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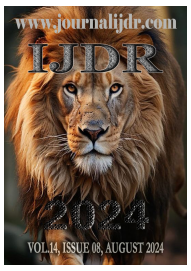

RESEARCH ARTICLE OPEN ACCESS

PREVALENCE AND RISK FACTORS OF HEALTH CARE ASSOCIATED INFECTIONS IN ICU: A CROSS SECTIONAL STUDY

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ABSTRACT

Abstract: Healthcare-associated infections (HAI) are regarded as the most common adverse events in health care service delivery. Most Common types of HAIs includes Surgical Site infections (SSI), Urinary tract infections (UTI), Blood stream infections (BSI) and Ventilator Associated Pneumonia (VAP). Adult inpatients in common specialties who developed hospital acquired infection (HAI) remained in hospital 2.5 times longer, incurred hospital costs almost three times higher. Present study aims to assess the prevalence and risk factors of health care associated infections in ICU. ***Material & Method:*** The quantitative non-experimental research approach and descriptive cross-sectional research design were adopted for this study. Convenience sampling technique was used for sample selection. The data were observed from 300patients admitted in ICU who were connected to mechanical ventilator. Structured tool was used to gather the data. Through SPSS, both descriptive and inferential statistics were used for data analysis. ***Results:*** Findings showed that prevalence of health care associated infections (VAP) was 22(7.3%) and found to be caused by E coli, klebsiella, streptococcus pneumonia and Hemophilus. Prevalence of CAUTI was 35(11.7%) in which organism was found to be caused by E coli, klebsiella and Proteus. ***Conclusion:*** The study's findings showed that VAP (7.3%) and CAUTI (11.7%) were the most common illnesses linked to HAIs. By adhering to standard protocols, taking precautions, and equipping healthcare workers with the proper protective gear, infections associated with healthcare can be prevented.

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INTRODUCTION

Healthcare-associated infections are those that individuals get while receiving treatment for illnesses that are not yet incubating at the time of admission. The primary problems in underdeveloped countries are infections associated with medical care, which often harm sick people. Both during a patient's treatment and after they are released from the hospital, health care-associated infections (HCAIs) might appear. The exact worldwide burden of healthcare-associated infections (HCAIs) remains unknown despite being the most frequent adverse event in healthcare due to the difficulty in acquiring reliable data. The burden of HCAI is one of Clean and Safer Care's main areas of concern, which is why this study was made.[1] Seven out of every 100 hospitalized patients from industrialized countries and ten from developing countries will at some point suffer an illness associated to medical care, according to the World Health Organization. Urinary tract infections (UTI), blood stream infections (BSI), ventilator-associated pneumonia (VAP), and surgical site infections (SSI) are the most common types of health-related infections (HAIs).[2] Adult inpatients in common specialties who contracted hospital acquired infections (HAIs) saw 2.5 times longer hospital stays and nearly three times greater hospital costs. Hospital costs after discharge, an increase in antibiotic-resistant bacteria, increased costs to healthcare systems, and preventable fatalities are all higher than for patients who are not infected. Worldwide, illnesses related to healthcare routinely endanger patients' lives.[3] Healthcare-associated infections (HAIs) have a significant effect because they prolong hospital stays, boost antibiotic resistance in microorganisms, raise financial burden, and impair patient outcomes by increasing morbidity and death rates. A review of published papers has indicated that at least 20% of nosocomial infections could be avoided, depending on the research design, the kind of infection, baseline infection rates, and the environment.[4] According to another analysis of the research, if HAIs are tracked as part of the IC program, infection rates can be reduced by as much as 30%. However, little is known about the epidemiology of healthcare-associated infections (HAIs) in maternity facilities, which have a distinct patient group.[5] Ventilator-associated pneumonia (VAP) is the most common infection that patients treated in intensive care units (ICU) are susceptible to contracting; complications from VAP are associated with a 5- to 15% hospitalization rate. Many modifiable factors (e.g., body position, sedation, intubation and mechanical ventilation, upper airway instrumentation), as well as non-modifiable factors (e.g., age, duration of stay at the ward, comorbidities) influence the chance of complications.[6] Ventilator-associated

pneumonia is the most common illness acquired in intensive care units (ICUs) (VAP). The incidence of VAP varies, with values ranging from 7% to over 40%. The risk of pneumonia increases by 1% to 3% for every day the patient requires tracheal intubation, and rates of pneumonia in intubated patients might be anywhere from 6 to 21 times higher than in non-intubated patients. Long hospital stays and a high fatality rate are associated with it.[7] Gram-negative bacilli are responsible for about 60% of VAP cases etiologically, and P. aeruginosa is usually ranked first or second on lists of causative organisms.11–13 Longer ICU stays are the main reason why VAP increases hospital costs.[8] Urinary tract infections (UTIs) are infections that affect the kidney, ureters, bladder, or urethra. As per the National Healthcare Safety Network (NHSN), UTIs are the most common type of sickness associated with healthcare. Urinary catheters, which are tubes inserted into the bladder through the urethra to drain urine, are suspected of causing about 75% of UTIs that are acquired in hospitals. 15–25% of patients utilize urinary catheters while they are in the hospital. The main risk factor for catheter-associated UTIs (CAUTIs) is extended use of the urinary catheter. For this reason, catheters should only be used when necessary and removed as soon as they are no longer needed.[9] Enterococcus (14%), Candida (24%), and Escherichia coli (24%), are the most frequent causal pathogens causing CAUTI. In 10% of cases, pseudomonas, 10% of cases, Klebsiella, with the remainder being other organisms. The high level of antibiotic resistance exhibited by biofilm-producing microbes makes CAUTI a major source of morbidity and mortality.[10] Long hospital stays, age, and uncontrolled diabetes are important risk factors for CAUTI. In addition to the length of catheterization, other risk factors include female gender and weakened immunity. The presence and maintenance of a urinary catheter as well as the catheterization technique are significant risk factors for the development of nosocomial CAUTI, particularly in the intensive care units.[11]

Problem Statement: Prevalence and risk factors of health care associated infections in ICU: Across sectional study.

Objectives

1. To assess the prevalence and risk factors of health care associated infections. (VAP and CAUTI)
2. To find the association between prevalence and risk factors of health care associated infections. (VAP and CAUTI)
3. To find out the association between prevalence of health care associated infections (VAP and CAUTI) with selected demographic variables.

MATERIALS AND METHOD

Research Design: In this study cross sectional study design was adopted to assess the prevalence and risk factors of health care associated infections in ICU.

Population: Population is the entire aggregation of cases that meets a designated set of criteria for research. The target population of the present study was patients admitted in ICU.

Research setting: The study was conducted at Life Kare Multi Super Speciality Hospital, Fatehgarh Churian Road, Amritsar, Punjab.

Sample Size: A total sample for this study was 300 patients admitted in ICU.

Sampling Technique: Convenience sampling technique was used to select the sample for this study.

Sampling criteria

Inclusion criteria

- Patients who were intubated and connected to mechanical ventilator
- Patients who were catheterized.
- Patients who were staying in ICU for more than 2 days.

Exclusion criteria

- Patients who were critically ill with ASA score of 5
- Patients who were undergone tracheostomy and connected to ventilator.

Ethical Considerations

- The permission was obtained from ethical committee of Sai Tirupati University, Udaipur.
- Permission was obtained from concerned hospital authority for conducting the research study.
- The consent was taken from the subjects attendees. To gain their confidence, they were ensured that research data will be kept confidential and will be used for only research purpose.
- The purpose of the study will be explained to the subjects attendees. They were also informed about their right to refuse from participation in the study.

Plan for data analysis: The data analyses were done according to the study objectives by using descriptive and inferential statistics. The plans of data analysis were as follows:

- Frequency, percentage, mean, and standard deviation was calculated.
- The chi-square test was used for association with demographic variables.

RESULTS AND DISCUSSION

Table 1. Frequency and Percentage Distribution of Demographic Variables

N=300

S. No	Demographic Variables	Frequency (f)	Percentage (%)
1	Age in years		
	a. 31-40 years	73	24.3
	b. 41-50 years	94	31.3
	c. 51-60 years	133	44.4
2	Gender		
	a. Male	206	68.7
	b. Female	94	31.3
3	Education		
	a. Up to Primary	41	13.7
	b. Secondary	87	29
	c. Higher secondary	90	30
	d. Graduation and above	82	27.3
4	Occupation		
	a. Unemployed/ Housewife	122	40.7
	b. Employed	92	30.7
	c. Self employed	86	28.6
5	Dietary pattern		
	a. Vegetarian	250	83.3
	b. Non vegetarian	50	16.7
6	Area of residence		
	a. Urban	135	45
	b. Rural	165	55
7	BMI		
	a. Underweight (< 18.5)	72	24
	b. Normal weight (18.5 – 24.9)	61	20.3
	c. Pre obesity (25 – 29.9)	93	31
	d. Obesity class I (30 – 34.9)	74	24.7
8	Diagnosis		
	a. CVS diseases	65	21.7
	b. Neurologic diseases	50	16.7
	c. G.I diseases	82	27.3
	d. Respiratory diseases	54	18
	e. Renal diseases	49	16.3

Table 1 depicts the distribution of socio- demographic variables of parents admitted in ICU. According to their age, majority 133(44.4%) were in 51-60 years of age, 94(31.3%) were in 41-50 years of age and 73(24.3%) were in 31-40 years of age. Regarding gender, maximum 206(68.7% were male and 94(31.3%) were female patients. As per education, majority 90(30%) had higher secondary education,

87(29%) had secondary education, 82(27.3%) had graduation and above and 41(13.7%) had up to primary education. With regard to occupation, maximum 122(40.7%) were unemployed or housewife, 92(30.7%) were employed and 86(28.6%) were self employed. According to dietary pattern, more than two third of patients 250(83.3%) were vegetarian and one third 50(16.7%) were non vegetarian. As per area of residence, more than half 165(55%) were residing in rural area and 135(45%) were residing in urban area. Regarding BMI of patients, maximum 93(31%) were pre-obesity, 74(24.7%) were obese, 72(24%) were underweight and 61(20.3%) were normal weight. With regard to diagnosis, majority 82(27.3%) had G.I diseases, 65(21.7%) had CVS disease, 54(18%) had respiratory disease, 50(16.7%) had neurological disease and 49(16.3%) had renal disease.

Table 2. Frequency and Percentage Distribution of risk factors of health care associated infections

N=300

S. No	Risk factors	Frequency (f)	Percentage (%)
1	History of smoking		
	a. Yes	80	26.7
	b. No	220	73.3
2	History of alcohol		
	a. Yes	114	38
	b. No	186	62
3	Comorbid illness		
	a. Yes	186	62
	b. No	114	38
	If yes specify		
	Diabetes	73	39.2
	Hypertension	65	35
	Both HT and DM	48	25.8
4	Obesity		
	a. Yes	63	21
	b. No	237	79
5	Length of stay		
	a. 1-7 days	103	34.3
	b. 8-14 days	127	42.4
	c. 15-21 days	70	23.3
6	Present history of surgery		
	a. Yes	55	18.3
	b. No	245	81.7
7	Duration of catheterization		
	a. 1-6 days	164	54.7
	b. 7-12 days	120	40
	c. 13-18 days	16	5.3
8	Duration of intubation		
	a. 1-7 days	198	66
	b. 8-14 days	87	29
	c. 15-21 days	15	5
9	No of antibiotics		
	a. 1-2	229	76.3
	b. 3-4	71	23.7
10	Hemoglobin level		
	a. < 10	117	39
	b. > 10	183	61
11	Creatinine		
	a. < 1.5	220	73.3
	b. > 1.5	80	26.7
12	Duration of CVP		
	a. 1-5 days	103	34.3
	b. 6-10 days	110	36.7
	c. > 10 days	87	29
13	Respiratory diseases (COPD, ARDS, Pneumonia)		
	a. Yes	95	31.7
	b. No	205	68.3
14	Use of corticosteroids		
	a. Yes	166	55.3
	b. No	134	44.7
15	ASA score		
	a. Normally healthy	0	0
	b. Discrete systemic disease	92	30.7
	c. Serious systemic disease	156	52
	d. Life threatening disease	52	17.3

Table 2 depicts the distribution of risk factors of health care associated infections. According to history of smoking, majority 220(73.3%) had no history of smoking and 80(26.7%) had smoking. As per history of alcohol, maximum 186(62%) had no history of alcohol and 114(38%) had history of alcohol. Regarding comorbid illness, more than half 186(62%) had comorbid illness and 114(38%) had no comorbid illness. 73(39.2%) had diabetes, 65(35%) had hypertension and 48(25.8%) had both (diabetes and hypertension) With regard to obesity, 2/3 of patients 237(79%) were not obese and 63(21%) were obese. According to length of stay in ICU, majority 127(42.4%) were in ICU for 8-14 days, 103(34.3%) for 1-7 days and 70(23.3%) for 15-21 days. As per present history of surgery, maximum 245(81.7%) had no surgery and 55(18.3%) had undergone surgery. Regarding duration of catheterization, majority 164(54.7%) had catharized for 1-6 days, 120(40%) for 7-12 days and 16(5.3%) for 13-18 days. With regard to duration of intubation, maximum 198(66%) had intubated for 1-7 days, 87(29%) for 8-14 days and 15(5%) for 15-21 days. According to number of antibiotics, more than 2/3 of them 229(76.3%) had 1-2 antibiotics and 71(23.7%) had 3-4 antibiotics. As per hemoglobin level, more than half 183(61%) had above 10 g/dl and 117(39%) had less than 10 g/dl. Regarding creatinine level, majority 220(73.3%) had less than 1.5 mg/dl and 80(26.7%) had above 1.5 mg/dl. According to duration of CVP line, maximum 110(36.7%) had for 6-10 days, 103(34.3%) for 1-5 days and 87(29%) for above 10 days. As per respiratory diseases (COPD, ARDS, Pneumonia), majority 205(68.3%) had no respiratory diseases and 95(31.7%) had respiratory diseases. Regarding use of corticosteroids, more than half 166(55.3%) were under corticosteroids and 134(44.7%) were not given corticosteroids. With regard to risk index classification (ASA), maximum 156(52%) had serious systemic disease, 92(30.7%) were discrete systemic disease and 52(17.3%) had life threatening disease.

Table 3. Prevalence of health care associated infections (VAP) among patients admitted in ICU

N=300

PREVALENCE	f	%	Organism
Yes	22	7.3	E Coli – 12
No	278	92.7	Klebsiella – 5 Streptococcus pneumonia - 3 Hemophilus influenzae - 2

Table 3 depicts that prevalence of health care associated infections (VAP) was 22(7.3%) in which organism was found to be caused by E coli (12), klebsiella (5), streptococcus pneumonia (3) and Hemophilus (2).

Table 4. Prevalence of health care associated infections (CAUTI) among patients admitted in ICU

N=300

PREVALENCE	f	%	Organism
Yes	35	11.7	E Coli – 23
No	265	88.3	Klebsiella – 7 Proteus - 5

Table 4 depicts that prevalence of health care associated infections (CAUTI) was 35(11.7%) in which organism was found to be caused by E coli (23), klebsiella (7) and Proteus (5). Table 5 illustrates that age and diagnosis of patients was found significant association with prevalence of VAP at $p<0.05$ but gender, education, occupation, dietary pattern, area of residence and BMI were found to be non significant. Table 6 revealed that age and BMI of patients was found significant association with prevalence of CAUTI at $p<0.05$ but gender, education, occupation, dietary pattern, area of residence, and diagnosis were found to be non significant. Table 7 illustrates that comorbid illness, obesity, length of stay in ICU, present history of surgery, duration of intubation, use of corticosteroids and risk index ASA was found significant with prevalence of VAP at $p<0.05$ but history of smoking, history of alcohol, duration of catheterization, no of antibiotics, hemoglobin level, creatinine level, duration of CVP and respiratory diseases were found to be non significant.

Table 5. Association between prevalence of health care associated infections (VAP) with selected demographic variables

N=300

S. No	Demographic Variables	VAP		χ2value	df	p value
		Yes	No			
1	Age in years					
	a. 31-40 years	2	71	9.782	2	0.007*
	b. 41-50 years	3	91			
	c. 51-60 years	17	116			
2	Gender					
	a. Male	18	18	2.094	1	0.148^{NS}
	b. Female	4	90			
3	Education					
	a. Up to Primary	6	35	4.599	3	0.185^{NS}
	b. Secondary	7	80			
	c. Higher secondary	6	84			
	d. Graduation and above	3	79			
4	Occupation					
	a. Unemployed/ Housewife	9	113	3.522	2	0.171^{NS}
	b. Employed	10	82			
	c. Self employed	3	83			
5	Dietary pattern					
	a. Vegetarian	21	229	3,287	1	0.143^{NS}
	b. Non vegetarian	1	49			
6	Area of residence					
	a. Urban	9	126	0.161	1	0.689^{NS}
	b. Rural	13	152			
7	BMI					
	a. Underweight (< 18.5)	5	67	0.715	3	0.901^{NS}
	b. Normal weight (18.5 – 24.9)	4	57			
	c. Pre obesity (25 – 29.9)	6	87			
	d. Obesity class I (30 – 34.9)	7	67			
8	Diagnosis					
	a. CVS diseases	0	65	14.91	4	0.002*
	b. Neurologic diseases	4	46			
	c. G.I diseases	4	78			
	d. Respiratory diseases	9	40			
	e. Renal diseases	5	49			

*p value < 0.05 level of significance
NS-Non Significant

Table 6. Association between prevalence of health care associated infections (CAUTI) with selected demographic variables

N=300

S. No	Demographic Variables	CAUTI		χ2value	df	p value
		Yes	No			
1	Age in years					
	a. 31-40 years	4	69	8.245	2	0.015*
	b. 41-50 years	8	86			
	c. 51-60 years	23	110			
2	Gender					
	a. Male	26	180	0.581	1	0.446^{NS}
	b. Female	9	85			
3	Education					
	a. Up to Primary	5	36	0.357	3	0.949^{NS}
	b. Secondary	11	76			
	c. Higher secondary	9	81			
	d. Graduation and above	10	72			
4	Occupation					
	a. Unemployed/ Housewife	15	107	0.682	2	0.711^{NS}
	b. Employed	12	80			
	c. Self employed	8	78			
5	Dietary pattern					
	a. Vegetarian	30	220	0.162	1	0.688^{NS}
	b. Non vegetarian	5	45			
6	Area of residence					
	a. Urban	12	123	1.838	1	0.175^{NS}
	b. Rural	23	142			
7	BMI					
	a. Underweight (< 18.5)	4	68	7.397	3	0.047*
	b. Normal weight (18.5 – 24.9)	4	57			
	c. Pre obesity (25 – 29.9)	15	78			
	d. Obesity class I (30 – 34.9)	12	62			
8	Diagnosis					
	a. CVS diseases	6	59	4.125	4	0.389^{NS}
	b. Neurologic diseases	7	43			
	c. G.I diseases	14	68			
	d. Respiratory diseases	4	45			
	e. Renal diseases	4	50			

*p value < 0.05 level of significance NS-Non Significant

Table 7. Association between prevalence and risk factors of health care associated infections (VAP)

N=300

S. No	Risk factors	VAP		χ2value	df	p value
		Yes	No			
1	History of smoking					
	a. Yes	6	74	0.004	1	0.947^{NS}
	b. No	16	204			
2	History of alcohol					
	a. Yes	11	103	1.451	1	0.228^{NS}
	b. No	11	175			
3	Comorbid illness					
	a. Yes	18	168	4.377	1	0.036*
	b. No	4	110			
4	Obesity					
	a. Yes	0	63	10,82	1	0.001*
	b. No	22	215			
5	Length of stay					
	a. 1-7 days	4	99	17.32	2	0.001*
	b. 8-14 days	5	122			
	c. 15-21 days	13	57			
6	Present history of surgery					
	a. Yes	1	54	3.981	1	0.046*
	b. No	21	224			
7	Duration of catheterization					
	a. 1-6 days	14	150	0.787	2	0.756^{NS}
	b. 7-12 days	7	113			
	c. 13-18 days	1	15			
8	Duration of intubation					
	a. 1-7 days	10	188	25.09	2	0.001*
	b. 8-14 days	6	81			
	c. 15-21 days	6	9			
9	No of antibiotics					
	a. 1-2	15	214	0.873	1	0.350^{NS}
	b. 3-4	7	64			
10	Hemoglobin level					
	a. < 10	5	112	2,643	1	0.104^{NS}
	b. > 10	17	166			
11	Creatinine					
	a. < 1.5	18	202	0.941	1	0.332^{NS}
	b. > 1.5	4	76			
12	Duration of CVP					
	a. 1-5 days	7	96	0.866	2	0.649^{NS}
	b. 6-10 days	10	100			
	c. > 10 days	5	82			
13	Respiratory diseases					
	a. Yes	10	85	2.086	1	0.149^{NS}
	b. No	12	193			
14	Use of corticosteroids					
	a. Yes	17	149	4.624	1	0.032*
	b. No	5	129			
15	ASA score					
	a. Discrete systemic disease	5	87	8.031	2	0.015*
	b. Serious systemic disease	17	139			
	c. Life threatening disease	0	52			

*p value < 0.05 level of significance
NS-Non Significant

Table 8 revealed that length of stay in ICU, duration of catheterization, no of antibiotics and creatinine level was found significant with prevalence of VAP at p<0.05 but history of alcohol, history of smoking, comorbid illness, obesity, present history of surgery, duration of intubation, respiratory diseases, hemoglobin level, duration of CVP, use of corticosteroids and risk index ASA were found to be non significant.

DISCUSSION

Health care associated infections like VAP and CAUTI are likely to occur in patients admitted to ICU. Current study results showed that prevalence was VAP (7.3% and CAUTI (11.7%) in which E.coli and Klebsiella were most common to cause HAI's. Saroj G, et al[12]stated that prevalence of VAP was 35.14% and E coli was the common cause. Roa S, et al[13] in his study observed that 4.35% had developed VAP and the causative organism was klebsiella and pneumonia. Current study result revealed that comorbid illness, obesity, length of stay in ICU, present history of surgery, duration of intubation, use of corticosteroids and risk index ASA was found significant with prevalence of VAP at p<0.05. Manaye C. B, et al[14] revealed that patients stay and duration on mechanical ventilation was associated with incidence of VAP in ICU patients. Malarmathi M, Nandhini S[15] showed that prolonged stay in ICU and use of antibiotics were the major risk factor for occurrence of VAP. Denise B et al[16] observed that longer ICU stay was the major risk factor associated with VAP. Chaudary U, Dhruva C[17] had stated that increase in age of patients was found positive association with cause for VAP.

Russo P.L. et al[18] observed that prevalence of CAUTI was 2.4%. Another study was similar carried by Venkataraman R, et al[19]revealed that 12.5% had developed urinary tract infection which was caused by E coli and also revealed that use of antibiotics and length of stay in intensive care unit were the risk factor found significant association with incidence of CAUTI. Krishnaiah V, et al[20] comorbidity (diabetes mellitus), duration of catheterization and levels of creatinine were significantly associated with CAUTI. Verma D et al[21]in his study showed that higher incidence of CAUTI was found in female as compared to males.

Table 8. Association between prevalence and risk factors of health care associated infections (CAUTI)

N=300

S. No	Risk factors	CAUTI		χ2value	df	p value
		Yes	No			
1	History of smoking					
	a. Yes	8	72	0.303	1	0.588^{NS}
	b. No	27	193			
2	History of alcohol					
	a. Yes	12	102	0.232	1	0.630^{NS}
	b. No	23	163			
3	Comorbid illness					
	a. Yes	24	162	0.726	1	0.394^{NS}
	b. No	11	103			
4	Obesity					
	a. Yes	4	59	2.475	1	0.116^{NS}
	b. No	31	206			
5	Length of stay					
	a. 1-7 days	8	95	8.599	2	0.013*
	b. 8-14 days	12	115			
	c. 15-21 days	15	55			
6	Present history of surgery					
	a. Yes	7	48	0.074	1	0.786^{NS}
	b. No	28	217			
7	Duration of catheterization					
	a. 1-6 days	17	147	10.95	2	0.004*
	b. 7-12 days	12	108			
	c. 13-18 days	6	10			
8	Duration of intubation					
	a. 1-7 days	21	177	0.900	2	0.656^{NS}
	b. 8-14 days	12	75			
	c. 15-21 days	2	13			
9	No of antibiotics					
	a. 1-2	31	198	3.773	1	0.048*
	b. 3-4	4	67			
10	Hemoglobin level					
	a. < 10	12	105	0.370	1	0.543^{NS}
	b. > 10	23	160			
11	Creatinine					
	a. < 1.5	14	206	22.51	1	0.001*
	b. > 1.5	21	59			
12	Duration of CVP					
	a. 1-5 days	8	95	2.485	2	0.289^{NS}
	b. 6-10 days	16	94			
	c. > 10 days	11	76			
13	Respiratory diseases					
	a. Yes	7	88	2.492	1	0.114^{NS}
	b. No	28	177			
14	Use of corticosteroids					
	a. Yes	21	15	0.349	1	0.555^{NS}
	b. No	14	120			
15	ASA score					
	c. Discrete systemic disease	13	79	1.248	2	0.509^{NS}
	d. Serious systemic disease	18	138			
	e. Life threatening disease	4	48			

*p value < 0.05 level of significance
NS-Non Significant

Karshini R, Sangeetha S[22] revealed that age above 70 years were having more risk for CAUTI and found to be statistically significant and stated that incidence of CAUTI was found to be markedly more in females than in males. Omer S.A et al[23]observed that Female gender was significantly associated with CAUTI.

CONCLUSION

Findings of study concluded that prevalence of health care associated infections (VAP) was 22(7.3%) caused by E. coli and klebsiella. Prevalence of CAUTI was found to be 35(11.7%)caused by E coli, klebsiella and proteus. The immunological and physiological systems of older patients often weaken, leading to various comorbidities. This raises the risk of VAP and CAUTI by extending hospital stays and increasing the need for mechanical ventilation. Because of this, maintaining standards and reducing the risk of healthcare-associated infections (HCAIs) depend on carefully cleaning hospital surfaces. It is imperative that strategy, policy, and education initiatives do not overlook the crucial responsibility of managing and controlling these diseases, which are mainly preventable.

Recommendations

Here are some potential recommendations for future researchersbased on this study.

- Conduct studies to identify emerging risk factors contributing to the prevalence of VAP and CAUTI. This could include exploring genetic predispositions, environmental factors, or healthcare practices that increase susceptibility.
- Evaluate the effectiveness of multimodal interventions in reducing VAP and CAUTI rates. Such interventions could involve combining hand hygiene protocols, antimicrobial stewardship, device care bundles, and patient-specific risk assessments.
- Investigate the microbiological profiles associated with VAP and CAUTI to understand the prevalence of specific pathogens, their antibiotic resistance patterns, and how they relate to infection rates.

- Conduct longitudinal studies to track trends in VAP and CAUTI prevalence over time, especially in response to changes in infection control policies, antibiotic use, or patient demographics.
- Analyze the economic burden associated with VAP and CAUTI, including costs related to extended hospital stays, additional treatments, and patient outcomes. Assess the cost-effectiveness of preventive measures versus treatment costs.
- Explore patient-specific factors such as age, comorbidities, and immune status to better understand their role in VAP and CAUTI development. This could lead to personalized preventive strategies.

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