











RESEARCH ARTICLE

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# Assessment of Knowledge, Attitude and Practice on Prevention of Catheter-associated Urinary Tract Infection (CAUTI) among Health Care Professionals Working in a Tertiary Care Teaching Hospital

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## Abstract

Catheter-associated Urinary Tract Infection (CAUTI) is a common healthcare-related infection occurring in patients admitted for various ailments. Approximately 80% of hospital acquired Urinary Tract Infections (UTIs) are catheter associated. The purpose of the current research was to find out the level of knowledge, attitude and practice on prevention of CAUTI among healthcare professionals working in tertiary care hospital. A descriptive study was done among 95 health care working in tertiary care hospital in Chennai. The researchers administered standard questionnaire and statistically explored the knowledge, attitude, and practice levels about prevention of CAUTI among the participants. Among 95 participants, 28.4% and 71.6% of the individuals had moderately adequate knowledge and adequate knowledge about CAUTI. About 4.2% of the participants had unfavourable, 88.4% had moderately favourable and 7.4% had favourable attitude towards prevention of CAUTI. About 4.2% of the individuals had moderately adequate and 95.8% had adequate practice towards the prevention of CAUTI. There was significant correlation between attitude and practice. The professional experience of the participants showed statistically significant association with the level of practice among the demographic variables. In our present study, we found out that health care professionals had adequate knowledge, attitude, and practice on prevention of CAUTI. Medical education programs, frequent auditing with a checklist about catheter care must be conducted to maintain the achieved knowledge and practice levels.

**Keywords:** Knowledge, Attitude, Practice, Health care professionals, CAUTI, Prevention

## INTRODUCTION

Urinary catheterization is an indispensable procedure performed in hospitals especially, in ICU settings. Approximately 70-80% of all acquired UTIs are due to improper urinary catheterization and failure to follow the Centres for Disease Control (CDC) guidelines for catheterization<sup>1</sup>.

CAUTI is the most common and frequently occurring nosocomial infection in patients admitted with hip fracture, spinal cord injury, urinary incontinence, bladder obstruction and extended use of indwelling catheterization in chronically sick patients<sup>1</sup>. Urinary Tract Infection affects 150 million people worldwide and approximately 80% of the nosocomial UTIs are catheter associated<sup>1</sup>. CAUTI is caused by variety of pathogens including *Escherichia coli*, followed by *Proteus* species and *Pseudomonas* species. The other causative microbial organisms are *Enterococci*, *Klebsiella*, *Candida*, *Serratia* and few others<sup>1</sup>. CAUTI shows clear female predominance due to the anatomy of the urinary tract and the hormonal changes that take place in women. The possibilities for developing bacteriuria and UTI are seen in geriatric and paediatric age group, impaired immunity, co-morbid conditions like diabetes, hypertension, and obesity<sup>2</sup>.

According to World Health Organization (WHO), infections acquired by patients during the

period of hospital stay is a major public health concern which may leads to increase in duration of the patient's hospital stay, rise in the morbidity and mortality rate, financial burden, and causes additional sufferings for their family members.<sup>3,4</sup> More than one-fourth of all hospital in-patients will be catheterized during their hospital stay, due to various reasons<sup>5</sup>. CAUTI may lead to many physical complaints in admitted patient such as fever, body pain, and prolonged antibiotic intake leading to the development of multidrug resistant pathogens. For those developing drug resistant organisms, urinary tract acts as a reservoir and can be spread to other nearby patients<sup>6</sup>.

Majority of CAUTI are preventable. By following proper guidelines and preventive measures such as washing hands effectively by using appropriate techniques, meticulous care of the indwelling catheter and proper removal of the catheter CAUTI can be prevented. Unnecessary urinary catheterization and the prolonged duration of catheterization should be avoided. Evidence based practices need to be followed in order to improve patient care<sup>7</sup>.

Catheter insertion and its care is the cornerstone for the prevention of CAUTI. However, applying and following the needed preventive measures may be challenging in busy clinical settings<sup>8</sup>. Therefore this study was undertaken with

the target to investigate the depth of knowledge, attitude, and practice on prevention of CAUTI among Healthcare Professionals (HCPs) in a tertiary hospital in Chennai.

## **MATERIALS AND METHODS**

### **Study participants**

This present study was a cross-sectional study carried out in Tamil Nadu, India. A semi-structured questionnaire developed by the researchers was used to assess the Knowledge, Attitude and Practice levels on prevention of CAUTI among health care professionals working in a tertiary care hospital. The sample was collected through random sampling technique.

### **Inclusion criteria**

- Age criteria – 21 years and above
- Individuals who are working in health care sectors
- Individuals who are willing to participate in the study

### **Exclusion criteria**

- Individuals those who are not willing to participate in the study.
- Incomplete questionnaire form

A total of 130 participants were involved in the research. Only 95 participants completed the research questionnaire.

### **Compliance with Ethical Standards**

The research was initiated after obtaining the approval from Institute of Research board of Panimalar Medical College Hospital & Research Institute, Chennai. (IRB#1/2020/014). Data collected from the participants were kept confidential.

### **Data collection tools**

A validated structured questionnaire on knowledge and modified Likert scaled attitude, and practice questionnaire were given to the participants for assessment. It was framed by following the review of literatures, national, and international CDC guidelines. The questionnaire was validated by following face validity method. The validity and reliability of the tool were tested by conducting a pilot study in different group of participants working in tertiary care hospital. The participants involved in the pilot study were not included in the present study.

### **Methods of measurement (Scoring)**

The questionnaire consisted of four sections. The demographic data section, it consists of details of the participants such as age, gender, education, profession, and professional experience. This was followed by a set of 14, yes or no questions to assess the level of knowledge. Score of “1” was awarded to the correct response and “0” was awarded to the incorrect response accordingly. The possible total knowledge score could range from 0 to 14. Based on the mean score, the level of knowledge was classified into inadequate, moderately adequate, and adequate knowledge, if the score was below, equal and more than the mean score. The section to assess attitude comprised of 8 statements which was scaled by using 5 points Likert scale. Options for the provided positive statements were “Strongly Agree,” “Agree,” “Neither agree nor disagree,” “Disagree,” and “Strongly disagree” and was given score from 1 to 5, respectively. The scores were reversely coded as 5, 4, 3, 2, and 1, for negatively phrased questions. Then, the overall attitude score was calculated, which could range from 8 to 40. Attitude scores ‘below the mean’ was assigned for unfavourable attitude section, ‘above the mean score’ were assigned for favourable attitude section, and ‘equal to the mean score’ were classified under moderately favourable attitude section. The final sections for practice assessment had a set of 10 statements which were scaled by 3 point scale. Options for the provided positive statements were “Agree,” “Neither agree nor disagree,” and “Disagree,” scored from 1 to 3, as stated. The scores were reversely coded as three, two, one, for negatively phrased questions. Then, total overall score calculated, ranged from 10 to 30. Practice scores were categorized into three sections - inadequate practice, moderately adequate practice, and adequate practice. The below mean score was categorized into inadequate practice, above mean score was categorized into adequate practice, and equal to mean score was assigned for moderately adequate practice section.

### **Statistical Analysis**

SPSS (Statistical Package for Social Sciences) software for Microsoft windows-17 was

used to calculate the statistics. Cross tabulation was used for calculating descriptive statistical data.

## RESULTS

Based on the inclusion and exclusion criteria, 130 participants were included in the study. Out of which 95 participants submitted the completed questionnaires. Table 1, illustrates the demographic variables of health care professionals. About 10.5% belonged to the age group of above 21-24 years, between 25-30 years of age was 65.3%, and participants of more than 30 years were 24.2%. Among the participants 69.5% were females and 30.5% were male. About 49.5% were doctors, 48.4% were nurses, and 2.1% were other allied health care professionals in our study. About 27.4% were diploma holders, undergraduate were 45.3%, and postgraduates were 27.4% among the study population. Participants with professional experience less than 6 months were 35.8%, 6 months -2 years were 25.3%, professionals with 2- 6 years of experience were 16.8%, 7-10 years of experience were 10.5%, and participants with more than 10 years of experience were 11.6%.

**Table 1.** Demographic characteristics of health care professionals (n=95)

Demographic variables	Frequency	Percentage
<b>Age</b>	n	%
21-24 Years	10	10.5%
25 - 30 Years	62	65.3%
> 30 Years	23	24.2%
<b>Gender</b>		
Female	66	69.5%
Male	29	30.5%
<b>Profession</b>		
Medicine	47	49.5%
Nursing	46	48.4%
Allied Health Sciences	2	2.1%
<b>Educational qualification</b>		
Diploma	26	27.4%
Undergraduate	43	45.2%
Post Graduate	26	27.4%
<b>Professional Experience</b>		
Less than 6 Months	34	35.8%
6 Months - 2 Years	24	25.3%
2 - 6 Years	16	16.8%
7 - 10 Years	10	10.5%
More than 10 Years	11	11.6%

## Knowledge on CAUTI

The knowledge level assessment of the research participants, are shown in Table 2, 28.4% (n = 27) of individuals had moderately adequate knowledge and 71.6% (n = 68) had adequate knowledge about CAUTI. Average mean knowledge of the study participants was  $11.42 \pm 1.534$  (Table 2). 82.1% of the research participants were aware that CAUTI is one of the hospital acquired infection, 94.7% of the participants were aware that high risk groups for CAUTI include female gender and elderly patients, 95.8% of the research participants knew that strict aseptic precautions to be followed for urinary catheterization to prevent the CAUTI among the catheterised patients, 78.9% of the research participants were aware that as per the CDC guidelines, the catheter must be removed within 24 hours for the post-operative patients, 92.6% of the participants aware that cleaning the peri-urethral region with antiseptics is mandatory to prevent CAUTI, 94.7% of the participants aware that securing the IUC catheter properly after insertion, is important to prevent displacement of the catheter and injury to the bladder, 84.2% participants aware that CAUTI increases the duration of the patient's stay in the hospital, 94.7% of the participants know that if the urinary catheter remains indwelling for a month, the risk of bacteriuria is high, 70.5% of the participants were aware that cleaning of the meatus and catheter with soap and water daily will reduce the possibility of CAUTI (Table 3). There was no correlation between the level of knowledge with attitude, practice (Table 4). There was no significant association of age, gender, profession, education, and professional years of experience in health care professional with the level of knowledge among the research participants (Table 5).

## Attitude towards CAUTI

In this present study, as illustrated in Table 2, 4.2% (n = 4) had unfavourable attitude, 88.4% (n = 84) had moderately favourable attitude and 7.4% (n=7) had favourable attitude towards CAUTI. Average mean and standard deviation of the attitude of the research participants was  $26.01 \pm 2.793$  (Table.2). About 51.6% research participants agreed that renewal reminders for catheter, prevents CAUTI, 55.8% of the participants strongly agreed that education

and training regarding basic catheter care, will help in prevention of CAUTI. About 55.8% of the participants agreed that routine screening for asymptomatic bacteriuria is recommended in catheterized patients (Table 4). There was correlation between the levels of attitude with

**Table 2.** Level of Knowledge, Attitude, and Practice on prevention of CAUTI among health care professionals. (n=95)

Variables	Levels	Frequency	Percentage	Mean	SD
Knowledge of health care professionals on CAUTI	Moderately adequate knowledge	27	28.4	11.42	1.534
	Adequate knowledge	68	71.6		
Attitude of health care professionals on CAUTI	Unfavourable Attitude	4	4.2	26.01	2.973
	Moderate favourable Attitude	84	88.4		
Practice of prevention of health care professionals on CAUTI	Favourable Attitude	7	7.4	26.71	1.967
	Moderate Practice	4	4.2		
	Adequate Practice	91	95.8		

**Table 3.** Assessment of Knowledge on CAUTI among health care professionals (n=95)

Q.No	Variables	Yes		No	
		n	%	n	%
8	Most common Hospital acquired infection is CAUTI	78	82.1	17	17.9
9	Risk factor of CAUTI is not directly related to the duration of catheterization	36	37.9	59	62.1
10	High risk groups for CAUTI include female gender and elderly patients	90	94.7	5	5.3
11	Acute urinary retention and bladder obstruction is the indication catheterization	85	89.5	10	10.5
12	Strict Aseptic precautions to be followed for urinary catheterization	91	95.8	4	4.2
13	Catheter must be removed as soon as possible or within 24 hours for catheterized post-operative patients.	75	78.9	20	21.1
14	Cleaning the peri-urethral region with antiseptics is mandatory to prevent CAUTI	88	92.6	7	7.4
15	Secure the IUC catheter properly after insertion, to prevent displacement of the catheter and injury to the bladder	90	94.7	5	5.3
16	CAUTI increases the duration of the patient's stay in the hospital	80	84.2	15	15.8
17	If urinary catheter remains indwelling for a month, the risk of bacteriuria is high	90	94.7	5	5.3
18	silicone alloy-coated indwelling urinary catheters may benefit the patients for long-term-care	82	86.3	13	13.7
19	Frequent use of lubricants with antiseptics may not be necessary	44	46.3	51	53.7
20	Daily cleaning of the meatus and catheter with soap and water reduce the possibility of CAUTI	67	70.5	28	29.5
21	CAUTI is most often caused by Escherichia coli	88	92.6	7	7.4

**Table 4.** Assessment of Attitude towards prevention of CAUTI among health care professionals (n=95)

Q.No	Variables	Strongly agree		Agree		Neither agree nor disagree		Disagree		Strongly disagree	
		n	%	n	%	n	%	n	%	n	%
22	Renewal reminders for catheter prevents CAUTI	34	35.7	49	51.6	9	9.5	2	2.1	1	1.1
23	Development of CAUTI cannot be avoided among catheterized patients.	16	16.8	28	29.5	17	17.9	24	25.3	10	10.5
24	CAUTI is not a very serious illness.	8	8.4	26	27.5	16	16.8	37	38.9	8	8.4
25	Education regarding basic catheter care helps to prevent CAUTI	53	55.8	36	37.8	5	5.3	0	0	1	1.1
26	Health care workers can remove the catheter whenever they are convenient	17	17.9	27	28.4	7	7.4	35	36.8	9	9.5
27	Prevention of CAUTI is a frequent problem and impossible to attain it	11	11.6	22	23.2	14	14.7	37	38.9	11	11.6
28	Aseptic precautions may not be needed for removing the Foley's catheter	10	10.5	24	25.3	11	11.6	36	37.9	14	14.7
29	Routine screening for asymptomatic bacteriuria (ASB) is recommended in catheterized patients, which has now not advised by the CDC prior to catheter insertion	26	27.3	53	55.8	7	7.4	7	7.4	2	2.1

practice (Table 6). The attitude level of the participants towards CAUTI prevention had no statistically significance with the selected demographic variables (Table 5).

#### Practice on Prevention of CAUTI

Among the 95 research participants, 4.2% (n = 4) of individuals had moderate practice, and 95.8% (n = 91) had adequate practice on prevention of CAUTI. Average mean and standard deviation of the practice level of the research participants was 26.71± 1.967 (Table 2). About 96.8% of the research participants were aware that before and after handling of the catheter site, hands must be washed with antiseptics. 93.7% of the participants were aware that appropriate catheter size should be used to minimize urethral trauma, 89.5% were aware that kinking or twisting of the catheter must be prevented for unobstructed flow of urine,

94.7% of the participants were aware that the urine collecting bag should be emptied regularly and must be kept below the bladder level (Table 5). There was correlation between the levels of practice with attitude but there was no correlation with knowledge (Table 4). Professional experience had statistically significant association with the level of practice among the demographic variables at p=0.01 and other demographic variables like age, gender, profession, education in health care professional showed statistically no significant relationship. (Table 7)

#### DISCUSSION

For many decades lot of research and practice guidelines have been devised to determine the effective strategies for avoiding indwelling urethral Catheterization (IUC) and

**Table 5.** Assessment of Practice on prevention of CAUTI among health care professionals (n=95)

Q.No	Variables	Agree		Neither agree nor disagree		Disagree	
		n	%	n	%	n	%
30	Before and after handling the catheter site, hands must be washed with antiseptics.	92	96.8	2	2.1	1	1.1
31	Appropriate catheter size should be used to minimize urethral trauma	89	93.6	5	5.3	1	1.1
32	Urinary Catheterization must be done whenever there is an appropriate indication.	82	86.3	9	9.5	4	4.2
33	Twisting and kinking of the catheter must be prevented for an unobstructed flow of urine	85	89.5	6	6.3	4	4.2
34	At least once daily, the bladder must be irrigated with antimicrobial solutions/iodine solution.	52	54.7	20	21.1	23	24.2
35	urine collection bag should be emptied regularly	90	94.7	4	4.2	1	1.1
36	Urine collection bag must be positioned and fixed below the level of the bladder	90	94.7	3	3.2	2	2.1
37	Isolation must be done for a patient with UTI, from other non-infected patients	28	29.5	31	32.6	36	37.9
38	Maintaining close drainage system prevents CAUTI	65	68.4	18	18.9	12	12.7
39	Regular educational training to be given on basic urinary catheter care	90	94.7	5	5.3	0	0

to prevent its related complications such as prolonged usage, decubitus ulcer, and hospital-acquired infections. In general, most of these interventions were aimed at changing the beliefs and behaviours of health care professionals towards CAUTI as well as concerning limited usage of IUC and safe management of IUC<sup>9</sup>. Every hospital should adopt strict infection control measures to minimize the occurrence of CAUTI.

In our present study, Among 95 participants, 65.3 % of the health care professionals belonged to the age group of more than 30 years. About 69.5% were female participants which were similar to the study done by Assanga et al.<sup>10</sup> Equal percentage of doctors and nurses has participated in our study. Among them, 45.3% were under graduates with 11.6% having more than 10 years of experience.

**Table 6.** Correlation between knowledge, attitude and practice on prevention of CAUTI among healthcare professionals (n-95)

Spearman's correlation rho		Knowledge	Attitude	Practice
Knowledge	Correlation Coefficient	1.000	0.072	0.058
	Sig. (2-tailed)	0	0.488	0.579
Attitude	Correlation Coefficient	0.072	1.000	0.264**
	Sig. (2-tailed)	0.488	0	0.010
Practice	Correlation Coefficient	0.058	0.264**	1.000
	Sig. (2-tailed)	0.579	0.010	0

The correlation is significant \*\* At P< 0.01 level (2-tailed).

**Table 7.** Demographic variable's association with the knowledge, Attitude and Practice level on prevention of CAUTI among health care professionals (n=95)

Demographic variables	Adequate Knowledge	Chi-Square value	Moderate favourable Attitude	Favourable attitude	Chi-Square value	Adequate practice	Chi-Square value
Age	>21 Years	$\chi^2=2.178$ Df=2 P=0.336 (NS)	9 90.00%	0 0%	$\chi^2=5.709$ Df=4 P=0.222 (NS)	10 100%	$\chi^2=5.926$ Df=2 P=0.052 (NS)
	25 - 30 Years > 30 Years	42 67.70%	57 91.90%	3 4.80%		61 98.40%	
Gender	Years		18 78.30%	4 17.40%		20 87.00%	$\chi^2=0.747$ Df=1 P=0.338 (NS)
	Male	47 71.20%	59 89.40%	3 4.50%	$\chi^2=4.119$ Df=2 P=0.128 (NS)	64 97.00%	
Profession	Female		25 86.20%	4 13.80%		27 93.10%	
	Medicine	29 61.70%	42 89.40%	4 8.50%	$\chi^2=7.079$ Df=4 P=0.132 (NS)	47 100%	$\chi^2=4.448$ Df=2 P=0.108 (NS)
Educational qualification	Nursing	37 80.40%	41 89.10%	2 4.30%		42 91.30%	
	A H S	2 100%	1 50.00%	1 50.00%		2 100%	
Educational qualification	Diploma	21 80.80%	23 88.50%	1 3.80%	$\chi^2=4.643$ Df=4 p=0.326 (NS)	25 96.20%	$\chi^2=1.169$ Df=2 p=0.557 (NS)
	Under Graduate	27 62.80%	40 93.00%	3 7.00%		42 97.70%	
	Post Graduate	20 76.90%	21 80.80%	3 11.50%		24 92.30%	



**Table 7. Cont...**

Demographic variables	Adequate Knowledge	Chi-Square value	Moderate favourable Attitude	Favourable attitude	Chi-Square value	Adequate practice	Chi-Square value
Professional experience	26 76.50%	$\chi^2=3.141$ Df=4 P=0.535 (NS)	30 88.20%	2 5.90%	$\chi^2=10.228$ Df= 8 P=0.249 (NS)	34 100.00%	$\chi^2=19.172$ Df=4 P=0.01** (S)
Less than 6 Months	14 58.30%		23 95.80%	1 4.20%		23 95.80%	
6 Months - 2 Years	12 75.00%		14 87.50%	1 6.30%		16 100.00%	
2 - 6 Yrs	7 70.00%		9 90.00%	0 0%		7 70.00%	
7 - 10 Yrs	9 81.80%		8 72.70%	3 27.30%		11 100.00%	
More than 10 Yrs							

NS- Not Significance, S – significance, Df- Degree of freedom. \*\* - significance at p < 0.01

In our study, 71.6% had adequate knowledge about CAUTI and 28.4% had moderately adequate knowledge. This finding was similar to the results of Jain et al.<sup>11</sup> Three fourth of the participants knew that CAUTI is one of the frequent and commonly occurring hospital-acquired infections and duration of the catheter in situ have a major impact on the development of the infection. The research participants had adequate knowledge about the strict aseptic precautions that had to be followed during catheterization. As per Table 3.1, 94% of the research participants were aware that female gender and geriatric patients were the high risk groups for acquiring UTI and had adequate knowledge about the indications for urinary catheterization. Ninety two percent of the research participants had knowledge about using aseptic solution for cleaning the peri-urethral region and to properly secure the catheter after insertion. About 92.6% of the participants had adequate knowledge about the microorganisms causing CAUTI. These findings were in correlation with the study results conducted by Jain et al. and Datta P et al.<sup>11,12</sup> Being one of the most basic procedures done by the professionals in the hospital setup, it is not surprising to see such a high level of knowledge among the participants, and remembering the guidelines for urinary catheter insertion is the first important step towards preventing CAUTI.

In our study, 88.4% had moderately favourable attitude and only 7.4% had favourable attitude towards CAUTI, which was supported by Salha et al.<sup>13</sup> About 56% of the participants strongly agreed that training about catheter care has helped in preventing the occurrence of CAUTI. The research participants have agreed that aseptic precaution is needed for removal of urinary catheter. About 55% of the participants have accepted that screening must be done to rule out asymptomatic bacteriuria for catheterised patients, which has now not been advised by the CDC prior to catheter insertion. About 56% of the participants strongly agreed that education and training on prevention of bundle care have helped in minimizing the occurrence of CAUTI. (Table 4) CAUTI causes lot of problems pertaining to physical health, social and psychological aspect as well. Hence, it is important that all professionals handling patients needing catheterisation must be

aware of the updated and revised guidelines.

In our study, 95.8% of the research participants had adequate practice and only 4.2% needed more training and practice sessions for improvement of their skills in handling CAUTI. The study group had adequate practice towards washing hands before and after handling the catheter (Table 5). About 86% of the professionals follow the guidelines for the need for catheterisation and removal of the catheter. Our study participants have practiced effective catheter care for preventing CAUTI by maintaining a close drainage system, isolating the UTI patients, keeping urinary bag below the bladder level and emptying the urinary collection bag regularly. These findings were supported by Meneguetti et al and Parker et al.<sup>8,14</sup>

There was a correlation between attitude and practice (A-P) as calculated by spearman's correlation at  $P < 0.01$  level (2-tailed). Current research showed a significant association between professional experience and practice at  $p < 0.01$  (Table 7). There was no significant association between the other demographic variable with knowledge, practice and attitude. This may be attributed to the trainings given of the professionals to meticulously follow protocol and hence over the years, their practice towards CAUTI has improved.

Our results obtained from this study reflects the importance of setting up guidelines and policies to support the prevention of CAUTI. There must be sufficient staffing, educational training sessions, and access to adequate and appropriate supplies. Proper documentation for the urinary catheter use, indication for catheterization, date of insertion and removal, should be maintained and established.<sup>15</sup>

## CONCLUSION

CAUTI is one of the most frequently occurring healthcare acquired infections. In the current study, health care professionals had adequate knowledge, attitude, and practice on prevention of CAUTI. Infection prevention programs in every hospital must develop, implement, and monitor policies and procedures to minimize infections associated with the use of urinary catheters. In the health care setups, there must be medical education programs,

interdisciplinary training programs, and audits to be conducted with checklist about catheter care to improve the knowledge and practice of health care professionals.

## Statement of limitations

The Sample size was small, as many participants were not be able to include in the study due to the COVID-19 pandemic, hence a large sample size be required in order to generalize these results to the whole population.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## AUTHORS' CONTRIBUTION

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

## FUNDING

None.

## DATA AVAILABILITY

All datasets generated or analyzed during this study are included in the manuscript.

## ETHICS STATEMENT

This study was carried out in accordance with the recommendations of NIH guidelines for the Human participants and the protocol was approved by the Institutional Review Board (IRB) of the Panimalar Medical College Hospital & Research Institute, Chennai under the protocol number: Panimalar Medical College Hospital & Research Institute IRB #1/2020/014. This study conformed to the requirements of the Declaration of Helsinki (as revised in Seoul 2008). All the data collected was kept confidential.

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