

## Original Research Article

# ASSESSMENT OF AVAILABILITY OF ANAESTHESIA MACHINES AND VENTILATORS IN OPERATION THEATRES OF HOSPITALS IN TAMIL NADU

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### ABSTRACT

**Background:** Anaesthesia machines and ventilators are critical equipment in operation theatres, ensuring patient safety and effective surgical outcomes. Presence of ventilators will increase the possibility of wide range of surgeries that can be taken in the particular hospital, Tamil Nadu, being one of India's most populous states, requires adequate healthcare infrastructure. **Aims and Objectives:** To assess the availability of anaesthesia machines and ventilators in operation theatres of hospitals in Tamil Nadu.

**Material and Methods:** This study is a cross-sectional analysis conducted in Operation Theatres of Hospitals in Tamil Nadu between September 2023 and December 2023 with sample size of 70. The population consists of Doctors who are all working in operation theatres. Consecutive sampling technique was used.

**Results:** Most of the doctors (37.1%) were participated from district and taluk/Municipality. 57.1% of hospitals had the availability of anaesthesia machine. The most common reason for non-availability of anaesthesia machine was Minor OT (36.7%), the second reason for non-availability of anaesthesia machine was budget issues (33.3%). Only 30% of hospitals had the availability of ventilator. The availability of Multipara monitor was 50% in hospitals. 44.3% of doctors told that if anaesthesia machine and ventilator was present, it definitely improve the patient safety. More number of district hospitals had ventilator and multipara monitor compared to other location, which was statistically significant. **Conclusion:** The study highlights a significant gap in the availability of critical medical equipment, such as ventilators and anaesthesia machines, in many hospitals, often due to infrastructure limitations and budget constraints. Addressing these gaps can significantly enhance patient safety and improve surgical outcomes.

**Keywords:** Anaesthesia machines, Ventilators, Operation Theatres.

## INTRODUCTION

Modern anaesthetic machines have improved greatly since 1917 when Boyle modified the American Gwathmey apparatus of 1912 to develop the ubiquitous continuous flow anaesthetic machine. It perform a range of complicated and precise functions, facilitating the administration of safe anaesthesia to patients. Anesthesia machine is a medical device used to generate and mix a fresh gas

flow of medical gases and inhalational anaesthetic agents for the purpose of inducing and maintaining anaesthesia.<sup>[1]</sup>

The basic design of an anaesthesia machine consists of pressurised gases supplied by cylinders or pipelines to the anaesthetic machine, which controls the flow of gases before passing them through a vapouriser and delivering the resulting mixture to the patient through the breathing circuit. A ventilator is a type of breathing apparatus that provides

mechanical ventilation by moving breathable air into and out of the lungs, to deliver breaths to a patient who is physically unable to breathe, or breathing insufficiently. Ventilators may be computerized microprocessor-controlled machines, but patients can also be ventilated with a simple, hand-operated bag valve mask. Ventilators are chiefly used in intensive-care medicine, home care, and emergency medicine (as standalone units) and in anesthesiology (as a component of an anesthesia machine). Ventilator Provides pressure to keep the small air sacks in lungs (alveoli) from collapsing.

So, Anaesthesia machines and ventilators are most necessary critical equipment in operation theatres, ensuring patient safety and effective surgical outcomes.

**Aim:** To assess the availability of anaesthesia machines and ventilators in operation theatres of hospitals in Tamil Nadu.

**Objectives:** To assess the availability of anaesthesia machines and ventilators in operation theatres of hospitals in Tamil Nadu.

To identify the cause of Nonavailability of anaesthesia machines and ventilators in operation theatres of hospitals in Tamil Nadu.

## MATERIALS AND METHODS

This study is a cross-sectional analysis conducted in Operation Theatres of Hospitals in Tamil Nadu between September 2023 and December 2023 with sample size of 70. The population consists of doctors who are all working in Operation Theatres of Hospitals in Tamil Nadu. The consecutive sampling technique was used.

The inclusion criteria for this study was doctors working in Operation Theatres of Hospital, who consent to participate in the study.

The following details was asked from study participants such as location of working, availability of anaesthesia machine, reason for absence of anaesthesia machine, availability of ventilator and multipara monitor.

Descriptive statistics were reported as mean (SD) for continuous variables, frequencies (percentage) for categorical variables. Chi square was used to find the association between categorical variables. Data were statistically evaluated with IBM SPSS Statistics for Windows, Version 16.0., IBM Corp.

## RESULTS

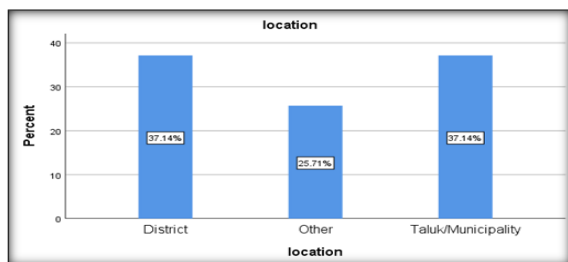


Figure 1: Distribution of location of study participants

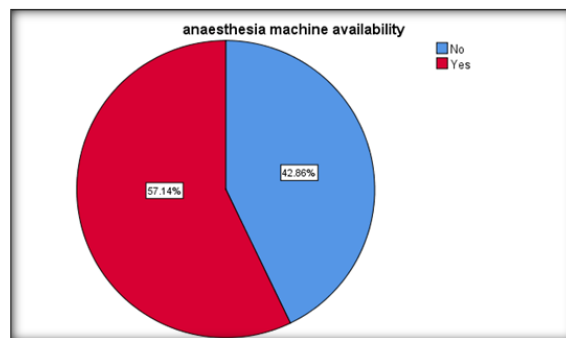


Figure 2: Anaesthesia machine availability

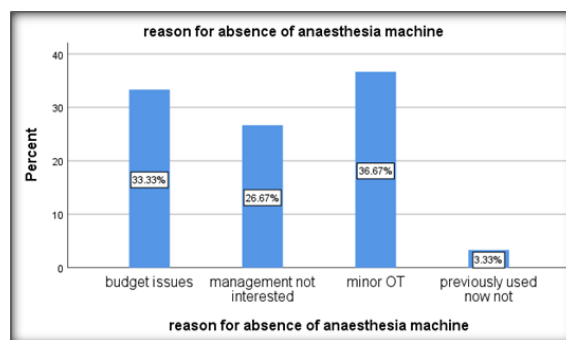


Figure 3: Reason for Non-availability of Anaesthesia machine

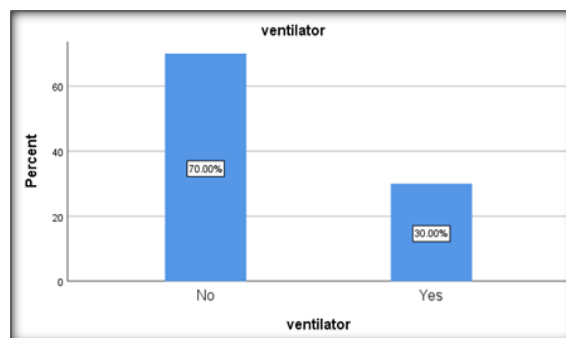


Figure 4: Ventilator machine availability

Most of the doctors (37.1%) were participated from district and taluk/Municipality. 57.1% of hospitals had the availability of anaesthesia machine. The most common reason for non-availability of anaesthesia machine was Minor OT (36.7%), the second reason for non-availability of anaesthesia machine was budget issues (33.3%). Only 30% of hospitals had the availability of ventilator. The availability of Multipara monitor was 50% in hospitals. 31 (44.3%) of doctors told that if anaesthesia machine and ventilator was present, it definitely improve the patient safety and also 13 (18.6%) of doctors told that if anaesthesia machine and ventilator was present, it may be improve the patient safety. There was significant association between Location and ventilator availability. More number of district hospitals had ventilator compared to other location. There was significant association between Location and Multipara monitor availability. More number of

district hospitals had multipara monitor compared to other location.

**Table 1: Distribution of location of study participants**

| Location           | Frequency | proportion |
|--------------------|-----------|------------|
| District           | 26        | 37.1       |
| Other              | 18        | 25.7       |
| Taluk/Municipality | 26        | 37.1       |
| Total              | 70        | 100.0      |

**Table 2: Anaesthesia machine (AM) availability**

| AM    | Frequency | proportion |
|-------|-----------|------------|
| No    | 30        | 42.9       |
| Yes   | 40        | 57.1       |
| Total | 70        | 100.0      |

**Table 3: Reason for Non-availability of Anaesthesia machine**

| NA of AM                  | Frequency | proportion |
|---------------------------|-----------|------------|
| Budget issues             | 10        | 33.3       |
| Management not interested | 8         | 26.7       |
| Minor OT                  | 11        | 36.7       |
| Previously used now not   | 1         | 3.3        |
| Total                     | 70        | 100.0      |

**Table 4: Ventilator machine availability**

| Ventilator | Frequency | proportion |
|------------|-----------|------------|
| No         | 30        | 42.9       |
| Yes        | 40        | 57.1       |
| Total      | 70        | 100.0      |

**Table 5: Multipara monitor availability**

| Multipara monitor | Frequency | proportion |
|-------------------|-----------|------------|
| No                | 35        | 50.0       |
| Yes               | 35        | 50.0       |
| Total             | 70        | 100.0      |

**Table 6: Association between Location and Ventilator**

| Location           | Ventilator |           | Total    | p value |
|--------------------|------------|-----------|----------|---------|
|                    | Yes        | No        |          |         |
| District           | 13(50%)    | 13(50%)   | 26(100%) | 0.002   |
| Other              | 0(0%)      | 18(100%)  | 18(100%) |         |
| Taluk/Municipality | 8(30.8%)   | 18(69.2%) | 26(100%) |         |
| Total              | 21(30%)    | 49(70%)   | 70(100%) |         |

Chi square test \*p<0.05

**Table 7: Association between Location and Multipara Monitor**

| Location           | Multipara Monitor |           | Total    | p value |
|--------------------|-------------------|-----------|----------|---------|
|                    | Yes               | No        |          |         |
| District           | 17(65.4%)         | 9(34.6%)  | 26(100%) | 0.04    |
| Other              | 5(27.8%)          | 13(72.2%) | 18(100%) |         |
| Taluk/Municipality | 13(50%)           | 13(50%)   | 26(100%) |         |
| Total              | 35(50%)           | 35(50%)   | 70(100%) |         |

Chi square test \*p<0.05

## DISCUSSION

Anaesthesia machines and ventilators are the backbone of any modern operation theatre, playing a vital role in safeguarding patient lives and ensuring successful surgical outcomes. The availability of ventilators not only enhances the safety of patients undergoing surgery but also expands the scope of procedures that can be performed in a hospital. This is particularly crucial in Tamil Nadu, one of India's most densely populated states, where the demand for advanced and reliable healthcare infrastructure is ever-growing. By equipping hospitals with cutting-edge ventilators, Tamil Nadu can take a significant

step toward delivering world-class medical care and meeting the diverse surgical needs of its population. Our study found that 57.1% of hospitals had anaesthesia machines, while only 30% had ventilators, with their absence often linked to minor OT setups (36.7%) and budget constraints (33.3%). Multipara monitors were available in 50% of hospitals, and 44.3% of doctors emphasized that anaesthesia machines and ventilators significantly improve patient safety. District hospitals had better access to ventilators and multipara monitors compared to other locations, highlighting the importance of location in medical equipment availability.

## CONCLUSION

The study highlights a significant gap in the availability of critical medical equipment, such as ventilators and anaesthesia machines, in many hospitals, often due to infrastructure limitations and budget constraints. District hospitals are better equipped compared to other locations, underlining the need for targeted investment in healthcare infrastructure, particularly in underserved areas. Addressing these gaps can significantly enhance patient safety and improve surgical outcomes.

**Conflict of Interest:** None

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