Effects of oxygenotherapy in neonatology: integrating literature review

Efeitos da oxigenoterapia em neonatologia: revisão integrativa de literatura

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RESUMO

Objetivo: Buscar evidências na literatura sobre os efeitos da utilização de oxigenoterapia em neonatologia. Método: Revisão integrativa realizada em janeiro de 2017, com busca nas bases de dados: Pubmed, Lilacs, Scielo e Web of Science. Resultados: Identificaram-se dezesseis artigos e, após análise, emergiram duas categorias: Patologias relacionadas ao uso da oxigenoterapia em neonatologia e fatores de risco associados ao uso de oxigênio no período neonatal. Conclusão: O uso do oxigênio em neonatos apresenta-se como um paradoxo, caracterizado por um lado, pelo seu efeito lesivo, e por outro, pelo reconhecimento de seu papel indispensável na correção da hipóxia. Quanto mais longo o tempo em oxigenoterapia, em todas as suas formas, e maior a fração de oxigênio inspirado, maiores são as chances para o desenvolvimento de problemas nos recém-natos. Há necessidade de maior envolvimento dos profissionais no manejo do oxigênio, bem como de ampliar a produção de conhecimento nessa área de modo a subsidiar a prática baseada em evidências.

Descritores: Recém-nascido; Oxigenoterapia; Neonatologia; Oxigênio.

ABSTRACT

Objective: To search for evidence in the literature about the effects of oxygen therapy in neonatology. Method: Integrative review conducted in January 2017, with search in databases: PubMed, Lilacs, Scielo and Web of Science. Results: Sixteen articles were identified and, after analysis, two categories emerged: Pathologies related to the use of oxygen therapy in neonatology and risk factors associated with the use of oxygen in the neonatal period. Conclusion: The use of oxygen in newborns presents a paradox, characterized by its harmful effect and by the recognition of its indispensable role in the correction of hypoxia. The longer the time in oxygen therapy, in all its forms, and the greater the fraction of inspired oxygen, the greater the chances for the development of problems in newborns. There is a need for greater involvement of professionals in oxygen management, as well as to increase the production of knowledge in this area in order to subsidize the practice based on evidence.

Keywords: Newborn; Oxygen therapy; Neonatology; Oxygen.

NOTA

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INTRODUCTION

Oxygen therapy consists of the therapeutic and supplemental administration of oxygen (O2) in a concentration above atmospheric, in order to repair its deficiency and facilitate the exchange of gases in the lung. Its use has been widely known since 1920 and has been implemented in clinical practice since the 1940s[1-2].

In the Neonatal Intensive Care Units (NICU), one of the main care is the prevention of sudden changes in the amount of O2. The majority of newborns (NB) admitted to an NICU require some form of oxygen therapy, which generates concerns regarding these patients, regarding the repercussions caused by the use of O2, which, like any other medication, requires a attention to prescription, administration, duration and monitoring[1].

The literature points to several benefits regarding the use of oxygen therapy in newborns, such as: providing tissues with appropriate oxygenation and carbon dioxide removal in an effective and safe way; reduction of lung disorders; and prevention of hypoxemic episodes, which may result in increased morbidity, cardiorespiratory instability, neurological sequelae and impairment in child development and growth[3] .

However, the prolonged and indiscriminate use of O2 may be iatrogenic to the RN and cause damage to cellular structures, brain, lung, eye, and even death[1,4].

Due to this paradox regarding the use of O2, and considering its importance in the survival of neonates, as well as the risks related to the management of this therapy, it is reiterated the need to raise grounds on the subject, with a view to subsidizing the clinical practice of professionals based on scientific evidence.

In view of these aspects, it was decided to seek evidence in the literature on the effects of the use of oxygen therapy in neonatology.

METHOD

In order to carry out this study, we opted for an integrative literature review, a methodology that provides a comprehensive understanding of subjects relevant to health care, through the summarization of the theme from several data sources. In the present study, the five stages were covered[5].

In the first stage, the indiscriminate use of oxygen therapy in neonates was identified as a research problem. A priori the following guiding question was formulated: *"What scientific evidence is available about the use of oxygen therapy in neonatology in recent years?"*

In the second stage, the online search of the literature of interest, by January 2017, was carried out through access to databases: Pubmed, Latin American and Caribbean Literature in Health Sciences (LILACS), Scientific Electronic Library Online (SCIELO) and Web of Science, using the following descriptors in Health Sciences (DeCs): "oxygen", "oxygen" and "neonatology" combined with the Boolean operators: "AND", in order to provide the and thus to show only articles containing the descriptors listed, as well as the "OR" operator, so that the database provided the list of articles that contained at least one of the descriptors, enlarging and specifying the search result.

The following articles were included in the sample: articles published in Portuguese, English and Spanish, with their abstracts published in the selected databases, in the period between 2006 and 2016; whose methodology allowed to obtain scientific evidence about this therapy, namely: randomized controlled clinical trials, or studies with a near experimental design; articles that portrayed procedures, interventions or guidelines for the use of oxygen therapy, benefits and adverse effects, and that contributed to answer the guiding question. Studies of type literature review or systematic, letters and editorials were excluded.

For the selection of the articles, all the titles and abstracts were read, being selected those that had relation with the proposed objective. Next, they were elected to read in full, only those that were related to the subject under study. The bibliographic search allowed the identification of 30 publications, of which 16 were included in the review. This entire selection process is represented in the following flowchart (Figure 1).

In the third stage of sample evaluation, the studies were classified according to the level of evidence[7]. In addition, a tool was developed to obtain the following information: database, title, authors and year of publication, objective, main results and recommendations / conclusions, to be applied to articles selected for this study.

In the fourth phase, the included articles were analyzed according to the methodological framework initially proposed, which consists in extracting the data from the primary sources in relation to the characteristics of the study; a posteriori the extracted data are coded and compared item by item so that the similar data are organized in a manageable structure, being thus categorized and grouped[5].

Therefore, from the analysis of the selected studies, we identified the main results, from which emerged the following categories: complications after O2 use and risk factors associated with O2 use. The last step was made from the interpretation of results and discussion, in order to synthesize the main findings of this integrative review process.

RESULTS

Initially, a total of 30 articles were identified. Two studies showed duplicity in the studied databases. All abstracts

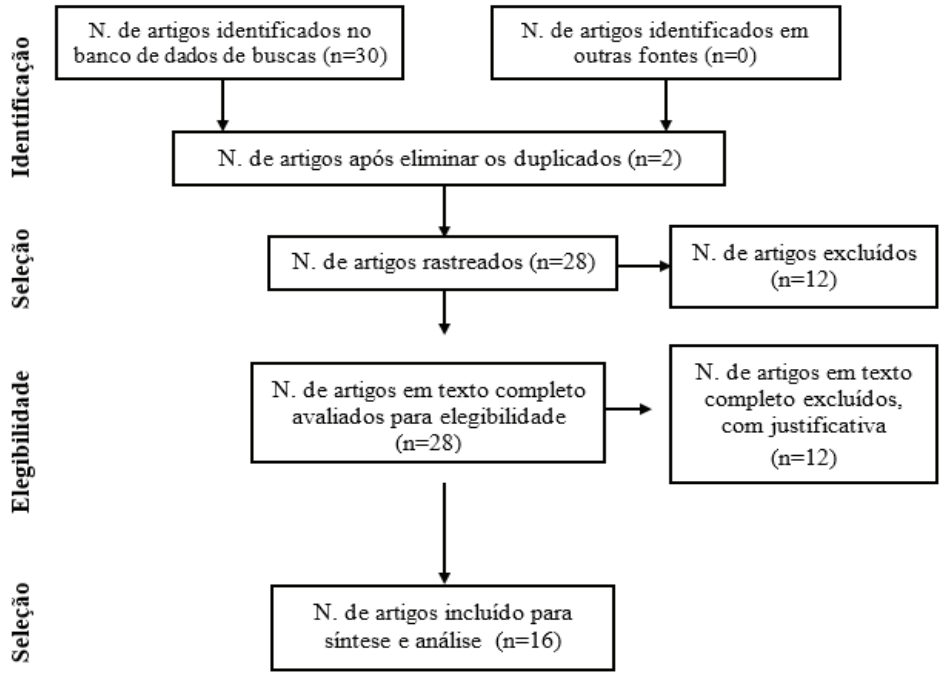

FIGURE 1 – Sample selection flowchart for the integrative literature review, prepared from GuidelinePRISMA (6). Guarapuava, 2017. Source: author.

were read and 12 articles were discarded because they did not meet the objective proposed in the research. The sample universe of the study was composed of 16 full text articles, which are characterized according to Table 1.

The period of publication of the articles comprised the years 2006 to 2015. Of these, seven were published in national journals and nine in international journals, two in Cuba and one in each of the following countries: Mexico, Argentina, Italy, Chile, Australia, Holland and Taiwan. Regarding the methodology, all the articles presented a quantitative approach, in the evaluation of the level of evidence, fourteen studies of the sample, presented level V, one was classified as level IV and one evaluated as level III.

The evidence points to the development of pathologies related to the use of oxygen therapy in neonatology, such as: BPD [8,9]; RP [10,11,12,13,14]; SDR [14, 15, 16]. In addition, the evidence also points to some risk factors[1,2,3,4,5,6,7] for the development of complications related to the use of O2 in neonatology.

DISCUSSION

Pathologies related to the use of oxygen therapy in neonatology

Some articles related the development of BPD, RP and SDR to the use of oxygen therapy in neonatology.

DBP is one of the major causes of morbidity in neonates who were born premature and underwent oxygen therapy (16). It is a multifactor disease, of great relevance and related to the immature lung, and this risk should be considered in any neonate that remains O2-dependent at concentrations above 21% for a period greater than or equal to 28 days[17,18].

Authors point to a greater probability of acquiring the condition, the lower the gestational age, which is dependent on a greater number of days in oxygen therapy, either through a catheter or tent, or in MV and non-invasive mechanical ventilation (NIV)[8,9].

The occurrence of BPD was present in 3 (three) articles (8,9). In a study that included 323 newborns, 7.6% developed this pathology, and the use of ventilatory assistance was significantly higher in those infants who developed than in those who did not develop BPD. The study concluded that BPD is associated with longer use of invasive MV, NIV and O2[8].

In another study, DBP occurred in 17.4% of 163 newborns and was related to: lower birth weight and lower gestational age, use of antibiotic therapy, parenteral nutrition and also MV, high values of inspired fraction of O2 (FiO2), early and prolonged MV, lower volume of enteral nutrition and weight gain[9].

According to the National Institute of Child Health and Human Development (NICHD), patients considered to be bronchodisplastic are more likely to develop respiratory infections in late childhood and adulthood, such

TABLE 1 – Main characteristics of selected studies for integrative review. Guarapuava, 2017. Source: author.

Article title Authors / year	Main Results	Recommendations/Conclusions
Inhaled oxygen therapy in pediatric patients admitted to a university hospital Camargo et al (2008)	Of 97 children, 62 (64%) received O2. Indications: pneumonia (52), asthma (5), bronchiolitis (4) tracheomalacia (1). Time of administration was 6 days, nasal catheter used in 94%.	Inhaled oxygen therapy was more frequent in younger children and with pneumonia, being the indication compatible with international criteria. The nasal catheter was safe.
Influence of maternal and neonatal factors on the development of bronchopulmonary dysplasia Lima et al (2011)	7.6% of newborns developed Pulmonary Bronchopulmonary Dysplasia (BPD), the mean number of days in the use of Non-Invasive Mechanical Ventilation (NIV) and O2 was 17.6, 16.2 and 46.1, respectively.	The occurrence of the Persistence of the Arterial Channel (PCA) and BPD are associated to the longer time of use of MV, NIMV and oxygen therapy.
Fatores associados à DBP prematuros sob ventilação mecânica precoce Duarte; Coutinho (2012)	A DBP ocorreu em 17,4% e relacionou-se à: menor peso ao nascer (PN), menor idade gestacional (IG), Apgar<7 no 1° e 5° minutos, maior tempo sob antibioticoterapia, nutrição parenteral e VM, valores elevados de FiO2, VM e baixo ganho ponderal.	A ocorrência da DBP foi baixa e relacionada ao manejo clínico, nutricional e VM precoce e prolongada. Exceto a FiO2 média, não foi encontrada relação entre a DBP e os demais parâmetros ventilatórios.
Estudo da retinopatia da prematuridade em um hospital universitário Tomé et al (2011)	De 148 pacientes, 66 (44,6%) desenvolveram RP; fatores de risco para o desenvolvimento foram: peso ao nascimento, IG, VM, transfusão sanguínea e PCA.	Encontrou-se uma elevada prevalência da RP. O desenvolvimento foi inversamente proporcional ao PN e à IG.
Retinopatia del prematuro y estrés oxidativo Cervantes, et al (2006)	A incidência de Retinopatia da Prematuridade (RP) foi de 22% (11/50). Os valores medidos apresentaram uma significativa diferença entre crianças que desenvolveram e as que não desenvolveram a doença.	Existe uma associação entre altos níveis séricos de lipoperóxido, estresse oxidativo, e incidência de RP.
Impacto del síndrome de dificultad respiratoria em RN de muy bajo peso de nacimiento: estúdiomulticêntrico sudamericano Fehlmann, et al (2010)	O principal fator de risco para a Síndrome do Desconforto Respiratório (SDR) foi a IG. Uso de corticóide no pré-natal e sexo feminino foram fatores protetores. No grupo com SDR o uso de surfactante, VM, mais dias sob O2 e dias de hospitalização foram maiores do que no grupo que não desenvolveu SDR.	A SDR teve uma alta incidência e mortalidade em RN de muito baixo peso, aumento no risco de morbidades e uso de variados recursos.
Fatores associados ao atraso do desenvolvimento motor de crianças prematuras internadas em unidade de neonatologia Araújo; Eickman; Coutinho (2013)	A média de IG foi de 37 semanas e 39,8% dos RN apresentaram desenvolvimento motor alterado. Fatores associados: menor PN; ocorrência de hipóxia e DBP; maior tempo de permanência na UTIN, uso de O2 e VM prolongadas.	Prematuros podem apresentar atraso no desenvolvimento motor, de forma grave ou limítrofe. PN, morbidades neonatais e assistência recebida foram os fatores que mais influenciaram o desfecho.
Caracterización de factores clínico-epidemiológicos em La retinopatia del prematuro Campos et al., (2009)	Fatores de maior risco para RP: sexo masculino, IG abaixo de 31,6 semanas, PN menor que 1499g, VM ou dependência de O2 por mais de 96 horas, doenças respiratórias e sepse.	A RP é uma entidade complexa e sua causa é provavelmente multifatorial.
Use of erythropoietin is associated with threshold retinopathy of prematurity in preterm ELBW neonates: a retrospective, cohort study from two large tertiary NICUs in Italy Manzoni, et al., (2014)	A RP ocorreu em 26,9% (29/108) dos RN de extremo baixo peso que receberam terapia com eritropoitina, comparado com 13,5% (12/89) que não receberam.	O uso de eritropoetina é um preditor adicional de RP em RN de extremo baixo peso.
High-flow nasal cannula in infants: experience in a critical patient unit Wegner et al., (2015)	Of 109 RNs surveyed, 56% presented interstitial infiltrate, 53.2% had bronchiolitis; 70.6% responded to the cannula.	There were no reported complications and the use of this device was considered safe.
Frequency of retinopathy of prematurity in NB in the Hospital das Clínicas of the Medical School of Ribeirão Preto Shinsato et al., (2010)	The frequency of RP was 35.71% and the risk factors for the disease were: weight, GI, SNAPPE II score, use of O2 by intubation and positive pressure, transfusions and use of diuretics.	More premature children have more severe forms of PR.
Higher Rates of Retinopathy of Prematurity after Increasing Oxygen Saturation Targets for Very Preterm Infants: Experience in a Single Center Manley et al., (2015)	O2 saturation of premature newborns increases survival, but increases PR, changing from 88% -92% to 91% -95% was associated with RP.	The shift to greater O2 saturation in preterm infants was associated with an increase in the rate and severity of PR, especially among premature infants.

Incidence and severity of retinopathy of prematurity and its association with morbidity and treatments instituted at the Hospital Universitário Antonio Pedro between 2003 and 2005 Schumann; Barbosa; Jack (2010)	53.4% presented PR. IG, PN and the longer time in O2 were associated with the occurrence and severity of RP. More advanced degrees were associated with elevated FiO2 values.	Although the characteristics of RP in PTNBs partly explained its influence on the genesis of the disease, blood transfusions were associated with a high chance of occurrence of RP.
Nationwide Inventory of Risk Factors for Retinopathy of Prematurity in the Netherlands Van Sorge et al., (2014)	Of 1380 children developed RP 21.9%, the mean GI was 29.8 weeks and the mean PN was 1260g. Risk factors for RP: nitric oxide inhalation (iNO), permanence in NICU> 28 days and MV> 7 days.	In addition to the established risk factors (GI, PN, NICU> 28 days, and artificial ventilation> 7 days), iNO treatment as a risk factor for RP was a finding. Antenatal corticosteroids and female sex showed a lower incidence for PR.
Retinopathy of prematurity in southern Taiwan: A 10-year tertiary medical center study Li et al., (2013)	Of 503 RN, 37.8% had PR. Low weight and lower IG were risk factors. Of the 67 with extreme low weight, 70.7% had PR. SDR, PCA, surfactant use, sepsis, upper gastrointestinal bleeding, transfusion, necrotizing enterocolitis were associated with RP.	Low birth weight is the highest risk for PR. RNs with extremely low weight were at high risk for advanced RP. Sequela do RP advanced: myopia and anisometropia.
Retinopathy of prematurity Quiñones et al., (2015)	Of 89 RN, 20.2%, presented RP and 72.2% were born before 32 weeks of gestation; the PN varied between 1000 and 1500 g, predominantly male. 66.6% RN with less than 1000 g presented RP. 88.2% received VM.	The most frequent conditions related to prematurity were PR and RDS and infections.

as pneumonia and bronchiolitis[18]. In addition, they may present greater occurrence of hospitalizations, developmental / growth-weight growth and neuropsychomotor development[18]. Findings in the literature relate the deleterious effects of O2 in the lungs potentiated by prolonged use of MV, following the evolution of BPD[19].

In addition to BPD, another risk evidenced in the analyzed articles correlates PR with a greater number of days in oxygen therapy, due to the high levels of oxidative stress[11,13,20,10]. PR is a prophylactic vase pathology of ischemic origin, which occurs in children born before complete retinal vascularization, which begins at 16 weeks of gestation and ends at the end of gestation[21].

Of the articles analyzed in this study, 07 presented considerable incidence in the development of RP in NB under oxygen therapy. When studying 73 newborns, the frequency was 53.4%[13]. In a study that included 148 RNs, 44.6% developed PR[22]. Of a total of 503, PR was identified in 37.8% of respondents[14]. In another study, with 1380 children, 21.9% presented pathology [23]. In 70 newborns studied, 35.71% developed the condition[24]. The disease occurred in 26.9% of 108 newborns[11]. Another study included 89 NB, of which 20.2% had disease in the retina[20].

Exposure of the child's retina to an environment of hyperoxia induces the formation of arteriovenous shunts at the border of the vascular and avascular zones, leading to the formation of fibrovascular membranes, which in turn entails a complete or partial displacement of the retina[20].

The shift to greater O2 saturation in preterm infants was associated with an increase in the rate and severity of PR, especially among premature infants[12].

Considered to be the greatest cause of childhood blindness in Latin America, evidence indicates that more advanced degrees of RP are associated with higher mean FiO2 values. In addition, longer mean oxygen therapy time was associated with greater occurrence and severity of RP. Adverse effects are associated not only with duration of exposure to O2, but also with partial pressure[13].

A study carried out in Mexico identified an association between high serum levels of lipoperoxide, estress-oxidativo and the incidence of RP. The measured values of all samples showed a significant difference between children who developed the disease and those who did not. Lipoperoxide and oxidative stress are related to the excessive production of free radicals or a decrease in the elimination capacity, which leads to a damaging interaction with the cell membrane, in the case of the retina[10].

A SDR também foi encontrada como uma das complicações que tem como fator de risco o uso de O2. É uma patologia caracterizada pela deficiência de surfactante que leva ao colapso dos alvéolos de forma progressiva, ocorrendo como consequência de um aumento da necessidade de O2 e estresse respiratório[25].

A study that aimed to analyze the incidence, risk factors, morbidity and mortality of very low birth weight infants with RDS, included 5991 children and detected a very high incidence of aggravation, of 74% (15). The main risk factor was the low gestational age. Use of prenatal corticosteroids, female sex, and premature rupture of the placenta were considered protective factors. Use of surfactant, MV, more days under O2 and hospitalization was higher among infants who developed RDS[15].

Risk factors associated with the use of oxygen in the neonatal period

The articles that addressed risk factors associated

with the use of O2 in neonatology, contributing to the occurrence of pathologies such as those presented previously, showed the following findings:

Male sex[26,27,20]; low birth weight[9,19,22,23,27,24,20]; prematurity[27, 24, 23, 20, 19, 22]; prolonged MV use (9,19,24,23); prolonged stay in NICUs[23,19,28,27]; presence of respiratory complications[26,28] and / or cardiac cause such as patent ductus arteriosus[22,24,14]; multiple blood transfusions[13, 22, 14, 24].

After analyzing the results, it was possible to verify that scientific publications about the use of oxygen therapy in neonatology indicate that, despite the benefits that justify the use of this therapy, there are risks associated with this practice, with potential complications to the newborn.

The articles included in this study show convergent results regarding the deleterious effects of oxygen therapy, both in inhalational form and in the form of MV and NIV.

It is known that the higher the FiO2, the greater the contact with O2 and, therefore, the greater the chance of oxidative stress. The occurrence of hyperoxia, in turn, increases the chances of developing BPD. In addition, an O2 partial pressure in the arterial blood (PaO2) above 80 mmHg increases in 3.42 times the chance of RN to develop the disease[8]. The literature states that there is a reduction in the incidence and severity of BPD when using initial FIO2 in the delivery room, below 40% in NIV concomitantly with early use of surfactant and amino acids[29].

In addition to BPD, another risk evidenced in the analyzed articles correlates PR with a greater number of days in oxygen therapy due to the high levels of oxidative stress[11, 13, 20, 10].

In a study conducted in Cuba, 85% of newborns who received O2 for more than four days developed RP. It also showed that 88.2% of the newborns received O2 through ventilation with intermittent positive pressure (IPPV), and those who received O2 by the incubator and NIV (CPAP), the occurrence was 5.9% and 5.9%, the which demonstrates an association between administration of O2 and the development of RP[20]. Another study carried out in São Paulo showed a significant correlation between the appearance of ROP and birth weight below 1,500 g[30]. These conclusions are in agreement with the findings of this review, which showed that low birth weight (<2500gr) may be a risk factor associated with the use of oxygen therapy.

Um estudo realizado em um hospital público do Maranhão mostrou que a maioria dos RN com baixo peso ao nascer (BPN) era do sexo masculino. RN com BPN, peso de nascimento inferior a 2500gr, apresentam como fatores principais para essa condição a restrição de crescimento intrauterino (RCIU) e a prematuridade, resultando em um problema de saúde pública com prejuízo ao desenvolvimento infantil[31].

Corroborating with the results found in the analysis, other studies confirm that the male gender is indicated as a risk factor for complications related to O2 use, as there is evidence in the literature that indicate that the process of pulmonary maturity is slower among male NB , due to the influences of the Y chromosome. Thus, it is necessary to institute preventive measures when treating male babies, considering the condition of fragility/vulnerability already acquired at conception[32].

Regarding LBW, this is considered a major nutritional risk factor. Malnutrition in the newborn overwhelms the functions of maturation, growth and pulmonary repair, potentializing the toxicity of O2 to the lung. This injured lung will need more and more help from the MV, which increases the risks of dysplasia, as has already been said[33].

The greater the number of days in oxygen therapy, in all its forms, and the greater the FiO2, the greater the chances of developing RDS. This confirms the prediction found in the literature, since the evidence indicates that FiO2 is a potential risk factor for the health of the newborns[9,13,12].

The data analyzed indicate that the greater the number of days in supplemental oxygen, the lower gestational age and the lower birth weight, the greater the risk of developing some complication[20,11]. It is therefore recognized that this child is more vulnerable, especially in the first months of life, and the lower the weight and the GI, the greater the likelihood of morbidity occurring, especially potentiated by unfavorable therapeutic environments[34]. This indicates the need for specialized and specific care to this population, always considering their specificities and fragilities, thus preventing, the morbimortality of this clientele.

Corroborating the above, a study was published in 2017 that indicates that the development of BPD is uncertain, but it is known that it is directly related to the long stay in NICU associated to the long stay in MV. In addition, its incidence is inversely related to gestational age at birth, due to the structural and physiological immaturity of the lung. In addition, it is pointed out that male babies are more likely to develop BDP, and that the persistence of ductus arteriosus, sepsis and necrotizing enterocolitis exacerbate the occurrence of BDP[17].

The findings of this study are in line with another study, evidencing the risks of multiple transfusions, because when evaluating transfused and non-transfused NB, the results indicated that in the transfused group, there was a statistically significant association between a greater number of transfusions and the incidence of BPD. Such a relationship contributes to increased oxidative stress caused by the increase of iron not bound

to transferrin or by inflammatory mediators present in anticoagulants and blood preservatives[34].

Even in the face of multicausal factors, it is noteworthy in this review that oxygen therapy with or without MV or NIV was the risk factor most evidenced to the occurrence of complications related to prematurity and neonatal hospitalization[22, 10, 27, 28, 24 , 12, 13, 23, 20].

The data found in this study that pointed to FiO2 and MV as risks to the development of complications, suggest that in addition to knowledge about the indication of O2 use in NB, health professionals should still be able to handle mechanical ventilators, since poorly established parameters may harm the health of newborns.

To reaffirm the risk of using oxygen therapy and prolonged MV, a study concluded that these had a significant tendency for impaired motor development during the development of children[35].

Two studies have emphasized the nasal catheter and the high-flow nasal cannula as a safe device for administration of O2 in newborns (26,28). Despite technological innovations, the choice of the device is not always correct, subjecting the RN to high O2 and/or inadequate devices for their clinical situation, reducing the effect of oxygen therapy, prolonging the treatment and allowing the occurrence of complications[33].

Despite the risks inherent in the use of oxygen therapy in newborns, it should be used safely and effectively, provided there is indication, maintenance, systematization of routines by health institutions. The installation of modern NICUs with human resources and technologies of medium and high complexity was one of the decisive factors in the reduction of neonatal mortality[36]. However, such resources must be used in a rational and responsible manner by the professionals involved in the care of the newborn..

The evaluation of the need for installation, maintenance and choice of the best device are extremely important behaviors within NICUs, which health professionals must provide the most profound competence.

The need for O2 is made through arterial blood gas analysis, pulse oximetry and observation of clinical signs. These procedures avoid unnecessary administration or high concentrations of O2, which could cause toxic effects.

Implications for clinical practice and professional performance

In view of the above, there is a need for greater involvement of professionals in oxygen management, as well as the expansion of knowledge production in this area in order to subsidize evidence-based practice.

More specifically, the implications for clinical practice and professional performance in the neonatal context also include the establishment of protocols based on scientific evidence for all patients of the NICU, especially for the population that present greater risks for the development of complications related to the use of oxygen in the NICU. Therefore, neonatal males, low birth weight, prematurity, prolonged MV use, prolonged NICU stay, presence of respiratory complications, and/or cardiac cause such as persistent ductus arteriosus, multiple blood transfusions should be monitored more frequently with indicators for monitoring the risks to oxygen management.

In addition, it is essential to develop actions that aim to remove the neonate from invasive ventilation as fast as clinically possible, with the use of non-invasive ventilation if indicated, avoiding prolonged use in mechanical ventilation. In addition, to monitor arterial oxygenation through gasometry and pulse oximetry, with alarm limits set for the SpO2 goal agreed in the institution specific for preterm neonates, especially the extremes, in order to avoid high FiO2 values. And the strengthening of actions for the use of antenatal corticosteroids, for fetal lung maturation

CONCLUSION

The present review allowed to point out the scientific evidence available on the use of oxygen therapy in neonatology.

O2 is a drug, banal and undue use has iatrogenic effects, especially for preterm infants. The most expressive data demonstrated the main complications such as: DBP, PR and RDS, besides evidencing risk factors associated to the use of O2 in the neonatal period.

However, use is indispensable in the correction of hypoxia and, therefore, health professionals must maintain absolute caution, especially when the newborn presents risk factors for the development of pathologies, such as those presented in this review.

Health professionals should be aware of the risks so that they are minimized and avoided. From the results of this study the professionals can elaborate strategies based on the risk factors evidenced by the literature, aiming at the prevention of complications in the use of O2 in the neonatal context.

The study evidenced that the research on the Brazilian reality is still limited, as well as pointed out the existence of care gaps involving safe oxygen therapy in neonatology, especially in premature infants. It is necessary that future investigations be implemented, with a view to the accuracy of limits, indications and a better understanding of strategies aimed at the prevention of complications, optimizing the rational and adequate use of this therapeutic resource.

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