

## Ventilator Associated Pneumonia and Its Prevention: A Survey on Physiotherapists

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**Abstract.** Ventilator-acquired pneumonia (VAP) is the most common hospital-acquired infection among patients who receive mechanical ventilation for longer than 48 hours in the intensive care unit (ICU). VAP is associated with increases in morbidity and mortality, hospital length of stay and costs. Hence, there is also need to determine the knowledge and awareness of physiotherapist about VAP. This study was done to determine the awareness, attitude and knowledge of VAP among physiotherapist working in different hospitals in Maharashtra. This survey study was conducted using a pre-validated multiple choice questionnaire was developed for 500 physiotherapists to evaluate knowledge of VAP and its prevention. Physiotherapists not willing to participate were excluded. 373 (74.6%) responded to the survey, 64.07% of the respondents knew that VAP occurs after 48 hours of endotracheal intubation. 66.3% had average knowledge about the etiology and prevalence of VAP, 57.9% recognized the importance of semi recumbent position for prevention of VAP. 46.3% respondents had a fair knowledge about the use of physiotherapy in prevention of VAP. The results of this study can be used to focus on educational programs on prevention of VAP. Knowledge alone cannot be considered for prevention of VAP but practice along with it is recommended.

**Key words:** ventilator-acquired pneumonia, hospital-acquired infection, intensive care unit, morbidity, mortality.

### Introduction

Ventilator-associated pneumonia or Ventilator-acquired Pneumonia (VAP) is one of the most common hospital-acquired infection among patients who are intubated by endotracheal tube or tracheostomy and then mechanically ventilated for longer than 48 hours in the intensive care unit (ICU) (Ruffell and Adamcova, 2008: 44-53). In VAP there is invasion of bacteria, fungi or viruses in the lower respiratory tract and lung parenchymal tissue. The oropharyngeal integrity is compromised during the intubation process there by exposing the lower airways to oral and gastric secretions (Browne et al., 2014).

Recent literature suggest that 39.59 patients per 1000 patients who were ventilated for over 48 hours developed VAP in Maharashtra (Patil and Patil, 2017: 46-55; Labeau et al., 2008: 180-185). There is an increased morbidity and mortality associated with VAP, the length of stay in the ICU (5-7days) and the wards (2 to 3 folds) also increases in these patients, thereby increasing the hospital costs. It has been studied that the rate of mortality in patients diagnosed with VAP is around 27% and when the causative agent is

resistant to the first line of treatment then it is increased to 43% rate of mortality (Jordan et al., 2014: 1115-1117; Ruffell and Adamcova, 2008: 44-53).

VAP can be divided into early onset and late onset VAP, the former is usually less severe and has a better prognosis is seen. The late-onset VAP is caused by multidrug resistant bacteria and early is caused by drug sensitive bacteria. There's an increased risk of morbidity and mortality in the late onset VAP group (Niederman and Craven, 2005: 388-416).

Recent literatures from India have investigated the causative organisms of VAP with *Pseudomonas* spp., *Acinetobacter* spp., *Escherichia coli*, *Klebsiella pneumoniae*, and *Staphylococcus aureus* being the more common VAP pathogens. There's an increased prevalence of VAP caused by polymicrobes. Infections caused by *Pseudomonas* spp., *Acinetobacter*spp & *Enterobacteriaceae* lead to late onset and severe VAP (Niederman and Craven, 2005: 388-416; Joseph et al., 2009: 7717; Chastre and Fagon, 2002: 867-903).

Since VAP is a co-morbid condition and causes an increase in the hospital costs to an increase in the length of stay. Thus it is of utmost importance to develop preventing strategies for development of VAP. The scope of Physiotherapists in the ICU has increased considerably in the last decade so the knowledge about the general information about the condition, pathogenesis of VAP and Prevention of VAP is ought to be know by the physiotherapist. Hence we conducted this study with an aim to determine the perspective of Physiotherapists working in ICUs of different Hospitals in Maharashtra about ventilator associated pneumonia.

Aim of the study was to determine the knowledge of physiotherapists working in ICUs of different hospitals in Maharashtra regarding Ventilator associated Pneumonia. We also wanted to investigate if any co-relation exists between the knowledge, experience and qualification of the physiotherapists.

### **Materials and Methodology**

A Descriptive, cross-sectional study was conducted during the period of March 2017 to July 2017 over period of 6 months. A questionnaire formed by Labeau et al was modified based on the recent advances in VAP which was face validated, it consisted of 17 questions with 4 multiple choices and 1 right answers. The questionnaire was developed on Google forms and was E-mailed to 500 physiotherapists working in ICUs of different hospitals across Maharashtra. These 500 were selected from a framework of 4,378 physiotherapist registered to the State body for Physiotherapist.

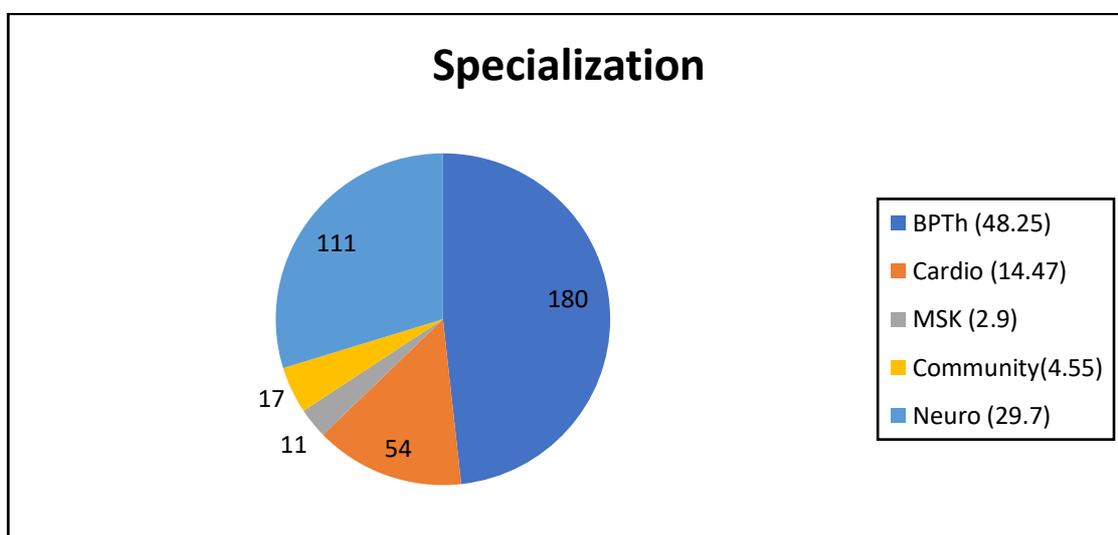
Approval for the survey study was obtained from institutional research board and ethical approval was obtained from the institutional ethical committee. The contextual framework of the study was explained before asking the participants to complete the questionnaire. Participation in the survey was voluntary, and the electronic consent forms were filled by all the participants. Confidentiality of participants (individuals) was maintained. A single VAP related questionnaire was provided to the participants. Participants not willing to participate were excluded. The questionnaire was designed to evaluate Perspectives about VAP. The questionnaire was evaluated for content validity by panel of experts (infection control consultant, infection control physician, infection control expert nurse, Intensive physician, pulmonary physician and respiratory therapist). The questionnaire was later pretested before sending it out as emails to physiotherapists working in various ICU's across hospitals in Maharashtra.

#### *Statistical analysis*

Data were analyzed using Graph pad instat software, version 3.0. Descriptive statistics, including frequency distribution and percentages were used to describe the participants' characteristics, correct answers in the questionnaire and perceived barriers of participants toward adherence to VAP prevention guidelines. Level of significance was set at 5%. Correlation Coefficient was done between the knowledge among the physiotherapists and their qualifications and also with their years of experience using Pearson correlation coefficient test.

**Results**

The questionnaire was distributed to 500 physiotherapists with response rate of 74.6% (n=373). Out of the 373 respondents 180 (48.25%) were Bachelors in Physiotherapy, 111 (29.7%) were Masters in neuro-physiotherapy, 54(14.47%) were masters in cardio-respiratory Physiotherapy, 17 (4.55%) were masters in community physiotherapy, 11 (2.9%) were masters in Musculoskeletal physiotherapy.



**Fig. 1.** The results of questionnaire

24 (6.4%) physiotherapists had an experience of >10 years, 75 (20.10%) had 6-10 years of experience, 71 (19.03%) had an experience of 1-5 years and the rest 203 (54.42%) had an experience of less than 1 year. Majority of the physiotherapist worked in Urban (41.28%) or Semi Rural (49.86%) ICU set ups (Table 1 and 2)

**Table 1.** Years of experience distribution

Years of experience	Numbers of PTs
>10 years	24 (6.4%)
6-10 years	75 (20.10%)
1-5 years	71 (19.03%)
<1 year	203 (54.42%)

**Table 2.** Distribution of respondents by locality

Area of practice	Numbers of PTs
Rural	32 (8.57%)
Semi-Rural	186 (49.86%)
Urban	154 (41.28%)

The questionnaire was divided into 3 parts so as to study the knowledge about physiotherapist for the same, viz- General information of VAP, Pathogenesis of VAP & Prevention of VAP.

*Question (General information of VAP)*

*What is the amount of time a patient should be mechanically ventilated to acquire VAP? (>48 HOURS) – 64.07%*

*What is the incidence of VAP in ICU admission in India? (per 100) (30-40 per 100 cases) -20.91%*

*What are the associated problems following VAP?*

*(All of the above) – 94.3%*

*Which part of the respiratory tract is affected following VAP?*

*(Lower respiratory tract) – 44.51%*

*Which patients are at risk of developing VAP?*

*(Critical illness) – 78.01%*

*Bacterial colonization of which area causes endemic VAP?*

*(Oropharyngeal) – 95.44 %*

*Question (Pathogenesis of VAP)*

*Which instrument contamination causes outbreaks of epidemic VAP? (Bronchoscope) – 89%*

*Which is the major risk factor for development of VAP?*

*(Reintubation) - 55.22%*

*Which position is at the highest risk of developing VAP in patients mechanically ventilated?*

*(Supine) - 82.57%*

*Which organism is responsible for development of early onset VAP?*

*(S. pneumonia) - 56.83%*

*Which organism is responsible for development of late onset VAP?*

*(Pseudomonas aeruginosa) – 21.71%*

*Question (Prevention of VAP)*

*Which therapeutic body positioning is ideal in mechanically ventilated patients to prevent occurrence of VAP?*

*(Semi recumbent) - 57.9%*

*Which of the following physiotherapy treatment strategies may be used for management of mechanically ventilated patients to prevent VAP?*

*(Suctioning and chest vibrations) – 42.62%*

*Which suctioning procedure is better in terms of prevention of VAP?*

*(Closed) – 46.91%*

The knowledge about VAP was superior among the more experienced physiotherapist. (r=0.814)

There was no correlation between the education qualification and knowledge of VAP. (r=0.319)

## Discussion

The present survey study was conducted in order to determine the knowledge of physiotherapists regarding VAP and its prevention. We found that 72.1% physiotherapist had knowledge about VAP, surprising 47.3% only knew about the pathogenesis of VAP. 59.1% were aware of the physical therapy practices to prevent VAP. The knowledge about VAP was superior among the more experienced physiotherapist. There was no correlation between the education qualification and knowledge of VAP.

The same kind of questionnaire was used to evaluate different health care professionals, nurses of the Flemish Society for Critical Care Nurses (Ghent, November 2005) and the nurses from several Mediterranean countries, Medical students and Physiotherapist in south India (Modi U, July 2017), all showed a lack of knowledge among the HCWs regarding Ventilator associated pneumonia and its prevention. The low knowledge scores obtained in most of the reported assessments indicate that formidable efforts must be made in the education of all HCWs.

### Conclusion

The below average knowledge of physiotherapist for VAP and Its prevention should be the main focus to include special emphasis on this condition. Theoretical knowledge being volatile, special emphasis on practical sessions and discussions is recommended. Being in a developing country, the main aim would be prevent the occurrence of any disease so as to ease the cost burden on the patient caregiver and government alike. The abuse of antibiotics has also lead to many virulent drug strains of micro-organisms causing VAP, hence prevention stands at the prime during this hour of need. It can be prevented by conducting routine health education and training of health care workers come in contact with ventilated nurses.

### References

- Browne, E., Hellyer, T.P., Baudouin, S.V., Conway Morris A., Linnett, V., McAuley, D.F. (2014). A national survey of the diagnosis and management of suspected ventilator-associated pneumonia. *BMJ Open Respir Res.*, 1(1). <https://doi.org/10.1136/bmjresp-2014-000066>
- Chastre, J., Fagon, J.Y. (2002). Ventilator-associated pneumonia. *Am J Respir Crit Care Med*, 165, 867-903. <https://doi.org/10.1164/ajrccm.165.7.2105078>
- Jordan, A., Badovinac, A., Spalj, S., Par, M., Slaj, M., Plancak, D. (2014). Factors influencing intensive care nurses' knowledge and attitudes regarding ventilator-associated pneumonia and oral care practice in intubated patients in Croatia. *American Journal of Infection Control*, 42, 1115-1117. <https://doi.org/10.1016/j.ajic.2014.07.008>
- Joseph, N.M., Sistla, S., Dutta, T.K., Badhe, A.S., Parija, S.C. (2009). Ventilator associated pneumonia in a tertiary care hospital in India: Incidence and risk factors. *J Infect Dev Ctries*, 3, 7717. <https://doi.org/10.3855/jidc.396>
- Labeau, S., Vandijck, D., Rello, J., Adam, S., Rosa, A., Wensch, C. (2008). Evidence-based guidelines for the prevention of ventilator-associated pneumonia: results of a knowledge test among European intensive care nurses. *Journal of Hospital Infection*, 70, 180-185. <https://doi.org/10.1016/j.jhin.2008.06.027>
- Niederman, M.S., Craven, D.E. (2005). Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med*, 171, 388-416.
- Patil, H.V., Patil, V.C. (2017). Incidence, bacteriology, and clinical outcome of ventilator-associated pneumonia at tertiary care hospital. *J Nat Sc Biol Med*, 8, 46-55. <https://doi.org/10.4103/0976-9668.198360>
- Ruffell A., Adamcova, L. (2008). Ventilator-associated pneumonia: prevention is better than cure. *Nurs Crit Care.*, 13(1), 44-53. <https://doi.org/10.1111/j.1478-5153.2007.00248.x>