosocial variables. The second category contained 12 questions on knowledge about the symptoms, transmission, protective measures, incubation period and treatment of COVID-19. Correct answers were given '1' point and wrong answers were given '0' points. The overall score was then calculated for assessment. The maximum attainable score was '12' and the minimum attainable score was '0'. At the end of the questionnaire, the respondents were given their scores and feedback for this section to help improve their knowledge.

In the third category, there were eight questions regarding attitude towards COVID-19 of which seven questions were used in the study. Three options were given to each question- positive, neutral and negative, and scores '2', '1' and '0' was given correspondingly. '14' was the highest attainable overall attitude score and '0' was the lowest attainable score. The fourth category had 13 questions which were subdivided into three sub-categories to analyse them separately. The first sub-category had 4 questions regarding personal hygiene and practice towards the elderly. Scores were given from '0' to '3' where '0' meant worst practice and '3' meant best practice. '12' was the highest attainable score and '0' was the lowest attainable score. The second sub-category contained 3 questions regarding the frequency of particular habits. The final sub-category contained 6 multiple choice questions to explore the daily practice.

Inclusion criteria

Responders above 18 years and living in Tamil Nadu who could read and understand English were included in the study.

Exclusion criteria

Responders below 18 years and living outside Tamil Nadu were excluded. Other responders who displayed a lack of comprehension of the English questions were also omitted.

Statistical analysis

The data analysis was done in RStudio and Jamovi software. Bio-social variables were assessed using the Goodness of fit test. The KAP scores were compared with bio-social variables using Tukey's ladder of powers transformation ANOVA, and also within themselves using Kendall's rank correlation tau test. Association between bio-social variables and individual practice habits were explored using Pearson's chi-square test of association. The confidence interval was set as 95% and p value less than 0.05 was considered statistically significant.

RESULTS

From a total of 1070 responses, duplicate responses and responses from outside Tamil Nadu were excluded, leaving a final 1008 valid responses. 220 responders were from Chennai, 129 from Perambalur, 105 from Salem and

76 from Tiruchirapalli. Out of 1008 responders, 507 (50.3%) were female and 501(49.7%) were male. 64.4% of the participants were 30 years old or younger. 80.9% of the participants were degree holders, 74.2% were non-HCWs, 45.5% were "not working currently" and 20.4% were "working from home".

Table 1: Knowledge of the responders regarding COVID-19.

Questions	Answers	n	%
QK1) What are the common symptoms of COVID-19?	Fever*	768	76.2
	Cough*	766	76
	Difficulty in breathing*	748	74.2
	Loss of senses of smell and taste*	574	56.9
	None of the above	164	16.3
	Correct answer**	501	49.7
QK2) Who are more likely to have a severe form of COVID-19?	Elderly- 60 years and above*	877	87
	People with diabetes*	682	67.7
	People with high blood pressure*	487	48.3
	People with cancer*	401	39.8
	People with lung disease*	744	73.8
	People with heart disease*	455	45.1
	None of the above	75	7.4
	Correct answer**	315	31.3
QK3) COVID-19 virus spreads through small droplets expelled from nose or mouth when an infected person coughs, sneezes or speaks.	Yes*	968	96
	No	9	0.9
	Don't know	31	3.1
QK4) People who are COVID-19 positive but do not have symptoms cannot spread the virus.	Yes	141	14
	No*	753	74.7
	Don't know	114	11.3
QK5) Patients who have COVID-19 need not wear a mask to prevent the disease from spreading.	Yes	70	6.9
	No*	920	91.3
	Don't know	18	1.8
QK6) Covering our mouth and nose with bent elbow or tissue while coughing or sneezing can reduce the virus spread.	Yes*	909	90.2
	No	77	7.6
	Don't know	22	2.2
QK7) Washing your hands with soap and water can kill the virus.	Yes*	912	90.5
	No	64	6.3
	Don't know	32	3.2
QK8) Social distancing will help prevent the spread of COVID-19.	Yes*	992	98.4
	No	7	0.7
	Don't know	9	0.9
QK9) Children and adolescents cannot be affected by COVID-19.	Yes	60	6
	No*	918	91.1
	Don't know	30	3
QK10) There is no proven vaccine or drug against COVID-19 in India.	Yes*	863	85.6
	No	91	9
	Don't know	54	5.4
QK11) Time between exposure to COVID-19 virus and noticing symptoms can range from 1-14 days.	Yes*	958	95
	No	18	1.8
	Don't know	32	3.2
QK12) COVID-19 virus cannot survive on surfaces like doors, doorknobs, plastic bags etc.	Yes	135	13.4
	No*	776	77
	Don't know	97	9.6

'*'- Correct answer, '**'- all correct answers chosen for each corresponding question.

The mean knowledge score was 9.71±1.83. The knowledge scores were higher among the degree holders, the HCWs and those living in apartments, compared to their respective counterparts. Responders who worked from home had better scores than those who were "not working currently" (Figure 1a).

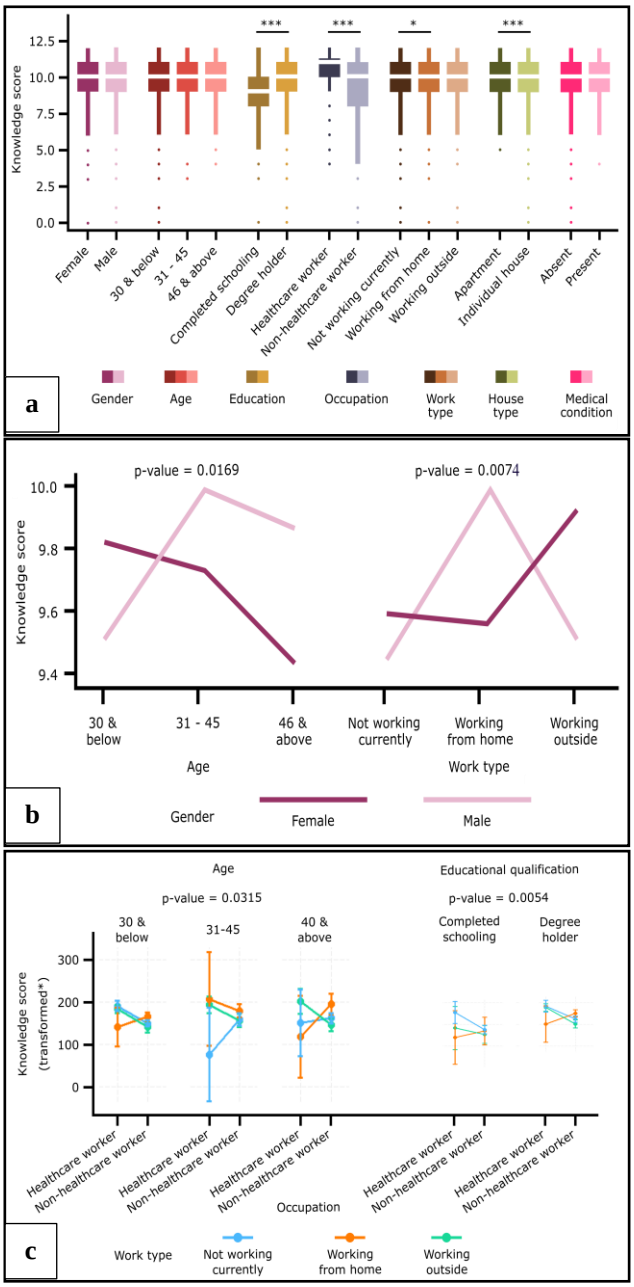

Figure 1: (a) Association between knowledge score and bio-social variables ('*'- <0.001, '*'- <0.05), (b) interaction between knowledge score and gender versus age category and work type, (c) interaction between knowledge score, occupation, work type versus age category and educational qualification.**

The knowledge scores were higher in the males among the categories 31-45 years and, 46 and above. However, there was a reversal of trend among the young responders (30 and below) where the female responders scored better (p value- 0.0169). Among those who were "working outside" and "not working currently", the female respondents had better, whereas among those who were "working from home" male respondents scored better (p value- 0.0074) (Figure 1b). Irrespective of age and educational qualification, HCWs who were "working outside" scored better than their corresponding non-HCWs, although non-HCWs who were "working from home" scored better than their corresponding HCWs (p value- 0.0054) (Figure 1c).

Table 2: Attitude of the responders regarding COVID-19.

Questions	Answers	n	%
QA1) Health care workers are taking necessary steps to fight COVID-19.	I agree*	930	92.3
	I disagree**	43	4.3
	I don't know***	35	3.5
QA2) Do you think washing hands with soap and water will help in preventing the transmission of COVID-19?	I do think*	906	89.9
	I don't think**	69	6.8
	I don't know***	33	3.3
QA3) Do you think covering the mouth and nose while coughing or sneezing by using a tissue or with elbow will help in reducing the transmission of COVID-19?	I do think*	892	88.5
	I don't think**	85	8.4
	I don't know***	31	3.1
QA4) Do you think the practice of keeping a certain distance from other people while going outside will help in preventing the transmission of COVID-19?	I do think*	971	96.3
	I don't think**	19	1.9
	I don't know***	18	1.8
QA5) Do you think taking home remedies or immune-boosting foods will protect you against COVID-19?	I do think*	823	81.6
	I don't think**	121	12
	I don't know***	64	6.3
QA6) Do you think it is important to protect the elderly (60 years and above) from COVID-19?	I do think*	986	97.8
	I don't think**	7	0.7
	I don't know***	15	1.5
QA7) India can win the battle against COVID-19 virus.	I agree*	791	78.5
	I disagree**	49	4.9
	I don't know***	168	16.7

'*'- Positive attitude, '**' - Negative attitude, '***' - Neutral attitude.

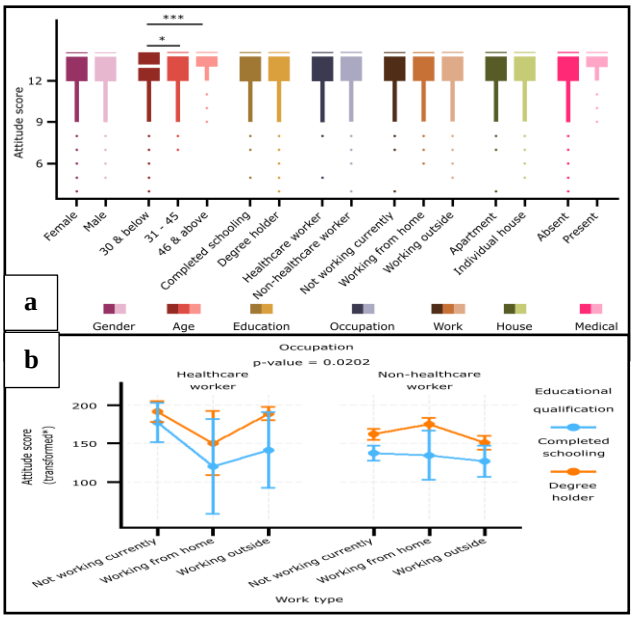

Figure 2: (a) Association between attitude score and bio-social variables, (b) interaction between attitude score, occupation, work type and educational qualification.

The mean attitude score was 12.85±1.63 (Table 2), (Figure 2). The attitude scores increased with age (p value- 0.0001), (Figure 2a). Regardless of their occupation and work type, degree holders scored better than those who completed schooling (p value- 0.0202) (Figure 2b).

The mean practice score was 10.61±1.74 (Table 3), (Figure 3). Degree holders, HCWs and working participants had higher practice scores than their respective peers. Responders aged between 31-45 years scored better than younger responders (Figure 3a). Residents with comorbidities in apartments scored better than those in independent houses (p value- 0.0368). But the reverse was true in those without comorbidities (Figure 3b).

Frequency of going outside had significant correlations with all the demographic variables except the type of house. Educational qualification influenced the frequency of disinfecting belongings and cleaning the house (p-value- 0.0005). The duration of washing hands had significant associations with gender and occupation.

Table 3: Practice of the responders regarding COVID-19.

Questions	Answers	n	%
QP1) Do you wear a face mask while going outside, after the COVID-19 pandemic has started?	No, I don't wear a mask while outside*	6	0.6
	Yes, rarely**	22	2.2
	Yes, mostly***	99	9.8
	No I don't go outside or Yes, every time****	881	87.4
QP2) Do you practise social distancing from other people while being outside?	No, I don't practice social distancing*	7	0.7
	Yes, rarely**	46	4.6
	Yes, mostly***	284	28.2
	No I don't go outside or Yes, every time****	671	66.6
QP3) While coughing and sneezing do you cover your mouth and nose with a tissue or elbow?	No, I don't*	21	2.1
	Yes, rarely**	27	2.7
	Yes, mostly***	241	23.9
	Yes, every time****	719	71.3
QP4) Do you take any measures to protect the elderly (60 years and above) from COVID-19?	I don't have an elderly at home****	338	33.5
	Yes, I do*	607	60.2
	No, I don't****	63	6.3
QP5) In the past week, have you gone outside?	No, I didn't go outside	344	34.1
	Yes, 1-2 times	363	36
	Yes, 3-7 times	141	14
	Yes, more than 7 times	160	15.9
QP6) Do you disinfect your belongings and clean your house?	No, I don't	38	3.8
	Yes, two or less than two times a week	156	15.5
	Yes, three or more than three times a week	181	18
	Yes, once daily	451	44.7
	Yes, more than once a day	182	18.1
QP7) For how long do you wash your hands?	Around 10 seconds	291	28.9
	Around 20 seconds	530	52.6
	More than 30 seconds	187	18.6
QP8) How are you washing your hands after COVID-19 pandemic has started?	With soap and water	864	
	With alcohol rub/hand sanitizer	599	

Continued.

Questions	Answers	n	%
	With water alone	107	
QP9) What mask do you wear while going outside?	Cloth mask	490	
	Surgical or medical mask	452	
	N95 or equivalent	345	
QP10) When you are out and wearing a mask, do you pull down your mask for any reason / reasons?	No, I don't pull down my mask while wearing it.	269	
	Yes, when nobody is near me	408	
	Yes, when I feel suffocated	368	
	Yes, while speaking to someone	67	
	Yes, while eating or drinking	18	
QP11) Are you currently taking any home remedies or immune-boosting foods to protect against COVID-19?	No	206	
	Yes, Ginger	538	
	Yes, Kabasura kudineer	499	
	Yes, Lemon drink	492	
	Yes, Turmeric	459	
	Yes, Nilavembu kudineer	209	
	Yes, others	38	
QP12) Have you engaged yourself in physical activities after COVID-19 pandemic has started?	No, I don't do	451	
	Yes, exercises like walking, jogging, cycling etc.	388	
	Yes, yoga	175	
	Yes, strength-training	137	
	Yes, others	16	
QP13) Do you update yourself regularly about COVID-19?	No, I don't update	44	
	Yes, through news	721	
	Yes, through the internet and social media like WhatsApp, Facebook, etc.	561	
	Yes, through friends and family	357	
	Yes, through scientific journals and publications	229	
	Yes, through health care workers	217	
	Yes, others	4	

* - 0 points, ** - 1 point, *** - 2 points, **** - 3 points.

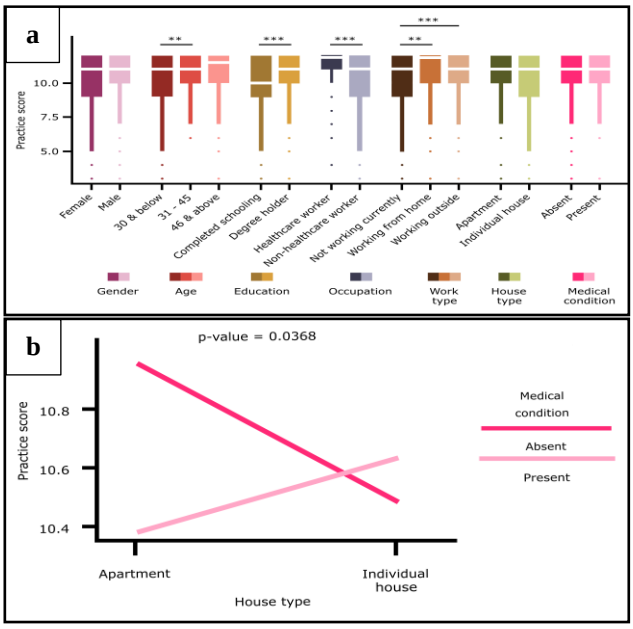

Figure 3: (a) Association between practice score and bio-social variables, (b) Interaction between practice score, house type and whether or not having a medical condition.

Knowledge, attitude and practice were significantly correlated with each other. Higher knowledge was associated with a more positive attitude and better practice. Positive attitude also led to better practice.

DISCUSSION

In Tamil Nadu, due to the huge backlog in economic progress and disruption of livelihood, it was important for the government to slowly resume normalcy in a phased manner. It was important, however, to take appropriate precautions as there were several hidden factors that contributed to COVID-19 becoming a pandemic.

The virus spreads through droplets when an infected person coughs or sneezes. But it's also noted that the virus can live outside the living body as fomites on surfaces and the amount of time the virus survives depends on the material of the surface.[5,9] The virus can remain viable in the air for up to 3 hours, copper for up to 4 hours, cardboard up to 24 hours, and on plastic and stainless steel up to 72 hours.[9] A person who touches these surfaces and touches their eyes, nose or mouth has a chance of getting the virus. Asymptomatic carriers are those who are infected with the virus without having any COVID-19 symptoms. Their acquaintances could be

infected without their knowledge. Also, the mildly symptomatic individuals might mistake it as the common cold, leading to further spread of the disease.[5,10] Patients who recovered from COVID-19 symptoms still tested positive and had enough viral load to spread the disease. If they don't take appropriate precautions they can contribute to virus spread.[5]

Though all these factors cannot be accurately measured, the disease transmission can be monitored using an epidemiological measurement called basic reproduction number (R0 or R zero) of an infection. This number is based on an average of how many people an infected person can infect.[11] The R0 of COVID-19 was somewhere between 2-2.5 (constantly varies) worldwide at the time of the study while that of SARS-CoV and MERS-CoV was 1.7-1.9, and 0.7 respectively.[12] It should be noted that only when the R0 goes below 1, the disease spread gets under control.[11] However, the mortality rate of COVID-19 was significantly lesser (2.3%- at the time of writing the paper) than SARS-CoV (9.4%) and MERS-CoV (34.4%).[12] Our study mainly aimed to explore the knowledge, attitude and practice regarding COVID-19 among the general public during the phased unlock period in Tamil Nadu.

COVID-19 symptoms and vulnerable population

Only 49.7% of the responders identified all the symptoms of COVID-19 (QK1). This low correct rate can be attributed to the failure of survey respondents to recognize anosmia as one of the common symptoms for COVID-19. The least correct rate was for QK2 which was 31.3%. Respondents failed to identify hypertension, cancer and heart disease as risk factors which indicated a failure to update themselves from proper sources. CDC clearly mentions patients with diabetes and hypertension are at least 3 times more prone, patients with 2 conditions are 4.5 times more prone, and those with 3 or more conditions are 5 times more prone than normal individuals to developing severe symptoms.[9]

97.8% of the responders believed it is important to protect the elderly (QA6). This attitude reflects on practice as well, where 93.7% took measures to protect their elderly. 91.1% knew that children and adolescents can also contract the disease (QK9). These results clearly highlight the government's effort to highlight 'though the elderly are more vulnerable to COVID-19, the young could still be affected'.

Transmission of COVID-19

96% knew that transmission of the virus is through droplets (QK3). A good number 753 (74.7%) of responders knew that infected people are capable of spreading the disease despite not having symptoms (QK4). High correct rates for these questions can be correlated to a deeper understanding about transmission. High awareness (95%) regarding the incubation period (QK11) suggests that people are well aware of how long they can develop symptoms after preliminary exposure and also how to quarantine time frame is decided. Only 77% of the population knew that the virus can survive on surfaces as fomites (QK12). People might find it difficult to correlate that a virus which cannot be seen through the naked eye can be viable on these surfaces and still cause an infection. It is, therefore, necessary to clean and disinfect households, especially those surfaces which are frequently touched like door handles, knobs etc. with appropriate chlorine-based disinfectants.[5,9] 451 participants cleaned their belongings once daily and 182 participants did it more than once a day (QP6). This suggests that more than half of the responders are pro-active in curbing the disease spread.

Respiratory hygiene

91.3% had proper knowledge regarding wearing masks even after testing positive for COVID-19 (QK5). The effectiveness of wearing masks to reduce the spread of respiratory diseases have been shown in studies done by Jefferson et al and Macintyre et al.[13,14] At times when wearing masks is not possible, simple measures like coughing into a bent elbow or tissue paper can be effective.[5,8,9] 90.2% have given the correct answer for QK6 which can be associated with good respiratory hygiene awareness among the people. Similarly, 88.5% believed in respiratory hygiene (QA3). 71.3% were able to practice proper respiratory hygiene every time (QP3). 87.4% of the participants either didn't go outside or wore a mask every time they went out (QP1). It can be agreed that the public has well adapted to the new normal lifestyle. Cloth masks were the most worn type which was the recommended mask for the general public (QP9). The major reasons to pull down the mask were when nobody was near them since coronavirus cannot be spread without an active source nearby or when they felt suffocated (QP10).

Hand hygiene

Studies by Warren-Gash et al and Bloomfield et al emphasize the effectiveness of hand washing in restricting the spread of respiratory infections.[15,16] It is recommended to wash hands with soap and water or alcohol rub for at least 20 seconds with appropriate technique.[5,8,9] CDC has recommended humming the happy birthday song to assist as a mental timer to cover 20 seconds.[9] Soaps have been proven to be effective against SARS-CoV by these mechanisms- membrane rupture, simple elution and viral entrapment.[17] QK7 questioned this knowledge and 90.5% answered correctly. 89.9% believed in hand hygiene (QA3) and 71.2% washed their hands for around 20 seconds or more (QP7). Most people used soap and water (QP8). High scores in this section suggest the government's success in removing the ambiguity on handwashing in controlling a respiratory pandemic.

Social distancing

The minimum safe distance to keep from each other is 1 meter to lessen the chance of inhaling the infective droplets.[5,8] 98.4% of respondents answered correctly for the question on social distancing (QK8) and 96.3% believed the importance of social distancing (QA4) which indicates that the people are well prepared to handle the unlock phase. 70.1% went out 1-2 times or didn't go out at all in the preceding week (QP5). This is an agreeably good practice despite the relaxation of local restrictions. However, only 66.6% of the participants socially distanced themselves every time they went out (QP2). This could be because in a country like India it is practically impossible to social distance every time considering the population density and smaller grocery stores and shops.

Home remedies to improve immunity

At the time of data collection, there was no proven vaccine or drug against COVID-19.[5] 85.6% had appropriate knowledge on COVID-19 treatment (QK10). 81.6% of the respondents believed taking home remedies or immune-boosting foods will protect them from COVID-19 (QA5). Most commonly consumed were ginger, turmeric, kabasura kudineer and lemon drink (QP11). In line with the advice of Siddha practitioners, people still believed and took these traditional home remedies in hope of fighting the COVID-19 better.[18]

A study by Martin et al has shown that moderate-intensity exercise reduces the severity of respiratory infections and improves immunity.[19] 451 responders didn't do any physical activity (QP12) and this could be attributed to the lack of emphasis on the importance of physical activities on overall health.

People's view

A large number of people resorted to updating themselves about COVID-19 from news, internet and social media, and through family and friends (QP13). These sources aren't completely reliable and need backing from trusted sources like HCWs and scientific publications. As per the National Health Profile 2019 (14th issue), patient-doctor ratio is 538 (approximately 2 doctors per 1000 people) in Tamil Nadu.[20] The state still accounted for around five lakh cases totally and around eight thousand deaths which is only third to Maharashtra and Andhra Pradesh in India as of September, 2020.[8]

Despite these huge numbers, the majority of the responders (92.3%) believed in the efforts of the health-care workers (QA1) which could be due to their trust based on their personal experience. Yet, 4.9% disagreed and 16.7% didn't know if India would win against COVID-19 (QA7), which is understandable as owing to its huge population and also considering the phased relaxation of restrictions, one might doubt or fear India's win over COVID-19.

Bio-social variables on knowledge about COVID-19

Degree holders had better knowledge which was congruent with studies by Byanaku et al, Al-Hanawi et al, Abdelhafiz et al, Tomar et al and Narayana et al.[21-25] Apartment-dwellers were more knowledgeable than those in other housing types which indicates an increased social awareness to protect themselves and others in an apartment community. HCWs being the front line workers are exposed to working with the disease on a day to day basis. This explains why HCWs had better knowledge than non HCWs. This association was synonymous with studies by Narayana et al, Edet et al and Kartheek et al.[25-27] Knowledge wasn't affected by gender or age category in our study, though other studies found varying results. Females had better knowledge scores in studies by Byanaku et al, Kartheek et al and Azlaan et al while in a study by Tomar et al males scored better.[21,24,27,28] In studies by Byanaku et al, Al-Hanawi et al, Tomar et al, Narayana et al, Azlaan et al and Adela et al the older population scored better than the younger (30 and below) population but in a study by Abdelhafiz et al this pattern was reversed.[21-25,28,29]

However, in our study, knowledge was higher among the males in 31-45 years and 46 and above categories but there was a reversal among the young responders where the female respondents had better knowledge. Working individuals have more opportunities to stay connected with colleagues and to share more information regarding COVID-19 and this could be the reason why responders who worked from home were more knowledgeable than those who weren't working currently. Among those who are working outside and not working currently, the female responders had higher knowledge, which could be due to the fact that the women generally take care of the family in terms of health and wellness than men in Tamil Nadu, right now.

Bio-social variables on attitude about COVID-19

With the increase in age, the attitude was more positive, suggesting that the older age groups had an appropriate mindset to tackle the pandemic. But the younger age groups have more chances of being an asymptomatic or mildly symptomatic carrier. Their attitude will play a crucial role in halting the disease spread. In Al-Hanawi et al study, females were more optimistic while in Adela et al study it was the males.[22,29] Studies by Narayana et al and Edet et al showed that the HCWs had a better attitude than the non HCWs.[25,26] But in our study, neither gender nor occupation played any role in attitude. Degree holders had a more positive attitude than those who completed schooling, regardless of their occupation or work type which is in agreement with studies by Al-Hanawi et al and Narayana et al.[22,25] This could be correlated with how education molds a person to have a more positive attitude.

Bio-social variables on practice regarding COVID-19

Though COVID-19 is a novel disease, degree holders have still done better which shows how education can help one acquire information and adapt early to the situation. Studies by Al-Hanawi et al and Narayana et al showed similar findings.[22,25] Younger age groups didn't follow good practice when compared to their counterparts which were comparable to studies by Narayana et al and Edet et al.[25,26] Women had better practice in the study by Al-Hanawi et al while it was the men in study by Adela et al.[22,29] But in our study, gender did not influence practice.

Overall

Higher knowledge influenced both positive attitude and better practice which was similar to studies by Tomar et al and Edet et al.[24,26] In addition to this, there was a significant correlation between positive attitude and good practice in our study.

Since our study was an online survey, the responders clearly represented the group which had internet facilities and the ability to use electronic media. Also, the study is based on self-observation and lacks space for responders to add new information as the questionnaire is restricted to non-modifiable options. Due to this limitation, this study might not reflect the actual practice of the population as a whole.

CONCLUSION

The aim of this study was to find the causation effect between knowledge, attitude and practice of the people. It is evident from our study that better knowledge leads to a positive attitude and in turn reflects on better practice. The areas of weakness in the knowledge section were regarding symptoms and vulnerable populations. The intermediate variable 'attitude' bridged the gap between awareness and how it affected the actual response. Our study revealed how education can be an effective tool in awareness and timely adaptation. It also pointed out how the youth needs more awareness and better habits regarding COVID-19. Our study establishes a baseline or reference value for future assessments and helps health authorities to formulate educational activities based on the areas of improvement. Ideally, the data gathered must be further analysed using qualitative methods (in-person interviews, daily observations, etc.) to have a deeper understanding. Our study also tried to gather data based on local practices quite unique to the region which provides scope to formulate completely new research questions. The people in turn will have to adapt to the new lifestyle to curb the spread of COVID-19.

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