

VAP or poisoning; which one has more effect on patients' outcomes in toxicological ICU?

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Summary. *Background:* Ventilator-associated pneumonia (VAP) is the main cause of acquired infections in ICUs. Every year, millions of people suffer from poisoning by various substances. Our aim was to determine the association between VAP incidence and different kinds of toxicity among Toxicological ICU (TICU) patients. *Materials and Methods:* Poisoned patients with diagnosis of VAP were enrolled to our retrospective study at TICU of Loghman Hakim Hospital. Data was collected through the medical records. The statistical analysis was performed with SPSS (version 16, Chicago, IL, USA). *Results:* Among 675 patients with MV > 48 h, 150 patients had the diagnosis of VAP. Mean age was 36.6 years. 74.7% were males. Intentional poisoning was 70.3%. The incidence of VAP was 22%. The higher incidence of VAP was recorded in anti depressants and opioid toxicities. The majority of bacterial isolates (81.3%) were multi drug resistance. MRSA accounted for 50.7% of VAP cases. Non survivors' hospital length of stay (mean = 18.7 days) was significantly higher than survivors (12.8). The hospital length of stay in VAP patients was highest in the Acinetobacter spp (mean > 20 days). Mortality rate of VAP cases was 18.6%. *Conclusion:* No specific association was detected between incidence of VAP and different kinds of toxicity, while Anti Depressants and opioids had high VAP incidence, in a Quarter of this population. It is noticeable that pesticide had the lowest incidence for its short hospitalization. In our TICU, MRSA and Acinetobacter spp were the main agents leading to VAP and prolonged ICU stay, respectively. (www.actabiomedica.it)

Key words: Ventilator-associated pneumonia, poisoning, incidence, ICU

Introduction

Ventilator-associated pneumonia (VAP) is the main cause of nosocomial and acquired infections in ICUs and results in high mortality and morbidity. VAP occurs almost 48 hours after endotracheal intubation and the initiation of mechanical ventilation (MV). The incidence of VAP varies from 7% to 70%, based on the definition, study population, and the type of hospital or ICU (1).

The predisposing factors associated with develop-

ing VAP include age and severity of the underlying diseases, history of antibiotic exposure and duration of mechanical ventilation (2).

Every year, millions of people suffer from poisoning by various substances and mortality due to complications from poisoning had increased dramatically.

In the United States, unintentional poisoning mortality rates almost tripled from 1990 to 2002 (3).

Hassanian-Moghaddam H *et al.* evaluated 108,265 patients, in Iran between 2006 and 2011 and concluded that anti-epileptics and sedative-hypnotics

(22.3%) were the most common medications responsible for poisoning, while pesticides and narcotics were the most common causes of death with 24.84% and 24.75% rates of mortality, respectively (4).

Additionally, it has been stated that the occurrence of VAP prolongs the duration of hospital stay by six to 30 days and increases life-threatening process (5).

The objective of this study was to determine the association and correlation between VAP incidence and different kind of toxicity among poisoned patients admitted to a toxicological ICU.

Materials and methods

Study design

A retrospective study was conducted at Loghman Hakim Hospital Poison Center (LHHPC) with 16 Toxicological ICU beds, over a period of 12 months from March 2012 to March 2013. The hospital is a unique tertiary care teaching and referral poison treatment center in the capital city of Iran (Tehran) with an average of 25000 hospitalized and outpatients, annually.

The Research Ethics committee of the Shahid Beheshti Medical University, M.SC approved this study. (Project identification number 1393-1-91-12852)

Adult poisoned patients with diagnosis of VAP were included. Data was collected through the medical records by the study-trained physicians, who filled the questionnaire to provide data including sex, age, mental status by Glasgow coma scale (GCS), type of poisoning, tympanic temperature, lab tests, microbial cultures and hospital length of stay.

Statistical analysis

We reported data as mean \pm SD and frequency (percent) for quantitative and qualitative data. T test and chi square test were use for comparing the mean and proportion in the two groups. Two ways ANOVA was used for multivariate analysis. The statistical analysis was performed by SPSS (version 16, Chicago, IL, USA).

Results

Among 675 ICU admitted patients that were under mechanical ventilation for more than 48 hours, 150 patients fulfilled the clinical, paraclinical and microbiological criteria for the diagnosis of VAP.

There were 112 (74.7%) males and 38 (25.3%) females. The mean age was 36.6 years (SD = 14.5).

Intentional poisoning for suicidal attempt was recorded in 475 (70.3%) patients and 200 (29.6%) cases had accidental toxicity. Table 1 shows the demographic and characteristic data of the patients.

The incidence of VAP was 22% (per ventilated patients \geq 48 hours/ICU admitted patients). Also, the incidence of VAP in each type of toxicity is shown in Table 2.

Opioid, anti depressants and benzodiazepines were recorded as the most frequent types of poisoning in 200, 135, and 121 patients, respectively.

Mean duration of hospitalization (\pm SD) was 13.99 (\pm 11.36) days.

The isolated organisms from tracheal and blood cultures of the patients, antimicrobial prescription of VAP protocol and chest X ray findings can be seen in Table 3.

The majority of bacterial isolates (81.3%) were found to be multi drug resistance (MDR). *Methicillin resistant Staphylococcus Aureus (MRSA)* accounted for 50.7% of VAP cases followed by *Acinetobacter* spp. and *Klebsiella*, each of which was responsible for 11.3% of the cases.

There were no statistically significant differences between survivors and non survivors in age, gender, type of poisoning, and isolated organisms from tracheal and blood cultures (P value > 0.05). Only, non survivors' hospital length of stay was significantly higher than survivors with the (mean \pm SD) 18.7 \pm 16.1 and 12.8 \pm 9.7 days, respectively (P value = 0.02).

However, different types of microorganisms in tracheal cultures were significantly associated with hospital length of stay. (p value = 0.003)

We noted that the hospital length of stay in VAP patients was highest in the *Acinetobacter* spp group with average mean, 22 days (Figure 1).

Also, we investigated the effect of toxicity type on bacterial culture result using two-way ANOVA, there

Table 1. The demographic and characteristic data of the patients

Variables		Outcome					
		Cure		Expire		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Sex	Male	89	73.0%	23	82.1%	112	74.7%
	Female	33	27.0%	5	17.9%	38	25.3%
Toxicity	BZD ¹	29	23.8%	3	10.7%	32	21.3%
	Anti Depressant	25	20.5%	6	21.4%	31	20.7%
	Anti Convulsive	10	8.2%	1	3.6%	11	7.3%
	Opioid	39	32.0%	12	42.9%	51	34.0%
	Pesticide	4	3.3%	1	3.6%	5	3.3%
	Co	3	2.5%	0	0.0%	3	2.0%
	Lidocain	0	0.0%	1	3.6%	1	0.7%
	Methanol	7	5.7%	2	7.1%	9	6.0%
	Multi substance toxicity	5	4.0%	2	7.2%	7	4.8%
GCS	3-5	20	16.4%	6	21.4%	26	17.3%
	6-10	67	54.9%	14	50.0%	81	54.0%
	11-15	35	28.7%	8	28.6%	43	28.7%

¹BZN= benzodiazepine

Table 2. The incidence of VAP in each type of toxicity.

Type of toxicity	Number of VAP/ All patients	Incidence (%)
BZD ¹	32/135	23
Anti Depressants	31/121	25
Anti Convulsive	11/75	14
Opioid	51/200	25
Pesticides	5/45	11
Co	3/13	23
Lidocain	1/5	20
Methanol	9/40	22
Multi substance toxicity	7/41	17
Total	150/675	22

¹Benzodiazepine

were no relation between length of stay and these two factors.

The mortality rate of VAP cases was 18.6%.

Discussion

In Iran, drug poisoning is the third cause of death in suicide patients (4).

The highest suicide rate has been reported in young adults with remarkable increasing rate, in developing world (6). In the present study, most of the patients had intentional poisoning and attempted suicide (70.3%).

On the other hand, VAP causes poor outcome; prolonged morbidity and high mortality rate from 25-50 percent in ICU patients. In several studies, the necessity of the early diagnosis and empiric antibiotic therapy was suggested. It is estimated that late diagnosis is associated with increased mortality for more resistant microorganisms. (1)

Overall the incidence of VAP was 22% (per ventilated patients) in our study, while the incidence density is reported to range from 13 to 51 per 1000 ventilator days. (1, 5, 7, 8) In the present study, no specific association was detected between incidence of VAP and different kinds of toxicity. VAP was recorded in a Quarter of anti depressants and opioids' poisoned patients. It is noticeable that pesticide had the lowest incidence for its short hospitalization.

Most of our VAP patients were male (74.7%), which was comparable to the Magret M *et al's* report in nine European countries (79%) (9).

According to the association between youth population and different kinds of poisoning, the mean age of 36.6± 14.5 is completely predictable.

This figure is comparable to that of the study done by Magret M *et al.* in which trauma patients were younger than none trauma patients (9).

In comparison with the other studies, which showed vice versa, mean age was more than 45 years, however (2, 7, 9).

Table 3. The isolated organisms from tracheal and blood cultures of the patients, antimicrobial prescription of VAP protocol and chest X ray findings

Variables		Outcome					
		Cure		Expire		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Antibiogram.	MRSA ¹	68	55.7%	8	28.6%	76	50.7%
Tracheal. Culture	Acinetobacter	10	8.2%	7	25.0%	17	11.3%
	Klebsiella	14	11.5%	3	10.7%	17	11.3%
	Pseudomonas aeruginosa	8	6.6%	4	14.3%	12	8.0%
	Poly micro	5	4.1%	3	10.7%	8	5.3%
	E. coli	6	4.9%	2	7.1%	8	5.3%
	MSSA ²	5	4.1%	0	.0%	5	3.3%
	Staphylococcus Epidermidis	2	1.6%	0	.0%	2	1.3%
	Streptococcus pneumoniae	4	3.3%	1	3.6%	5	3.3%
Antibiogram.	MDR ³	100	82.0%	22	78.6%	122	81.3%
Tracheal Culture.	NMDR ⁴	22	18.0%	6	21.4%	28	18.7%
MDR/NMDR							
Antimicrobial prescription of VAP protocol	Vanco ⁵ + B-Lactam+/- Aminogly ⁶	70	57.4%	16	57.1%	86	57.3%
	Targocid+B-Lactam+/- Aminogly	44	36.1%	8	28.6%	52	34.7%
	Colistin+ B-Lactam+/- Aminogly	4	3.3%	2	7.1%	6	4.0%
	Ceftriaxon+ Clindamycin	2	1.6%	2	7.1%	4	2.7%
	Linezolid+ B-Lactam+/-Aminogly	2	1.6%	0	.0%	2	1.3%
Lung Auscultation	Clear	25	20.5%	4	14.3%	29	19.3%
	Ronchy	13	10.7%	2	7.1%	15	10.0%
	Fine Rales	7	5.7%	1	3.6%	8	5.3%
	Coarse Rales	73	59.8%	19	67.9%	92	61.3%
	Decrease of Respi Sound	2	1.6%	0	.0%	2	1.3%
	Ronchy & Fine Rales	1	.8%	0	.0%	1	.7%
	Fine & Coarse Rales	0	.0%	2	7.1%	2	1.3%
	Coarse Rales & Decrease of Respiratory Sound	1	.8%	0	.0%	1	.7%
CXR	Clear	14	11.5%	0	.0%	14	9.3%
	Infiltrative	75	61.5%	22	78.6%	97	64.7%
	Blunt Angle	0	.0%	0	.0%	0	.0%
	consolidation	32	26.2%	6	21.4%	38	25.3%
	Infiltrative & consolidation	1	.8%	0	.0%	1	.7%
Antibiogram. Blood Culture	MRSA	10	52.6%	4	100.0%	14	60.9%
	Acinetobacter	0	.0%	0	.0%	0	.0%
	Klebsiella	1	5.3%	0	.0%	1	4.3%
	Pseudomonas	0	.0%	0	.0%	0	.0%
	Poly micro	0	.0%	0	.0%	0	.0%
	E. coli	0	.0%	0	.0%	0	.0%
	MSSA	0	.0%	0	.0%	0	.0%
	Staphylococcus Epidermidis	8	42.1%	0	.0%	8	34.8%
Streptococcus pneumoniae	0	.0%	0	.0%	0	.0%	
Blood Culture.	MDR	11	57.9%	4	100.0%	15	65.2%
MDR/NMDR	NMDR	8	42.1%	0	.0%	8	34.8%

1 = Methicillin resistant Staphylococcus Aureus; 2 = Methicillin sensitive Staphylococcus Aureus; 3 = multi drug resistant; 4 = non multi drug resistance; 5 = Vancomycin; 6 = Aminoglycoside

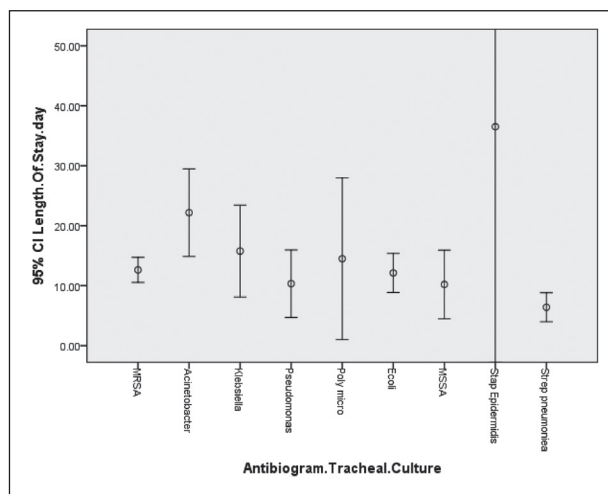


Figure 1. Different types of microorganisms in tracheal cultures and hospital length of stay

In the present study, mortality rate of VAP (18.6%) was increased in comparison to our previous survey (8%), while it was lower than Rocha Lde A et al.'s, Ranjan N et al.'s and Mukhopadhyay et al.'s reports, which were 32.1, 48.33 and 47.3 percent, respectively (5, 8, 10).

In the present study, most of the patients (71.3%) had GCS \leq 10. Erbay RH et al. reported most of the cases (62.2%) had GCS $<$ 9 which it is near to our result (11).

Of note, *Methicillin resistant Staphylococcus Aureus* (MRSA) accounted for 50.7% of VAP cases in our study, while in our previous study in 2007-2008, the most frequent isolated microorganism was sensitive *Staphylococcus aureus* (1).

During 5 years, MSSA was replaced by MRSA as the most frequent isolated microorganisms in our TICU (1, 12, 13). It seems that high manipulation by healthcare workers and skin *Staphylococcus Aureus* colonization in IV drug user are the reasons of this trend change (14). This is while; some other studies reported that the majority of bacterial isolates of VAP patients were Gram-negative bacilli (9, 15, 16).

Accordingly, the hospital length of stay in VAP patients was highest in the *Acinetobacter* spp group with an average mean of more than 20 days. According to the Tsakiridou E et al.'s survey in 2014, prolonged ICU stay (25 ± 17 days) was significantly reported in

Acinetobacter baumannii VAP patients, a result compatible with our findings. (16)

Conclusion

In this study, no specific association was detected between incidence of VAP and different kind of toxicity, while Anti Depressants and opioids had high VAP incidence, in a Quarter of this population. It is noticeable that pesticide had the lowest incidence for its short hospitalization.

In our TICU MRSA and *Acinetobacter* spp were the main agents leading to VAP and prolonged ICU stay, respectively.

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