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Case Report

ACUTE LUNG OEDEMA IN SEVERE PRE-ECLAMPSIA: ADVANCED MANAGEMENT AND ANESTHETIC INTERVENTIONS

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ABSTRACT

Introduction: Acute Lung Oedema (ALO) during pregnancy is an uncommon but potentially life-threatening condition, particularly when associated with severe pre-eclampsia. This critical obstetric emergency requires prompt recognition and comprehensive management to prevent adverse maternal and fetal outcomes. **Objective:** This report aims to highlights the management of a complex case of ALO in a pregnant patient with severe pre-eclampsia, underscoring the essential role of multidisciplinary collaboration, evidence-based protocols, and individualized care in achieving favorable outcomes. **Case Report:** A 30-year-old woman at 29–30 weeks gestation presented with significantly reduced consciousness and severe shortness of breath. Clinical examination revealed hypertension, tachycardia, and profound hypoxemia, with radiological evidence of pulmonary oedema. The diagnosis included severe-feature pre-eclampsia complicated by acute respiratory distress syndrome (ARDS) secondary to ALO. Endotracheal intubation was used to protect the mother's airway, mechanical ventilation was used to help her get enough oxygen, and her blood pressure and heart rate were stabilized right away. Fluid therapy was carefully monitored to avoid exacerbating pulmonary oedema. Obstetric management prioritized delaying delivery until maternal stabilization was achieved. A surgical intervention under general anesthesia resulted in the delivery of a moderately distressed neonate. Postoperative care in the intensive care unit included continued mechanical ventilation, sedation, and meticulous fluid management. Gradual stabilization allowed for successful weaning off ventilatory support, extubation, and transfer to a general hospital ward. **Discussion:** Management strategies were guided by the ABCDE principle, targeting reductions in left ventricular preload and afterload, adequate oxygenation, and infection prevention. The case emphasizes the value of early diagnosis, prompt intervention, and interdisciplinary collaboration involving obstetricians, intensivists, and anesthetists. **Conclusion:** This case illustrates the importance of early recognition, swift intervention, and tailored care in managing ALO associated with severe pre-eclampsia. Comprehensive, team-based approaches are critical for optimizing maternal and neonatal outcomes in such high-risk scenarios.

Keywords: Acute Lung Oedema, Acute Respiratory Distress Syndrome, Intensive Care Unit, Obstetric Intensive Care, Severe Pre-eclampsia

ABSTRAK

Pendahuluan: Edema Paru Akut (ALO) selama kehamilan merupakan kondisi yang jarang terjadi namun berpotensi mengancam jiwa, terutama jika dikaitkan dengan pre-eklampsia berat. Kegawatdaruratan obstetri yang kritis ini membutuhkan pengenalan yang cepat dan manajemen yang komprehensif untuk mencegah hasil yang merugikan bagi ibu dan janin. **Tujuan:** Laporan ini bertujuan untuk menyoroti manajemen kasus ALO yang kompleks pada pasien hamil dengan preeklampsia berat, menggarisbawahi peran penting kolaborasi multidisiplin, protokol berbasis bukti, dan perawatan individual dalam mencapai hasil yang baik. **Laporan Kasus:** Seorang wanita berusia 30 tahun dengan usia kehamilan 29-30 minggu datang dengan penurunan kesadaran dan sesak napas yang parah. Pemeriksaan klinis menunjukkan adanya hipertensi, takikardia, dan hipoksemia berat, dengan bukti radiologis adanya edema paru. Pasien di diagnosis dengan pre-eklampsia berat dengan Sindrom Gangguan Pernafasan Akut (ARDS) yang disebabkan oleh ALO. Penanganan segera dilakukan dengan intubasi endotrakeal untuk perlindungan jalan napas, ventilasi mekanis untuk mendukung oksigenasi, dan intervensi untuk menstabilkan hemodinamik ibu. Terapi cairan dipantau dengan hati-hati untuk menghindari memperburuk edema paru. Manajemen kebidanan diprioritaskan untuk menunda persalinan sampai stabilisasi ibu tercapai. Intervensi bedah dengan anestesi umum menyebabkan kelahiran neonatus dengan gawat janin sedang.

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Perawatan pasca operasi di ruang perawatan intensif termasuk ventilasi mekanis yang berkelanjutan, sedasi, dan manajemen cairan yang cermat. Stabilisasi bertahap memungkinkan penyapihan dukungan ventilasi, ekstubasi, dan pemindahan ke bangsal rawatan biasa. **Diskusi:** Strategi penatalaksanaan dipandu oleh prinsip ABCDE, yang menargetkan pengurangan preload dan afterload ventrikel kiri, oksigenasi yang memadai, dan pencegahan infeksi. Kasus ini menekankan pentingnya diagnosis dini, intervensi yang cepat, dan kolaborasi interdisipliner yang melibatkan dokter kandungan, dokter intensif, dan dokter anestesi. **Kesimpulan:** Kasus ini menggambarkan pentingnya pengenalan dini, intervensi cepat, dan perawatan yang disesuaikan dalam menangani ALO yang terkait dengan preeklampsia berat. Pendekatan komprehensif berbasis tim sangat penting untuk mengoptimalkan hasil maternal dan neonatal dalam skenario berisiko tinggi seperti ini.

Kata kunci: Edema Paru Akut, Perawatan Intensif Kebidanan, Preeklampsia Berat, Sindrom Kesulitan Pernapasan Akut, Unit Perawatan Intensif

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INTRODUCTION

Acute lung oedema (ALO) in pregnancy is a rare but life-threatening condition with high maternal and perinatal morbidity and mortality and is one of the complications of pre-eclampsia with an incidence ranging from 0.08% to 1.5% (1,2) The definitive treatment for pre-eclampsia is delivery (3). We report a case of severe pre-eclampsia complicated by pulmonary edema, in which delivery was delayed for maternal stabilization before a caesarean section under general anesthesia was performed.

The objective of this case report is to discuss the management of ALO in pregnancy complicated by severe pre-eclampsia, highlighting how important it is to use evidence-based multidisciplinary approaches to improve outcomes for both the mother and the baby.

CASE REPORT

A 30-year-old pregnant female with a decrease in consciousness for the past hour was referred to the anesthesiology department due to termination of pregnancy. The patient complained of severe shortness of breath, followed by a gradual decline in consciousness, and was unresponsive when examined. The patient was on her 7th pregnancy of 29–30 gestational weeks, had a bad obstetric history due to 5 abortions, and had no children. The fetal movement was within normal limits with a fetal heart rate of 158 bpm. The patient had a history of hypertension for the past week and has been taking methyldopa 3 x 500 mg and nifedipine 3 x 10 mg. History of other problems was denied.

Figure 1. Chest X-ray

The physical examination revealed consciousness was stupor (GCS E1M2V1), blood pressure was 175/111 mmHg, heart rate was 156 bpm, respiratory rate was 36 bpm,

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SpO2 was 63% with NRM 15 lpm. Body mass index was 29.77 kg/m^2 (overweight), with vesicular breathing sounds accompanied by crackles in both lungs and dullness to percussion of the lungs. The laboratory result was within normal limit with hemoglobin 9.8 g/dL, and urine protein +1. The thoracic x-ray revealed cardiomegaly with pulmonary oedema. The blood gas analysis showed pH was 6.97, pCO_2 was 109.7 mmHg, pO2 was 70 mmHg, HCO3 was 25.4 mmol/L, BE was -6, SO_2C was 80%, and lactate was 4.60 mmol/L.

The diagnosis was G7P1A5, gravida 29 – 30 weeks with severe feature pre-eclampsia, and acute respiratory distress syndrome (ARDS) due to ALO. Early management was endotracheal intubation with ETT No. 7.0, oxygenation, transport of the patient to the ICU, and ventilator mode AC PC Pi 19 RR 16 PEEP 8 FiO2 100% for the first hour and then tapering of the FiO2. The patient was in head-up position of 30˚, given IVFD Ringer lactate 20 cc/hr, fentanyl 10 mcg/hr, propofol 100 mg/hr, rocuronium 20 mg/hr, omeprazole 2 x 40 mg IV, furosemide 40 mg IV loading dose followed by 5 mg/hr IV, nebulized combivent and Pulmicort / 8 hr.

In the next 8 hours, the patient's blood pressure was 125/87 mmHg, HR 105 bpm, RR 16 bpm, peripheral saturation was 98 % (AC PC Pi 19 RR 16 PEEP 8 FiO2 60%). The P/F ratio was 245. The blood gas analysis showed pH 7.33, pCO2 39.2 mmHg, pO2 147 mmHg, HCO3 22 mmol/L, BE was -5, and SaO2 99%. Urine output was 2.63 cc/kg/hr, with a balance was (-) 1558 cc. We tried to wean off the ventilator and sedation drugs. Four hours later, the patient's consciousness was E4M6Vett, blood pressure 137/94 was mmHg, HR was 95 bpm, RR was 22 bpm, SpO2 was 98% (SIMV PC Pi 19 RR 10 PS 12 PEEP 8 FiO2 40%). Echocardiography showed EF 49%, global normocinetic, valve within normal limits, TAPSE 20, and IVC 18. We planned to terminate the pregnancy.

Sectio Caesarea was performed under general anesthesia, induction with propofol 100mg, fentanyl 100 mcg, and relaxant using rocuronium 20 mg, all intravenously. The procedure lasted approximately 2 hours and the baby was born with an APGAR SCORE of 4/6 with a birth weight of 1100 grams. Postoperatively the patient was sedated in the ICU with ETT retention. Breathing was fully controlled with a ventilator until 6 hours postoperatively with ventilator mode AC VC Pi 18 RR 14 PEEP 8 FiO2 50%. Furosemide still administered of 5 mg/hour with six hours postoperatively, the ventilator and sedation were weaned. The patient was fully conscious and extubated one day postoperatively.

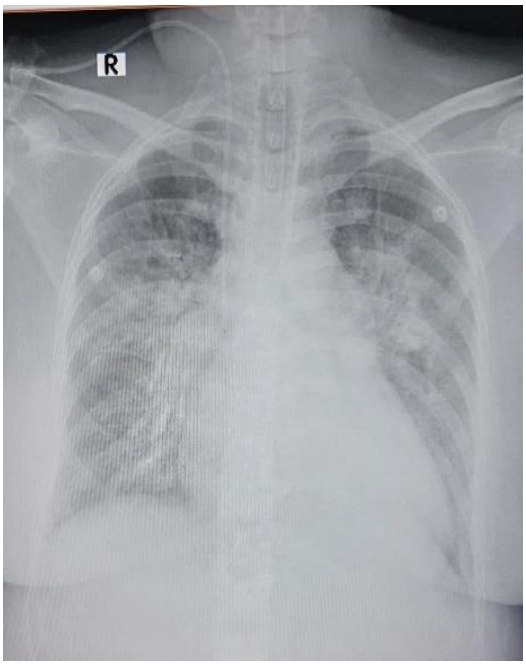

Figure 2. Chest X-ray Post Intubation

DISCUSSION

Pulmonary edema is defined as the abnormal accumulation of extravascular fluid in the lung parenchyma (4,5). Pulmonary edema can be characterized as either cardiogenic or non-cardiogenic. Pregnancy

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causes physiological changes that increase the risk of developing pulmonary edema (5,6). ALO in pregnant women is an uncommon yet life-threatening occurrence. The incidence varies between 0.08% and 3% (7).

During a normal pregnancy, both pulmonary and systemic vascular resistance drop dramatically. The gradient between colloid osmotic pressure and pulmonary capillary wedge pressure lowered by around 30%, increasing the susceptibility of pregnant women pulmonary oedema. Pulmonary oedema is caused by either an increase in cardiac preload (such as fluid infusion) or increased pulmonary capillary permeability (such as in pre-eclampsia), or both (6,8,9).

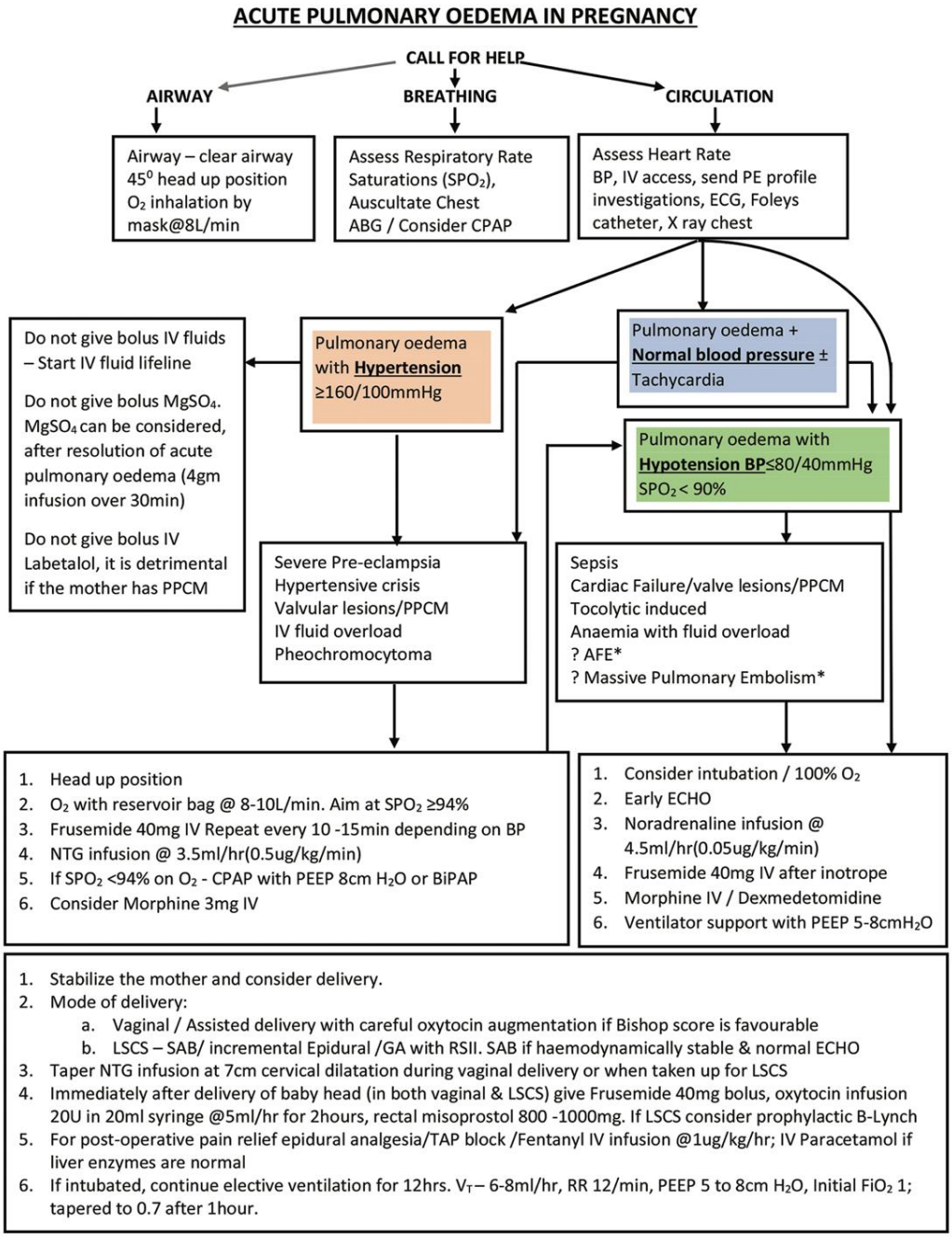

Figure 3. Management Pathway of Acute Pulmonary Oedema in Pregnancy (10)

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Preeclampsia is a frequent cause for obstetric patients to be admitted to the intensive care unit (ICU), and ALO can pose a life-threatening risk for those with preeclampsia (11,12) In our case, a 30-year-old woman was diagnosed with G7P1A5 gravida 29–30 weeks with severe preeclampsia, acute respiratory distress syndrome (ARDS) due to ALO. According to the American College of Obstetricians and Gynecologists (ACOG), patients suffering from severe preeclampsia should terminate the pregnancy, particularly if the pregnancy has reached 34 weeks or if the mother's condition has been stabilized (13). Terminating the pregnancy was our principal treatment. Since the mother's condition was unstable, the termination was postponed and efforts were made to stabilize the mother.

The aim of treating pulmonary oedema during pregnancy is to reduce preload and afterload on the left ventricle, reduce and prevent myocardial ischemia, maintain adequate ventilation and oxygenation, and protect against the risk of infection. The ABCDE principle remains important in treatment algorithms. Airway management should be carried out considering the high risk of heart attack in patients. Non-invasive ventilation should be performed before tracheal intubation to increase inspiratory volume, allow fluid movement from the alveoli to the lungs, reduce the respiratory effort to prevent fatigue and reduce the risk of tracheal intubation. Non-invasive ventilation also helps prevent complications of tracheal intubation during pregnancy, especially in pregnant women with preeclampsia such as intracerebral bleeding (14,15). ALO requires prompt oxygenation, ventilation, and circulation control. The patient's hemodynamic status at presentation (hypertension, normal blood pressure, or hypotension) determined etiological reasons and treatment (3,13–15)

Ventilatory and non-ventilatory methods have been utilized to treat pregnancy-related acute respiratory distress syndrome. There are different ways to ventilate, such as lung-protective mechanical ventilation, oxygenation, sufficient PEEP, prone ventilation, extracorporeal membrane oxygenation, airway pressure release ventilation, and recruitment maneuvers. Non-ventilatory strategies include fluid restriction, neuromuscular inhibition, corticosteroids, and inhaled prostacyclin/nitric oxide. Meanwhile, the strategy that offers the potential to decrease mortality in ARDS is the use of lung-protective mechanical ventilation (14)

The patient received oxygen with an NRM of 15 lpm before intubation. Nevertheless, the patient's saturation failed to improve, leading to respiratory acidosis, necessitating intubation. Fluid treatment was also administered. Monitoring is conducted to prevent the occurrence of excessive fluid, which could exacerbate the patient's disease. Within 8 hours, we promptly reached our intended therapeutic goals. These goals including keeping tidal volume to 6 to 8 mL/kg (ideal body weight). Hold PaCO2 below 60 mm Hg if at all feasible. Trim plateau pressures to between 30 and 35 cmH2O. Maintain PaO2 ≥ 55 mm Hg and SpO2 ≥ 88% as long as electronic FHR tracing is reliable. In individuals with a non-reassuring fetal state, a greater PaO2 may be required. Provide sufficient PEEP and titrate according to the requirement for oxygen.

The initial PaO2 in our patient was 70 mmHg, PCO2 was 109.7 mmHg, and oxygen saturation was 63% with NRM at 15 liters per minute. During the subsequent examination, the PaO2 level increased to 147mmHg, PCO2 decreased to 39.2mmHg, and oxygen saturation reached 98% AC PC Pi 19 RR 16 PEEP 8 FiO2 60%.

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We used propofol as sedatives, fentanyl, and rocuronium. Aside from that, furosemide is prescribed as a venodilator and diuretic. Propofol is widely used as a general anesthetic in pregnant women for both obstetric and non-obstetric procedures. It has not been linked to major fetal abnormalities in doses that are considered safe by doctors. Propofol was classified as FDA Pregnancy Category B. Propofol was found to lower the production of PGE2, COX2, interleukins, and tumor necrosis factor. These chemicals are normally made by amniotic epithelial cells that come from the inside of the placenta. This has a protective effect against starting labor too early (16). Multiple studies have found that low doses (2 mg/kg) of propofol result in equivalent Apgar ratings as well as neurological and adaptive capacity scores (17). In our case, we only administer less than 2 mg/kg propofol to the patient, which is a modest dose. There is no evidence of propofol's teratogenicity in animals or humans; nonetheless, there are concerns regarding neonatal depression when it is administered near to birth, particularly at high dosages (>9 mg/kg) (16,17)

Rocuronium was designated as FDA Pregnancy Category B, and it is not known to cause skeletal muscular weakness or paralysis in the neonate. When delivered in clinically meaningful doses, the water-soluble and positively charged highly ionized molecules of both depolarizing and nondepolarizing neuromuscular blocking medicines efficiently impede transfer across the placental barrier (18).

Opioids were classified as FDA Pregnancy Category C drugs, except for oxycodone which was categorized as Category B (16)A study on Intravenous patient-controlled analgesia comparing remifentanil with fentanyl revealed that remifentanil is more frequently related to temporary maternal oxygen desaturation, while fentanyl is linked to a greater requirement for neonatal resuscitation (16,19). While, fentanyl can easily pass through the placenta, more research is needed to determine its potential to predispose a fetus to opioid dependency in the womb (19). In our case, the top priority is to save the mother, hence the use of fentanyl is prioritized.

A comprehensive assessment is there after conducted on the patient. The echocardiography results indicated satisfactory left ventricular systolic function, with an ejection fraction (EF) of 49%. As per the guidelines of the European Society of Cardiology (ESC), it is recommended that all patients in ALO undergo evaluation using echocardiography. This test should include finding the left ventricular ejection fraction (LVEF), looking for segmental kinetic abnormalities (like those caused by ischemic factors), analyzing the right ventricular (VD) function, which includes figuring out the pulmonary artery pressure, checking the diastolic function of the left ventricle, and looking for signs of possible valvular disease. Echocardiography plays a crucial part in patient management since it immediately influences the decisions made regarding patient care. Furthermore, echocardiography serves as a valuable technique for determining the cause of sudden pulmonary edema, as well as evaluating any associated complications and predicting the outcome (20)

Once the patient's condition stabilized, 12 hours after being in a stable state, termination of pregnancy was performed on the patient under general anesthesia. The baby was born with an APGAR SCORE of 4/6 with a birth weight of 1100 grams. Postoperatively the patient was sedated in the ICU with ETT retention.

The patient was subsequently hospitalized for 2 days in the Intensive Care Unit (ICU) and showed improvement.

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According to the Protocol-based Management of Acute Pulmonary Edema in Pregnancy, if the patient was already intubated before the termination, it is recommended to continue elective breathing for 12 hours. The tidal volume is set at 6-8 mL per hour, the respiratory rate is 12 bpm, PEEP 5 to 8 cm H2O, Initial FiO2 1; tapered to 0.7 after 1 hour.[14] The following day, the patient's condition had improved and stabilized, and weaning procedures were carried out. We conducted extubation 20 hours after the surgery. After 24 hours of extubation, we transferred the patient to a standard hospital ward.

CONCLUSION

Due to physiological changes and fluid overload, pregnancy-related pulmonary edema is challenging. First, stabilize the mother and consider the fetus. This case's therapy centered on lowering left ventricle preload and afterload, preserving ventilation and oxygenation, and preventing infection. Treatment plans were based on the ABCDE idea, which stressed controlling the airway and non-invasive breathing to avoid problems with tracheal intubation, especially in women who are preeclamptic. Lung-protective mechanical ventilation, oxygenation, and fluid restriction were used. Echocardiography was essential for heart function evaluation and patient management. Due to their pregnancy safety, propofol, fentanyl, and rocuronium were provided cautiously. It was crucial to monitor maternal and fetal parameters throughout the process. According to guidelines, severe preeclampsia should be terminated after 34 weeks or when the woman stabilizes. Following surgery, the patient was treated in the ICU according to the pregnant ALO protocol. This example shows the need for multidisciplinary collaboration, evidence-based standards, and tailored patient care in handling difficult obstetric crises like ALO in preeclampsia patients**.**

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Conflict of Interest

The authors declare no conflict of interest regarding the publication of this article.

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Authors' Contributions

All authors have contributed to all processes in this research.

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