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Respiratory distress syndrome: Systematic review

Síndrome de distrés respiratorio: Revisión Sistemática

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Abstract: Respiratory distress syndrome is a prevalent cause of morbidity and mortality, however, patients who survive have sequelae due to lung damage which reduces their quality of life. Objective: to examine the empirical evidence on respiratory distress syndrome. Methodology: A systematic review of articles was carried out in databases such as Pubmed, Scopus, Scielo, Liliacas, using the key words "Respiratory Distress Syndrome, Risk Factors". We searched for articles written in Spanish, published in the last 10 years. Results: the most prevalent factors for developing respiratory distress syndrome are pulmonary clinical causes such as pneumonia, aspiration of gastric contents and thoracic trauma, mechanical ventilation and extrapulmonary causes such as shock, sepsis, severe trauma, blood transfusions, among others, and genetic factors. Conclusion: acute respiratory distress syndrome (ARDS) is a life-threatening lung injury, most people with ARDS are already in the hospital due to trauma or disease.

Keywords ─ Respiratory distress syndrome, related factors, respiratory failure.

Resumen: El Síndrome de Distrés Respiratorio es una causa prevalente de morbimortalidad, sin embargo, los pacientes que sobreviven presentan secuelas por el daño pulmonar el cual disminuye su calidad de vida. Objetivo: Examinar en la evidencia empírica sobre el Síndrome de Distrés Respiratorio. Metodología: Se realizó una revisión sistemática de artículos en bases de datos como Pubmed, Scopus, Scielo, Liliacas, utilizando palabras clave "Síndrome de Distrés Respiratorio, Factores de riesgo". Se buscaron artículos escritos en español, publicados en los últimos 10 años. Resultados: Los factores más prevalentes para desarrollar el síndrome

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de distrés respiratorio son las causas clínicas pulmonares como la neumonía, aspiración de contenido gástrico y el trauma torácico, ventilación mecánica y los extrapulmonares el shock, sepsis, trauma grave, transfusiones sanguíneas, entre otros, siendo y los factores genéticos. Conclusión: El síndrome de dificultad respiratoria aguda (SDRA) es una lesión pulmonar potencialmente mortal, la mayoría de las personas que padecen SDRA ya están en el hospital por un traumatismo o una enfermedad.

Palabras clave ─ Síndrome de distrés respiratorio, factores relacionados, insuficiencia respiratoria.

Introduction

Acute Respiratory Distress Syndrome is a prevalent cause of morbidity and mortality, however, surviving patients remain with lung damage which significantly reduces their quality of life (1). As pointed out by Tomicic 2010 (2), mortality due to respiratory distress is between 31 and 74%. In the European Union, the annual prevalence of ARDS is around 300,000 cases and mortality are around 40% (2). Similarly Erranz, et al. 2015 (3) points out in their study that the most severe form of respiratory failure is RDS.

Acute respiratory distress syndrome (ARDS) in the clinic is characterized by inflammatory and necrotizing processes of the pulmonary alveolus, extending through the systemic circulation to the whole organism resulting in biotrauma, it is also characterized by the involvement of the pulmonary circulation being associated with the occurrence of pulmonary hypertension. It should be noted that the pulmonary circulation and the heart are connected (4).

Pulmonary lesion can be caused by direct damage such as pneumonia, aspiration, or indirect damage such as sepsis, pancreatitis, on the pulmonary parenchyma (5), and causes modifications in the endothelial barrier and at the level of the alveolar epithelium, causing an alteration of alveolar micromechanics (6), which produces a gravitational collapse that causes interstitial edema and alveolar instability secondary to surfactant depletion, protein deposition and presence of detritus on the alveolar surface (7).

There is evidence that mechanical ventilation is a factor that by itself can cause lung damage, depending on the percentage of lung impairment, which causes anisotropic insufflation, out-of-phase alveolar opening and final expiratory collapse, causing lung damage, resulting in an inflammatory response, and developing multiple organ dysfunction (8,9).

Different studies show that mortality related to ARDS can be reduced by mechanical ventilation strategies that avoid excessive stretching of lung tissue (5,6,8,10). In our environment there are few studies and from the social point of view it is important to know the pathology which is influencing mortality and morbidity with a great impact on their quality of life, in addition to affective and emotional repercussions throughout the family circle especially when there is no psychological support to strengthen the multidisciplinary management of the patient. Also, for the health system, knowing the incidence of this disease will help in the optimization and allocation of health resources to establish a timely diagnosis and treatment.

The research is aimed at examining the empirical evidence on respiratory distress syndrome. In relation to the specific objectives: to identify in previous studies on the sociodemographic factors associated with respiratory distress syndrome at international level and to verify in the literature the clinical factors with respiratory distress syndrome.

Methodology

Type of research

A systematic review of the literature was carried out.

Search strategies

The systematic review was carried out by means of search engines: Google Scholar, Scielo, Liliacs. The following keywords related to the objectives were used for the search according to the terms Mesh and DeCs: "Respiratory Distress" "Factors" "Clinical factors", Boolean AND and OR connections were used. Associated to this, observational reports, cross-sectional, retrospective, and prospective studies and cross-sectional, systematic reviews were considered.

Inclusion and exclusion criteria: To select the sample, different inclusion criteria were used: systematic reviews, scientific articles, publications of health institutions and research related to respiratory distress, in the Spanish language, during the period 2010 to 2021. Reviews, duplicate articles, and publications, and that did not have the expected scientific quality were excluded.

Procedure:

In the first stage, the topic was identified, the formulation of the research question in the PICO (Population, Intervention, Control and Disposal) format: ¿what are the sociodemographic and clinical factors associated with Respiratory Distress?

In the second and third stages, the inclusion criteria were determined: Systematic reviews, scientific articles, publications of health institutions and research related to the topic, in Spanish language, and reviews, articles and duplicated publications were excluded, as well as those that did not have the expected scientific quality.

In the fourth and fifth stages, the articles were evaluated according to the objective set.

The sixth stage ended with the discussion and conclusions of the study.

Results

Studies related to the topic respiratory distress syndrome: Systematic Review were identified. The selection process was performed using the PRISMA statement detailed in Figure 1.

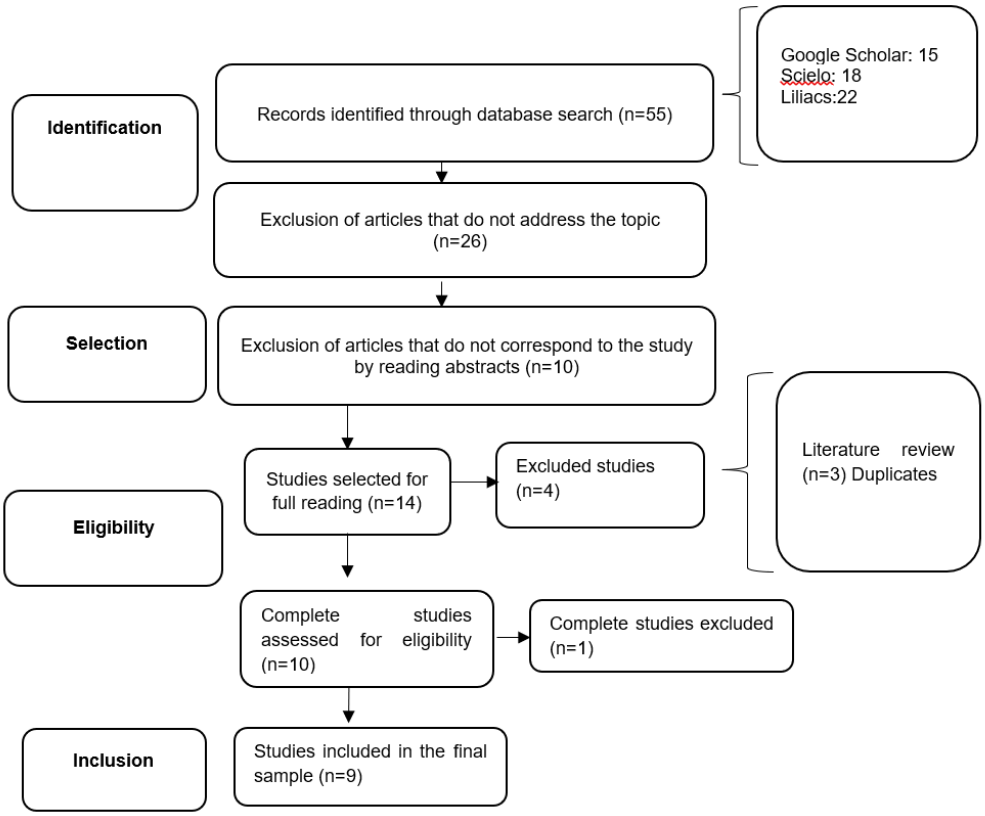

Figure 1. PRISMA Extraction Flow chart for the study
Prepared by authors

Table 1. Characteristics of the selected studies

N°	Base	Magazine	Language	Title	Author and year	Objective	Main results
1	BVS	Medicine	Spanish	Acute Respiratory Distress Syndrome	Estenssoro. 2016. (11)	Defining Acute Respiratory Distress Syndrome	ARDS is a cause of frequent admission to the Intensive Care Unit (ICU) in a percentage of 8% and is a consequence of mechanical ventilation by 18%. Being frisk actors: Pulmonary or direct among them pneumonia, aspiration of gastric contents and chest trauma, mechanical ventilation with pressures or high current volumes which causes an increase in proinflammatory mechanisms. Extrapulmonary or indirect are shock, sepsis, severe trauma, acute brain injury, transfusions, acute pancreatitis, fatty embolism, among others. Pneumonia and shock are the main factors, however, there may be genetic factors, related to a greater intensity of the inflammatory response.
2	Escopus	University Medicine	Spanish	Prevalence of Acute Respiratory Distress Syndrome in a multipurpose pediatric intensive care unit	Gauze, et al. 2012 (12)	To determine the prevalence and mortality of acute respiratory distress syndrome (ARDS) in our intensive care unit.	In the study period, 767 patients were admitted, of which only 4.7% (n=36) met the ARDS criteria, 66.6% (n=24) of the cases were due to direct pulmonary causes and 33.3% (n=12) to indirect causes. An overall mortality of 50% is reported, the age group most affected was the one over one year of age. Most patients were admitted with an oxygenation index, in the range of >15 to <35.

N°	Base	Magazine	Language	Title	Author and year	Objective	Main results
3	Scielo	Camagüey Medical Archive Magazine	Spanish	Incidence and mortality of acute respiratory distress syndrome	Rodriguez, et al. 2015 (13)	To determine the incidence and mortality of acute respiratory distress syndrome in the intensive care unit of the Dr. Eduardo Agramonte Piña Pediatric University Hospital in the city of Camagüey.	In the study period, 4,438 children were admitted, of whom 3.6 % met the diagnostic criteria, 76.6 % of them due to direct pulmonary causes and 23.4 % due to indirect causes. 47.4 % of the patients were admitted with an oxygenation index of less than 15. Overall mortality was 36.7 % and the most affected age group was 7-11 years.
4	Medigraphic	Clinical Journal of the UCR-HSJD School of Medicine	Spanish	Acute Respiratory Distress Syndrome	Salazar, Et al. 2019. (14)	Entender the etiology, seek an accurate description of the pathology and improve the management of such patients.	Acute respiratory syndrome (ARDS) is a form of non-cardiogenic pulmonary edema, due to an alveolar lesion and is diagnosed according to the Berlin definition. It is associated with a mortality of approximately 20-40%. ARDS is characterized by three sequential phases: the exudative, the proliferative and the fibrotic phase. It presents a wide differential diagnosis.
5	UCSG	Repositorio. ucsg.edu.ec	Spanish	Distrés Respiratorio Agudo Syndrome; Sepsis; Cuidados Intensivos.	Becerra. 2015. (15)	To note the prevalence of acute respiratory distress syndrome in patients with septic processes	Of a universe of 43 patients, 26 correspond to the male sex equivalent to 60.5%, 17 to the female sex representing 39.5%. The most affected group in both sexes was between 50 and 65 years old with 61.5% of the cases. We found 26 pathologies associated with sepsis and ARDS, the most representative was nosocomial pneumonia with a prevalence of 29.5%.
6	UCA	Repositorio Institucional Universidad de Cuenca	Spanish	Prevalence of respiratory distress syndrome and associated factors in newborns admitted to the Neonatology Service of the Vicente Corral Moscoso Hospital during 2015	Siguencia.2015 (16).	To establish the prevalence of respiratory distress syndrome and associated factors in newborns during the period 2015 at the Vicente Corral Moscoso Hospital	A found a statistically significant association between respiratory distress syndrome and the following variables: Prematurity less than 37 weeks gestation (p 0.000), weight less than 2500 grams (p 0.001), cesarean delivery (p 0.000), APGAR at one minute less than 7 (p 0.000) and APGAR at 5 minutes less than 5 (p 0.000).
7	Scielo	Medisur	Spanish	Acute respiratory distress syndrome in children	Rodriguez, et al. 2019 (17)	To write and update the evolution of concepts on this syndrome, in particular those relating to the paediatric population.	Respiratory distress syndrome is a pathology with a low incidence, but high mortality. Two clinical forms of ARDS are differentiated: pulmonary and extrapulmonary.

N°	Base	Magazine	Language	Title	Author and year	Objective	Main results
8	Scielo	Revista Uruguaya de Cardiología	Spanish	Postoperative respiratory complications of cardiac surgery in adults	Cáceres, et al. 2020 (18)	To analyze the main respiratory complications in the postoperative scenario of cardiac surgery and the corresponding therapeutic actions.	Acute respiratory distress syndrome is the main cause of severe postoperative respiratory failure, with a mortality of up to 80%. It increases hospital stay and long-term morbidity. There are no patients exempt from the risk of developing it. It is associated with CPB, transfusion of blood products, sudden changes in intravascular volume and pulmonary injury linked to mechanical ventilation. The incidence is variable: depending on the methodology, it is estimated between 0.4%-20%. Its prevalence is higher in severe acute aortic syndromes (AAS) (50%), valve surgery (8.1%), where tricuspid surgery is an independent predictor (OR=5.2) and in emergency surgery.
9	Liliacs	Rev. méd. hered	Spanish	Morbidity and mortality of patients with acute respiratory distress syndrome/ acute pulmonary injury due to Influenza A H1N1 who required cardiopulmonary support in a general hospital.	Zegarra, et al. 2012 (19)	To determine the morbidity and mortality of patients with acute respiratory distress syndrome (ARDS)/ acute pulmonary injury (IPA) due to Influenza A H1N1 who required cardiopulmonary support in a general hospital.	We treated 99 patients with Influenza A H1N1, 9 admitted to the SCIG for ARDS/ IPA; five required invasive mechanical ventilation (IPV), three noninvasive mechanical ventilations, and one did not require ventilatory support. The mean age was 43.3 ± 18.3 years; the time of illness 8 ± 3 days. At admission, 100% had fever and dyspnea, the APACHE II score was 10.5 ± 4.1 and the SOFA 5.6 ± 3.2: the Pa02/Fi02 96.74 ± 28.6. In 4/5 patients in IPV the Pa02/Fi02 at 12 h and at the end of mechanical ventilation was < 200.

Prepared by authors

Discussion

The present work was carried out to identify previous studies on the sociodemographic factors associated with Respiratory Distress at the international level and to verify in the literature the clinical factors associated with respiratory distress syndrome.

According to literature reviews, we found that acute respiratory distress syndrome in terms of sociodemographic factors, as indicated by Garza, et al. 2012 (12) in their study, the age group most affected was the one older than one year. Similarly, Zegarra et al, 2012 (19) in their study in which 99 patients with Influenza A H1N1 participated, of which 9 were admitted for ARDS/PAI; five required invasive mechanical ventilation (IMV), three noninvasive mechanical ventilation. Mean age was 43.3 ± 18.3 years; time of illness 8 ± 3 days. Similarly, Becerra 2015 (15) in his study on acute respiratory distress syndrome in a population of 43 patients, was able to determine according to sociodemographic variables that 26 were male being 60.5%, followed by 39.5% female. The most affected age group was between 50 and 65 years with 61.5% of the cases. There were 26 pathologies associated with sepsis and ARDS, the most representative being nosocomial pneumonia with a prevalence of 29.5%.

With the aim of identifying clinical factors with respiratory distress syndrome. Authors agree that the most prevalent factors are pulmonary and extrapulmonary factors (12,13,14,17). As determined by Estenssoro. 2016 (11) that ARDS is a cause of admission to the Intensive Care Unit in a percentage of 8%, being pulmonary or direct risk factors such as pneumonia, aspiration of gastric contents and thoracic trauma, mechanical ventilation and extrapulmonary or indirect how shock, sepsis, severe trauma, acute brain injury, transfusions, acute pancreatitis, fat embolism, among others, being pneumonia and shock the main factors, and there may be genetic factors related to a greater intensity of the inflammatory response.

Linked to this Siguencia 2015 (16). In his study on the prevalence of respiratory distress syndrome and associated factors in newborns, he points out that there is a statistically significant association between respiratory distress syndrome and the variables prematurity of less than 37 weeks of gestation, weight less than 2500 grams, delivery, cesarean section, APGAR at one minute less than 7 and at 5 minutes less than 5. On the other hand, Cáceres, et al 2020 (18) in their study indicate that acute respiratory distress syndrome is the main cause of severe postoperative respiratory failure, with a mortality rate of up to 80%.

Conclusions

According to the data obtained in the study it can be concluded that: respiratory distress syndrome can occur in people who have some serious pathology or important injuries at pulmonary level such as pneumonia, aspiration of gastric contents and thoracic trauma, mechanical ventilation. Many people who develop ARDS do not survive. The risk of death increases with age and severity of the disease, leaving permanent sequelae in the lungs. Most people who develop ARDS are already hospitalized for another condition, and many are critically ill. You are especially at risk if you have a widespread bloodstream infection such as sepsis.

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