The ARDS Kigali definition: do we need a new definition for low-income countries?

Gautam Rawal[1,*], Sankalp Yadav[2], Raj Kumar[3]

[1]Attending Consultant, [3]Senior Consultant & Incharge, Dept. of Respiratory Intensive Care, Max Super Specialty Hospital, Saket, New Delhi, [2]General Duty Medical Officer- II, Dept. of Medicine & TB, Chest Clinic Moti Nagar, North Delhi Municipal Corporation, New Delhi

***Corresponding Author:**
Email: drgautamrawal@hotmail.com

Abstract

Acute respiratory distress syndrome (ARDS) has always been the center of research during the past decades due to its high mortality and morbidity. The ARDS definition of the Berlin conference has received both appreciation and criticism and has now travelled a long journey to the Kigali city of Rwanda, to be modified. This Kigali modification of ARDS definition allows the identification of ARDS not only in rich or middle-income countries, but also in the low-income countries or in the healthcare facilities with very limited resources. In a developing country like India, there are still a large number of healthcare facilities which lack the proper resources. Further research on this modified definition is needed for its proper validation and reliability and consequent widespread use.

Keywords: ARDS; Berlin definition; Kigali; Sepsis

Commentary

Acute respiratory distress syndrome (ARDS), initially described by Ashbaugh et al. 1967, is an acute inflammatory pulmonary condition carrying a high morbidity and mortality[1,2]. ARDS represents an acute pulmonary response to various stimuli/injuries which may be direct (pneumonia, pulmonary contusion due to trauma, inhalational injury, aspiration of gastric content) or indirect injuries (sepsis, pancreatitis, massive transfusion, multi-trauma, severe burns, non-cardiogenic shock)[2,3].

ARDS is characterized by a dysregulated inflammatory cascade along with inappropriate accumulation of leukocytes and alveolar barrier disruption resulting in stiff lungs and life-threatening hypoxemia[2-4]. Extensive research has been undertaken in the past few decades to understand the pathogenesis of ARDS and improve the survival. Despite this the mortality associated with ARDS remains high (about 40-50%) with limited therapeutic interventions which include low-tidal volume mechanical ventilation, prone ventilation in serve ARDS cases and the use of extra corporeal membrane oxygenation in cases not responding to the conventional therapies[5,6].

In 2011, the panel of experts met during the Annual Congress of the European Society of Intensive Care Medicine in Berlin (endorsed by the American Thoracic Society and the Society of Critical Care Medicine) created the present new definition of ARDS[4]. The major recommendations were: a) timing: the onset of respiratory symptoms within one week of a known insult, b) oxygenation: three levels based on the degree of hypoxemia- mild, moderate or severe and the term acute lung injury was omitted, c) positive pressure ventilation: a minimum level of positive end expiratory pressure (PEEP) of $\geq$5 cm H_2O and d) an objective evaluation like echocardiography to rule out cardiogenic/hydrostatic edema[4].

Limitations of the Berlin definition of ARDS: The Berlin definition had critics. The major issues were raised from the low income countries where the researchers realized that the technical devices (for providing the positive pressure ventilation), lab values (including the arterial blood gas analysis), availability of intensive care beds, and the sophisticated measurements that are necessary to define ARDS may not be available in the resource-constrained medical centers. Riviello et al, published a study in 2016, on incidence and outcomes of ARDS in a hospital in the Kigali city of Rwanda and used a modified definition of ARDS (Kigali modification)[7]. In this study, the Kigali modification defined ARDS without the PEEP, as the presence of bilateral opacities on the chest radiograph or lung ultrasound and hypoxia defined as SpO2/FIO2 less than or equal to 315

and concluded that the Berlin definition of ARDS may likely underestimate the impact of ARDS in low-income countries with lack of sufficient resources. The concept of this Kigali modification was to avoid any underestimation of the incidence of ARDS in the low income countries and to estimate the actual incidence of ARDS and not just the treated incidence[7-9]. The study by Riviello et al. 2016, had its limitations too, as being a study coming from a single center in a country of the African continent its generalizability is questionable. The feasibility of this study seems to be good as the required diagnostic tests and the clinical data (chest radiographs/lung ultrasound and SpO2) are routinely available and used by clinicians in hospital settings, even in low-income countries, but nonetheless the use of Kigali modification requires further research for its validation and thus increasing its reliability for its widespread use, especially in the low-income resource-constrained countries thereby making the roles of agencies involved in such dissemination of knowledge extremely important[10-23].

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