

CLINICAL PROFILE AND OUTCOME OF VENTILATED CHILDREN IN A PEDIATRIC INTENSIVE CARE UNIT OF A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To assess the clinical profile and outcome of mechanically ventilated patients at a pediatric intensive care unit of a tertiary care teaching hospital of Pakistan.

Study Design: Cross-sectional study.

Place and Duration of Study: Pediatric Intensive Care Unit, Pak Emirates Military Hospital Rawalpindi, from Jan 2018 to Jun 2018.

Methodology: A prospective study was conducted on 200 patients admitted in the pediatric intensive care unit. Demographic profile included age, gender, medical illness and reason to put on the ventilator. Duration for which each patient stayed on mechanical ventilations was also calculated. Outcomes included death, discharge from Intensive Care Unit and leave against medical advice (LAMA).

Results: A total of 200 patients admitted in pediatric intensive care unit were put on ventilator in the study duration time. Respiratory tract diseases including pneumonia was the commonest underlying medical disorder among the target population followed by neurological disorders. Mean age of patients put on ventilator was 3.23years (\pm 4.945). Most of the patients were put on ventilator in gasping condition. Out of 200 patients, 110 (55%) died, 75 (37.5%) were discharged and 15 (7.5%) left against the medical advice (LAMA).

Conclusion: This study gives an insight into the pattern of common illnesses and conditions encountered and managed in a pediatric intensive care unit. Management of critically ill children involving the mechanical ventilator is an integral part of pediatric critical care medicine. More expertise and depth in this aspect may improve the outcome among these critically ill children.

Keywords: Demographic profile, Mechanical ventilation, Outcome, Pediatric intensive care unit.

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INTRODUCTION

Pediatric illnesses are increasing with each passing day posing a great budget on health care system worldwide¹. Pakistan is no exception to this and prevalence of childhood illnesses is on a rise demanding more and more resources². Pediatric critical care medicine is an emerging specialty with very limited coverage in the developing countries³.

Mechanical ventilation is an expensive and operator dependent technique⁴. It is the only life saving option among the patients suffering from acute respiratory failure. Various studies in the past have demonstrated that around 3-64% of the patients require mechanical ventilation inside the

pediatric intensive care unit⁵. Mechanical ventilation especially if prolonged has been associated with many hazards including the death^{6,7}.

A study done in India concluded that neurological problems were the commonest cause of ICU admission and mechanical ventilation⁸. Another similar study conducted in the same country on the rural population showed similar results regarding the etiology of ICU admission but prognosis of most children were poor⁹. Data of 2017 from an urban tertiary care hospital revealed that pneumonia was the commonest cause of ICU admission among the children and more than half of mechanically ventilated children died¹⁰. A large study done on patients admitted in various pediatric intensive care units of UK and Ireland concluded that mechanical ventilation was associated with good mortality among the

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target population¹¹. Most of the literature available on this aspect concludes that mechanical ventilation is a requirement in all the settings but only trained staff and timely decisions can make best use of this modality and reduce the mortality among the children suffering from respiratory failure due to various causes^{7,8}.

Various factors have been correlated with the good outcome among the children admitted and mechanically ventilated in the intensive care unit. Some of them include type of underlying illness, effective organized early intervention, regular follow-up, use of non invasive ventilation as first line in emergency and duration of mechanical ventilation^{6,10}.

Being from a developing nation with limited resources this topic is of utmost relevance in good pediatric clinical practice. Few studies have been done in the past in other provinces in the public sector hospitals regarding outcome children admitted in ICU but no study has so far been conducted at a tertiary care military hospital receiving patients from all over Pakistan including the public sector tertiary care hospitals. This study was planned with the rationale to look for the clinical profile and outcome among the pediatrics patients admitted in the intensive care unit and put on mechanical ventilation in a tertiary care teaching military hospital of Pakistan.

METHODOLOGY

This cross-sectional study was conducted at the pediatric intensive care unit of Pak Emirates Military Hospital Rawalpindi, from 1st January 2018 to 30th Jun 2018. Sample size was calculated by WHO Sample Size Calculator. Non probability Consecutive sampling technique was used to gather the sample. All patients between the age of 01 month and 12 years admitted in pediatric intensive care unit and required mechanical ventilation were included in the study. Patients who were referred from other military, public sector and private hospitals who required mechanical ventilation were also included in the analysis in addition to the referrals from pediatric wards of own hospital. Exclusion criteria were the patients

with >1 month of age or those with unclear medical diagnosis. Patients whose parents did not give written informed consent were also excluded from the study.

After ethics approval from the ethics review board committee and written informed consent from the parents of potential participants, patients mechanically ventilated in pediatric intensive care unit of MH RWP were included in the study. Pediatric intensive care unit is an eight-bed facility with around 450 admissions per year and around 300 patients requiring mechanical ventilation. Pediatric critical care medicine is not a recognized specialty in Pakistan, so a resident pediatrician is present round the clock in the unit working under the supervision of the consultant. Staff trained to operate the mechanical ventilator also works round the clock. The most commonly used mode on conventional mechanical ventilation was Synchronized intermittent mandatory ventilation pressure control pressure support (SIMV-PC/PS) with normal respiratory physiological parameters for such age and clinical condition in our unit. The initial parameter was set according to need of patients and adjusted according to clinical variables, chest X-ray and arterial blood gas analysis (ABG) as described in the existing literature¹⁴. Data was collected on a structured proforma specially designed for this study. Parameters in the study included age, gender, underlying medical condition, condition at time of ventilation, duration of ventilation and outcome (death, discharge and leave against medical advice).

All statistical analysis was performed by using the Statistics Package for Social Sciences version 23.0 (SPSS-23.0). Frequency and percentages for gender, underlying medical condition, condition at time of ventilation and outcome was calculated. Mean \pm standard deviation (SD) for age and duration of ventilation was calculated.

RESULTS

A total of 210 patients were initially approached to get them included in the analysis. Six were less than one month old, three had no clear

diagnosis of the underlying medical condition and parents of one did not give consent to include him in the study. Out of 200 patients

Table-I: Characteristics of study participants (n=200).

Age (years)	
Mean ± SD	3.23 ± 4.945
Range (min-max)	1 month - 12 years
Gender	
Male	120 (60%)
Female	80 (40%)
Indications of mechanical ventilation	
Gasping	79
Cardiac arrest	36
Respiratory arrest	41
Shifted on ambulatory device	05
Severe respiratory distress	39
others	10

Table-II: Underlying medical illness among the patients mechanically ventilated at pediatric ICU (n=200).

Medical Conditions	Frequency
Pneumonia and other respiratory conditions	46
Sepsis	22
Acute renal failure	19
Head injury and other Surgical patients	10
Hepatic conditions	14
Multi organ failure	19
Cardiovascular conditions	21
Meningitis and other neurological conditions	44
Others	05

included in the final analysis 120 were male and 80 were female. Other characteristics of study population have been summarized in table-I. Respiratory tract diseases including pneumonia

Table-III: Descriptive statistics regarding stay on ventilator.

Variable	Minimum	Maximum	Mean	Standard Deviation
Stay on ventilator (hours)	1	333	69.32	66.236

Table-IV: Outcome of patients put on ventilator.

Total	Death	Discharge	LAMA
200	110 (55%)	75 (37.5%)	15 (7.5%)

was the commonest underlying medical disorder among the target population followed by neurological disorders and sepsis. Head injury and surgical causes were least reported. Other causes

include poisoning, burns and status asthemicus (table-II). Mean age of patients put on ventilator was 3.23 years (± 4.945). Mean duration of stay at ventilator was 69.32 hours with 1 hour being minimum time of stay and 333 hours being the maximum time (table-III). Most of the patients were put on ventilator in gasping condition. Table-IV shows that out of 200 patients, 110 (55%) died, 75 (37.5%) were discharged and 15 (7.5%) left against the medical advice (LAMA).

DISCUSSION

Pediatric intensive care unit is a setup where critically ill children are admitted needing the organ support for various systems. Even adult Critical care medicine is still an emerging specialty in our country with <20 consultants available for more than twenty crore population. No fellowship is currently offered in pediatric critical care medicine in our country. Therefore our study provides a basic data and highlights the importance of work required for critically ill children who need mechanical ventilation for their survival^{11,14}.

Most of the patients in our study were male children with male-female ratio of 1.5:1. Similar results were reported in studies done in our own country and India^{12,14}. Reason might be either female children have lesser chance of getting critically ill in south Asia or chances of critically ill female babies reaching the tertiary care facility are less as compared to male babies. More research is required to look into this parameter.

Respiratory illnesses including pneumonia were the commonest underlying illnesses which caused the patients to be admitted in the ICU and

put on mechanical ventilator. Neurological causes were ranked topmost as etiology of mechanical ventilation in various studies done in past in other parts of the world^{8,12}. A recent study

showed results similar to ours, where respiratory causes were more common in the target population than CNS causes¹⁵. Study of these causes may help in both directions. May enable primary and secondary care physicians to treat them early and effectively and identify the risk factors associated with ICU admission. It may enable the critical care physicians to assess the outcome in each cause and specialized care and ventilator settings required for each ailment.

Average time for which the patients remained on ventilator in our study was 69.32 hours. Few patients required it as less as one hour and few required it for even more than a week. Similar trends were observed in the studies done in recent past^{8,9,12,15}. This clearly depicts that organ support and ventilator requirement is entirely different for different cases. In a developing country with limited resources this may give a road map to prioritize the patients in line to avail this facility.

Intensive care units are notorious for high mortality rate all over the world^{16,17}. This holds true for both adult and pediatric intensive care units^{18,19}. Outcome in our study was also not very different. Fifty five percent of the patients died despite all the efforts made in the intensive care unit including the ventilatory support. Only 37.5 percent were discharged and they too were not followed up to look for the final outcome and mortality. Fifteen patients left the ICU against the medical advice. Common reason for this was shift to another hospital either due to cost effectiveness or better facilities. Results were similar in the studies done in setups similar to us and were slightly better in the developed countries^{8,20,21}. More studies of similar pattern will help us in finding the factors determining the prognosis and associated with better outcome.

The major limitation of our study is the lack of generalizability as patients from one intensive care unit of a tertiary care hospital of Pakistan were studied instead of all hospitals of the country. Results might be different in units of public hospitals which have fewer facilities as compared

to military hospital and from private hospitals which have more facilities. The sample size, and design of study pose methodological issues as well. Relationship of the diseases and ventilation time were not related with the outcome. Patients were not followed up after the discharge so final outcome could not be determined. We suggest further studies on a broader based and a more representative sample size involving the hospitals of both public and private sector.

CONCLUSION

Common illnesses and conditions encountered and managed in a pediatric intensive care unit have been highlighted in the results of this study. Management of critically ill children involving the mechanical ventilator is an integral part of pediatric critical care medicine. More expertise and depth in this aspect may improve the outcome among these critically ill children.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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