

Prevalence and Determinants of nosocomial infections among patients in ventilator in a Tertiary Care Hospital at Makkah Al-mukarramh 2022

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Abstract:

Background

Nosocomial infections or healthcare-acquired infections are a common cause of increased morbidity and mortality among hospitals patients. Patients are at an increased risk for these infections due to their health states. Considering these adverse effects on and the socioeconomic burden, efforts should be made to minimize the transmission of these infections and make the hospitals a safer environment. These infection rates can be significantly reduced by the implementing and improving compliance with the “care bundles.” the common nosocomial infections such as ventilator-associated pneumonia (VAP), catheter-associated urinary tract infections (CAUTI), and surgical site infections (SSI).ventilator-associated pneumonia (VAP) is the most common nosocomial infection in the intensive care unit (ICU). It is a pulmonary infection that occurs after at least 48 hours of intermittent positive-pressure ventilation (IPPV), and is a leading cause of morbidity and mortality. The incidence of VAP ranges from 10% to 65% of intubated patients depending on the risk factors. **This study aimed:** To assess prevalence and determinants for nosocomial infections (NI) among patients in ventilator at Makkah Al-mukarramh hospital Saudi Arabia. **Methods:** A cross-sectional research design was carried out between Feb 2021 to May 2021 included 300 of patients in ventilator, who were randomly selected from hospitals. A structured questionnaire and observation checklist was used for data collection. using 3part Questionnaire and analyzed via SPSS v24 software. Chi-square test was run to analyses associations between socio-demographic data. **Results:** The distribution of pathogens is demonstrated, level of education, monthly income, hospital stays, BMI, chronic Medical conditions show that a significant relation between Nosocomial infection and Chronic Medical conditions were P-value=0.000 **Conclusion:** The study's found that prevalence of nosocomial infections among patients in ventilator in a Tertiary Care Hospital . Therefore careful disinfection and strict procedures of nosocomial infections are necessary in places that serve nosocomial infections patient. Moreover, a vision for the improvement of reports and studies in hospitals to report the rate of the nosocomial infections, hence, there is a need to raise awareness as well as training on nosocomial infections among patients in ventilator **Keywords:** Prevalence, determinants, Nosocomial infection, ventilator, Tertiary Hospital .

Introduction

Nosocomial infections (NI) are frequent complications in intensive care units (ICU) which result in high morbidity and mortality.[1]

Nosocomial infections (NI) have become a major problem in many intensive care units (ICU) that complicate the hospitalization of patients and result in considerable morbidity and mortality, increased length of stay and increased health care costs.[2]

The term “healthcare associated infection (HAI)” has replaced the terms “hospital-acquired infection” or “nosocomial infection”, for its occurrences as a result of several complications following surgical procedures, medical devices such as ventilators and catheters, and transmission between patients and healthcare professionals.[3] The most frequent infections are bloodstream infections, pneumonia, and necrotizing enter colitis (NEC); less frequent complications are infections of the eyes, mouth or skin.[4] In developed countries, the incidence rate of nosocomial infections ranges from 6 to 9 infections per 1000 patient-days, with 3- to 20-fold higher rates in developing countries.[5,6] The major pathogens of neonatal infections differ not only from country to country and from nursery to nursery, but also change within years in the same nursery.[7]

Effective surveillance is important to evaluate the epidemiology, the associated risk factors and the causative microorganisms.[8]

Nosocomial infections occur in 5% to 10% of patients admitted to hospitals in the KSA [9] and result in increased morbidity, mortality, and costs.[10] As a result, surveillance has been advocated by the Centers for Disease Control in order to develop priorities for research and infection control activities.[11] Efforts to streamline surveillance methods have been advanced, and a concept of identifying "preventable" infections has evolved.[12]

In general, preventable infections are those related to a device or a specific procedure, in contrast to infections that do not occur after a specific procedure or use of a device and that often occur in immunosuppressed hosts. It has recently been suggested that a high priority for infection control be the identification of procedure related infections in patients in intensive care units since a significant proportion of such infections may be preventable.[13,14] There are numerous risk factors for nosocomial infection among the patients in ventilator hospitalized for intensive care. The major risk factors can be categorized into intrinsic and extrinsic factors. The intrinsic factors include characteristics such as age, of the patients weight, severity of the disease, immunologic maturity. The extrinsic factors include hospital stay, use of invasive devices, medications, exposure to hospital environment and hospital staff, hygiene and hospital infection control practices. Understanding the risk factors associated with nosocomial infections is a prerequisite for the development of prevention strategies.[15]

Ventilator-associated pneumonia (VAP) is reported to be the most common hospital-acquired infection among patients requiring mechanical ventilation.[16] Risk factors associated with ventilator-associated pneumonia have been identified using multivariate statistical methods.[17] These risk factors appear to predispose patients to either colonization

of the aero digestive tract with pathogenic microorganisms and/or aspiration of comes, including attributable hospital mortality, demonstrating variable results.[18]

More than 2 million people, or approximately 5% to 10% of hospitalized patients, are affected by nosocomial infections within estimated 90,000 deaths every year.[19,20] As well as the disease burden regarding significant morbidity and mortality of nosocomial infections, high healthcare costs are incurred in managing nosocomial infections[21]. Additionally, because medical staff are associated with patients in different units, they may carry and spread pathogens.[22]

Literature review:

A study that was performed in Rhode Island Hospital showed that the cost of patients with hospital-acquired infections was more than three times higher than that of those without infectious diseases.[23] Nosocomial infections are usually transmitted by poor hygiene practice, followed by the provision of outpatient treatment and invasive medical procedures. Patients' impaired defense against bacteria (e.g., because of pre-term birth or immunodeficiency) increases the chance of infection.[24]

A previous study showed that male sex was among the major predictors for with multi-drug-resistant-Acinetobacter baumannii.[25] In this study, we found that the majority (80.3%) of patients in the case group stayed in the hospital for longer than 1 week.

Another study in found that prolonged hospital stay affected disease outcome and increased the mortality rate of patients.[26] In the present study, the respiratory tract was the most frequent site of infection. This finding is similar to a previous report.[8]

Most clinical studies evaluating VAP and its clinical importance have analyzed patients from single centers outside of the United States. Tariq et al 2017 assessed the prevalence of nosocomial pneumonia among ICU patients in Europe,[27] and Borchardt, et al 2018 examined the attributable mortality of VAP in Canadian hospitals. The largest US study published to date reported the prevalence of hospital-acquired pneumonia from US ICUs without analysis of risk factors or a attributable mortality.[28]

A previous study in Riyadh, Saudi Arabia, supports this patients with immunosuppression were three times more likely to be infected compared with those without immunosuppression (OR 2.9; 95% CI 1.5–5.6; p 0.002).showing that A. baumannii is more common in patients who have intravascular catheters, have prior antibiotic use, and use ventilator support. Also consistent with findings of study that reported the antimicrobial resistance pattern among community- acquired organisms in pilgrims. A. baumannii is highly resistant to carbapenems and quinolones.[29]

Study at the University of Virginia, the surveillance data demonstrated reasons why the highest priority for allocation of resources for control of nosocomial infections should be assigned to programs for control of infection among patients in ICUs: 1) 33% to 45% of all nosocomial bloodstream infections occurred in patients residing in critical care units, which comprised only 8% of hospital beds; patients in ICUs had rates of bloodstream infection up to 24 times greater than those of patients on wards; up to 73% of patients in surgical ICUs had at least one intravascular device inserted in addition to a peripheral IV catheter; the use of multiple intravascular devices was a marker for high-risk patients, since 5% to 17% of such patients developed a nosocomial blood stream infection; 4) the most efficient surveillance (number of nosocomial infections detected per hour of surveillance) was in ICUs.[30]

Zhang et al., (2019) reported that the adjusted five-year healthcare-associated infections incidence rate decreased from 4.10 per thousand patient days in 2013 to 3.62 per thousand patient days in 2017. They also stated that the most commonly HAIs were respiratory tract infection (43.80%), bloodstream infections (15.74%), and urinary tract infection (12.69%) (Zhang et al., 2019a). [31] Russo et al., (2019)[32] stated that the incidence of HAI was 250 infections per 100,000 bed days and that the rates of urinary tract infections, bloodstream infections, and lower respiratory tract infection were 51.2, 44.7, and 42.2 per 100,000 acute occupied bed-days, respectively. Zhang et al., (2019b) reported that the rate of healthcare-associated infections is 1.24% and that the rates of ventilator-associated pneumonia, catheter-associated urinary tract infection, and central line-associated bloodstream infection were 7.92 per thousand ventilator days, 2.06 per thousand catheter-days, and 0.63 per thousand central line-days, respectively.[31]

Rationale:

Nosocomial infections or healthcare-acquired infections are a common cause of increased patient's morbidity, hospital and ICU length of stay, treatment costs, and mortality. They are also responsible for increased antibiotic use, leading to antibiotic resistance and outbreaks of multidrug-resistant infections. Implementing and enforcing infection control measures is the pivotal step toward curbing the nosocomial infection. Increased awareness, health education, and adhering to care bundles have been proved to be efficacious in reducing nosocomial infections. Morbidity and mortality among hospitalized patients. Patients in ventilator are at an increased risk for these infections due to their immunosuppressed states. Nosocomial infections are common across all parts of the world, with an estimated incidence of 5–10% in developed countries and up to 30% in developing countries. With increased awareness and constant vigilance, there has been a steady and gradual decrease in the incidence rates of hospital-acquired infections with a 50% reduction in central line-associated bloodstream.

Aim of the study:

To assess prevalence and determinants for nosocomial infections (NI) among patients in ventilator at Makkah Al-mukarramh hospital Saudi Arabia .

Objectives:

- Assess the prevalence for nosocomial infections (NI) among patients in ventilator at Makkah Al-mukarramh hospital Saudi Arabia .
- Assess the determinants nosocomial infections (NI) among patients in ventilator at Makkah Al-mukarramh hospital Saudi Arabia

Methodology:**Study design**

A cross-sectional research design was carried out between Feb 2022 to May 2022 included 300 of patients in ventilator, in a Tertiary Care Hospital at Makkah 2022

Study Area

The study has been carried out in the city of Makkah Al-Mokarramah Makkah is the holiest spot on Earth. Contains a population around 2 million. The study was conducted at an approximately 500-bed tertiary care hospital providing all major specialties (e.g., adult cardiology, internal medicine, nephrology, urology, neurology, plastic surgery, dental health, emergency medicine, and adult intensive care) in Makkah, Saudi Arabia. During the April to

June , 2021, participants from a tertiary care hospital in Makkah. This hospital deals with a variety of patients with multiple risk factors. Therefore, there are strict infection control measures in hospital in general and intensive care unit to control the spread of infections. Measures are implemented and supervised by the infection control department. Standard precautions are taken (e.g., hand hygiene and use of protective devices) health care professionals to prevent spreading infection.

Study Population

The study population consisted has been conducted regarding the all patients aged 18 years and older in the intensive care unit and patients in ventilator in Tertiary Care Hospital at Makkah Al-mukarramh 2022 Makkah Al-mukarramh 2022 in this hospital

Selection criteria:

Inclusion criteria

- We included all patients who had one of the nosocomial infections among patients on ventilator in a Tertiary Care Hospital at Makkah Al-mukarramh during Feb 2021 to May 2021
- All adult patients aged 18 years and older in the intensive care unit and patients on ventilator
- Existing patients at Tertiary Hospital.
- Existing in Makkah province.
- All nationalities
- Both males and females.

Exclusion criteria :

- Other types of infections and the HAIs before 2022 were excluded.
- Inclusion criteria
- Patients less than 18 years
- Pedantic patients.
- Patients with severe cognitive impairment such as dementia or delirium.
- Patients unwilling to give written consent to participate.

Sample size

Nosocomial infections among patients in ventilator in a Tertiary Care Hospital at Makkah Al-mukarramh. Saudi Arabia in 2021. The sample size has been calculated by applying Raosoft sample size calculator based on (The margin of error: 5%, Confidence level: 95%, and the response distribution was considered to be 20%) accordingly the Sample size is (300) patients nosocomial infections among patients on ventilator in a Tertiary Care Hospital at Makkah Al-mukarramh. Saudi Arabia in 2021 (male and female) after official communication with the Tertiary Hospital Makkah City, and adding 10 more to decrease margin of error. After adding 5% oversampling, the minimum calculated sample has been 300. Computer generated simple random sampling technique was used to select the study participants.

Sampling technique:

Systematic random sampling technique is adopted. After that, by using random number generator, then simple random sampling technique has been applied to select the participant. Also, convenience sampling technique will be utilized to select the

participants in the study. By using systematic sampling random as dividing the total patients by the required sample size; (300).

Data collection tool:

The data was collected through a questionnaire that was developed by the researchers after reviewing the related literature. It was translated into simple Arabic language to suit the understanding level of the entire study subjects. The questionnaire contains three sections. First section: history Socio-demographic characteristics of the patients on ventilator with nosocomial infection. (Age, Gender, nationality, Monthly income, Level of education, BMI). The second section the pathogens isolated in patients with nosocomial infection. Also the information was collected through the patients and Infection control unit in the hospital. Third sections: association between Nosocomial infection and demographic data.

Data collection technique and analysis:

Infection control unit in the hospital help us in collecting the required data about prevalence and Determinants of nosocomial infections among patients in ventilator in a Tertiary Care Hospital at Makkah Al-mukarramh 2021. The collected data included the overall rate of nosocomial infections among patients in ventilator, device-associated infection rates, and the rate of other healthcare associated infections. The data were collected using Microsoft Excel and descriptive data of the study were represented by percentages and frequencies. The percentages were calculated by dividing the number of each category by the total number, and then multiplying the result by 100%. The mean and the standard deviation of different healthcare associated infections were calculated by Excel descriptive data analysis option.

Data entry and analysis:

The data were coded and introduced to the Statistical Package of Social Sciences (SPSS, version 24). The data were analyzed to present the findings in descriptive and inferential statistics. The descriptive statistics include frequencies and percentages for categorical variables, while means, median and standard deviations were used to summarize numerical data. The significant associations between demographic and background variables were detected at < 0.05 significance level.

Ethical considerations:

Ethics approval and consent to participate this study was first approved by the Institutional Review Board of Tertiary Care Hospital, Ministry of Health. All information was kept confidential, and results will be submitted to the department as feedback. The researcher described the aim and objectives of the study for the residents. No names were required to assure confidentiality of data, and all information was kept confidential only for this study's purposes.

Budget: Self-funded

Results:

Table 1. Distribution of Socio-demographic characteristics of the patients on ventilator with nosocomial infection. (Age, Gender, nationality, Monthly income, Level of education, BMI.....) (n- 300).

	N	%
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Age		
≤ 24 years	33	11
25 to 29 years	69	23
30 to 34 years.	45	15
≥ 35 years.	153	51
Gender		
Male	96	32
Female	204	68
Nationality		
Saudi	231	77
Non-Saudi	69	23
Education		
Illiterate	33	11
School	78	26
University	189	63
Monthly income		
< 5000 SAR	72	24
5000 to 10000 SAR	183	61
10000 SAR	45	15

	N	%
Hospital stays		
<3 days	24	8
3-10 days	69	23
>10days	207	69
BMI		
Under weight	84	28
Normal	63	21
Obese	153	51
Chronic Medical conditions		
Asthma	111	37
Diabetes	132	44

Heart disease	168	56
High blood pressure	210	70
Nosocomial infection		
Yes	21	7
No	279	93
Microorganism (n=92)		
Gram positive	32	34.78
Gram-negative	60	65.22

Table 1 shows that most of the participants (51.0%) were in the age group more than 35 years follow by the (23.0%) were in the age 25-29 years , the majority of them were female (68.0%) while male(32.0%),also regarding Nationality the majority of participant are Saudi were(77.0%) regarding level of education the majority of participant are university were(63.0%) while school were(26.0%). Regarding the Monthly income the majority of participant from 5000 to 10000 were (61.0%). Regarding the Hospital stays the majority of participant >10days were (69.0%) follow by the (23.0%) were stay 3-10 days. Regarding the BMI the majority of participant obese were (51.0%) follow by the (28.0%) were under weight. Regarding the Chronic Medical conditions most of the of participant High blood pressure were (70%) follow by the Heart disease were(56%) regarding Nosocomial infection the majority of participant No were(93.0%) .

Figure (1) Distribution of the patients on ventilator with nosocomial infection .

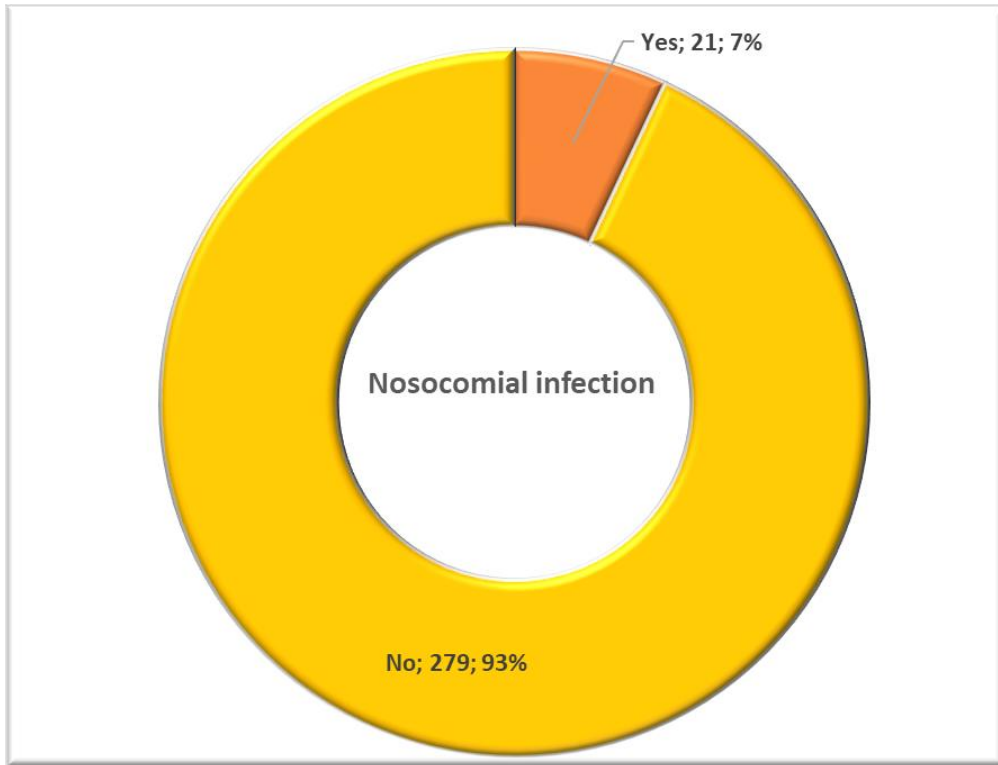


Figure (2) Distribution of the patients on ventilator with Microorganism (n=92).

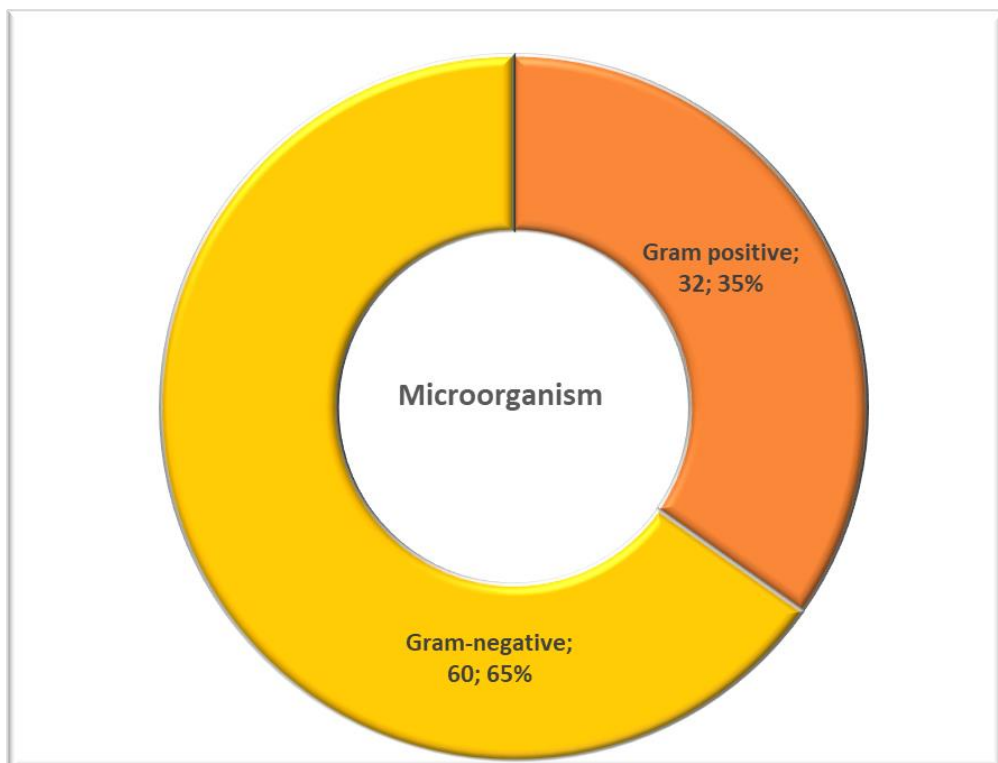


Table 2. Description of the pathogens isolated in patients with nosocomial infection

Microorganism	Microorganisms in patients with NI	
	N	%
Gram positive		
Coag. (-) Staphylococcus	13	14.13
MRSA	6	6.52
Enterococcus faecalis	7	7.61
Enterococcus faecium	6	6.52
Gram-negative		
Klebsiella pneumoniae	11	11.96
Klebsiella oxytoca ESBL+	6	6.52
E. coli	8	8.70
Enterobacter spp.	6	6.52
Pseudomonas aeruginosa	7	7.61
Acinetobacter baumannii	9	9.78
Acinetobacter lwoffii	3	3.26
Stenotrophomonas maltophilia	5	5.43
Chryseobacterium spp.	3	3.26
Achromobacter spp	2	2.17

Table 2 shows Gram-negative bacteria were the most prevalent pathogenic cause of nosocomial infection in our research. Four microorganisms (Klebsiella pneumoniae, E. coli, Pseudomonas aeruginosa, Acinetobacter baumannii) were (11.96%, 8.70%, 7.61%, 9.78%) from the Gram negative flora were most commonly isolated. From the Gram-positive bacteria, the leading pathogens were Coagulase-negative Staphylococcus (CoNS) (14.13%) and Enterococcus faecalis (7.61%). The distribution of pathogens is demonstrated

Table (3) Association between Nosocomial infection and demographic data (age, gender, Nationality, Level of education, Monthly income, Hospital stays, BMI, Chronic Medical conditions)

	Nosocomial infection				Total		Chi-square	
	Yes (n=21)		No (n=279)					
	N	%	N	%	N	%	X ²	P-

								value	
Age	≤ 24 years	2	9.52	31	11.11	33	11	1.417	0.702
	25 to 29 years	4	19.05	65	23.30	69	23		
	30 to 34 years.	5	23.81	40	14.34	45	15		
	≥ 35 years.	10	47.62	143	51.25	153	51		
Gender	Male	7	33.33	89	31.90	96	32	0.018	0.892
	Female	14	66.67	190	68.10	204	68		
Nationality	Saudi	16	76.19	215	77.06	231	77	0.008	0.927
	Non-Saudi	5	23.81	64	22.94	69	23		
Education	Illiterate	10	47.62	23	8.24	33	11	28.485	0.000
	School	9	42.86	69	24.73	78	26		
	University	6	28.57	183	65.59	189	63		
Monthly income	< 5000 SAR	10	47.62	62	22.22	72	24	13.141	0.001
	5000 to 10000 SAR	5	23.81	178	63.80	183	61		
	10000 SAR	6	28.57	39	13.98	45	15		
Hospital stays	<3 days	7	33.33	21	7.53	24	8	30.177	0.000
	3-10 days	11	52.38	63	22.58	69	23		
	>10days	3	14.29	195	69.89	207	69		
BMI	Under weight	16	76.19	68	24.37	84	28	26.084	0.000
	Normal	1	4.76	62	22.22	63	21		
	Obese	4	19.05	149	53.41	153	51		
Chronic Medical conditions	Asthma	13	61.90	98	35.13	111	37	65.090	0.000
	Diabetes	16	76.19	116	41.58	132	44	75.758	0.000
	Heart disease	15	71.43	153	54.84	168	56	113.357	0.000
	High blood pressure	19	90.48	191	68.46	210	70	140.876	0.000

Table (3) show that is no significant relation between Nosocomial infection and demographic data regarding age (increase in ≥ 35 years in No were (51.25%) follow by Yes were(47.62)) in X^2 1.417 and P-value= <0.702 . Regarding gender In our study no significant relation between Nosocomial infection and gender the majority of our participants were noticed in female in No Nosocomial infection were(68.0%) more than female in Yes Nosocomial infection were (66.67%), X^2 0.018 and P-value= 0.892.

Regarding Nationality In our study no significant relation between Nosocomial infection and nationality the majority of our participants were Saudi in No Nosocomial infection were(77.06%) more than Saudi in Yes Nosocomial infection were (76.19%), X^2 0.008 and P-value= 0.927. Regarding Level of education show that a significant relation between Nosocomial infection and Level of education (increase in University in No were(65.59%) more than Illiterate in Yes were(47.62%)), X^2 28.485 and P-value=0.000. Also regarding Monthly income show that a significant relation between Nosocomial infection and Monthly income (increase in 5000 to 10000 SAR in No were(63.80%) more than < 5000 SAR in Yes were(47.62%) , X^2 13.141 and P-value=0.001. Regarding hospital stays show that a significant relation between Nosocomial infection and hospital stays (increase in >10 days in Yes were 67.89% more than 3-10 days in No were(52.38%) X^2 30.177 and P-value=0.000.

Regarding BMI show that a significant relation between Nosocomial infection and BMI (increase in Under weight in Yes were(76.19%) more than in No in obese were(53.41%), X^2 26.084 and P-value=0.000. Regarding Chronic Medical conditions show that a significant relation between Nosocomial infection and Chronic Medical conditions (increase in High blood pressure in Yes were(90.48%) more than in No were(68.46 %), X^2 140.876 and P-value=0.000

Discussion

There may be a gap between knowledge of prevalence of the nosocomial infections among patients in ventilator in a Tertiary Care Hospital at Makkah and the Indeed, the study aimed To assess prevalence and determinants for nosocomial infections (NI) among patients in ventilator at Makkah Al-mukarramh hospital Saudi Arabia 2021, objectives of the study assess the prevalence for nosocomial infections (NI) among patients in ventilator and assess the determinants nosocomial infections (NI) among patients in ventilator at Makkah Al-mukarramh hospital Saudi Arabia

In our study findings shows that most of the participants (51.0%) were in the age group more than 35 years the majority of them were female (68.0%), also regarding Nationality the majority of participant are Saudi were(77.0%) regarding level of education the majority of participant are university were(63.0%). Regarding the Monthly income the majority of participant from 5000 to 10000 were (61.0%). Regarding the Hospital stays the majority of participant >10d ays were (69.0%). Regarding the BMI the majority of participant obese were (51.0%). Regarding the Chronic Medical conditions most of the of participant High blood pressure were (70%) follow by the Heart disease were (56%) regarding Nosocomial infection the majority of participant No were (93.0%) (See Table 1)

In our study findings are similar to a number of previous study results that showed and the Prevalence rate of nosocomial infections among patients in ventilator in 2020 was high (9.5%). This high rate could be due to several practices including the absence adherence to the recommendations of infection control procedures and policies, the correct and frequent hand hygiene measures, keeping a clean healthcare environment and clean equipment, using antibiotics correctly, and complying with standard sterile techniques[33]

Russo et al reported that the prevalence of nosocomial infections was 9.9% [32]. A previous study that was conducted in a Norwegian health region found that the overall rate of nosocomial infection was 6.5% [31] Moreover [34] stated that the prevalence of HAIs in Swiss children's hospitals ranged from 1.4% to 11.8%. WHO stated that in developed countries, that the rate of nosocomial infections is 7% and that the rate of HAIs is 10% in developing countries [35]

In our study of the pathogens isolated in patients with nosocomial infections report that Gram-negative bacteria were the most prevalent pathogenic cause of nosocomial infection in our research. Four microorganisms (Klebsiella pneumoniae, E. coli, Pseudomonas aeruginosa, Acinetobacter baumannii) were(11.96%, 8.70%, 7.61%,9.78%) from the Gram negative flora were most commonly isolated. From the Gram-positive bacteria, the leading pathogens were Coagulase-negative Staphylococcus (CoNS) (14.13%) and Enterococcus faecalis (7.61%). The distribution of pathogens is demonstrated (See Table 2)

Study support our study the prevalence of Gram-negative microorganisms. Was statistically significant compared to Gram-positive microorganisms (74.16% and 25.84%, respectively).

in our study findings are similar to a number of previous study results that showed we found that *Klebsiella* spp. were the most frequently isolated microorganism in patients with NI (25.84%) followed by CoNS (13.49%), *E. coli* (11.24%) and *Enterococcus* spp.(11.24%). For our country, a study in 2014 outlined *Klebsiella pneumoniae* and Coagulase negative *Staphylococcus* as the leading pathogens in the neonatal units.[36] Authors from Brazil, Italy, and Egypt have also observed *Klebsiella* spp. in the highest proportions among patients with NI. Gram-negative bacteria (*Klebsiella* spp. *E. coli*, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*) were the most common agents causing the leading NI-VAP. Although a shift has been noted in developed countries in the last years towards Gram-positive bacteria as agents causing pneumonia Gram-negative bacteria still remain the leading pathogens in less developed countries.[37,38]

In our country there are a limited number of studies considering patients in ventilator nosocomial infections. Rangelova et al 2020 for the period 2010-2011 discovered that 5% of all hospitalized patients in ventilator .[36]

In our study of the association between Nosocomial infection and demographic data show that is no significant relation between Nosocomial infection regarding age, gender and nationality

while show that is a significant relation between Nosocomial infection regarding education, monthly income, hospital stays, BMI and Chronic Medical conditions (increase in High blood pressure in Yes were(90.48%) more than in No were(68.46 %), X^2 140.876 and P -value=0.000 (See Table3).

Conclusion:

In order to understand the nosocomial infections among patients in ventilator, more studies are required. Moreover, more efforts are required by health care workers and other stakeholders to reduce the occurrence the prevalence of nosocomial infections among patients in ventilator. Nosocomial infections prevalence was high in 2020. Further studies are required to understand the trends (incidence, distribution, and prevalence) of nosocomial infections. Efforts are required by health care providers and other stakeholders to prevent nosocomial infections occurrence.

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