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Research Article

**SIGNIFICANCE OF APPROPRIATENESS OF BLOOD GAS IN
NEWBORNS HAVING RESPIRATORY DISTRESS**¹Dr. Shabana Amir, ²Dr. Tehmina Hayat, ³Dr. Arshia Maqbool¹THQ Kallur Kot²DHQ hospital Sheikhpura³Hilaleahmar Hospital Faisalabad**Abstract:**

Objective: The primary objective of the research was the establishment of the appropriateness of blood gas analysis in the neonates diagnosed with the problem of respiratory distress.

Subjects & Methods: Our research was held at the NICU (Neonatal Intensive Care Unit) which is a department of Mayo Hospital Lahore. Every new-born which was hospitalized on the diagnosis of the symptoms leading to respiratory distress were made a part of the research study. We managed these neonates with as a support of respiration with oxygen. No new-born was managed with pressurized ventilation and intubation during the stay at hospital. In the available data and records of the 16 new born children hospitalized for the analysis of the blood gas were also taken in to review.

Results: With an exception of two cases there was no case diagnosed with hypoxemia (PaO₂ below 80 mm Hg). In the same way there were two cases who were diagnosed with the incidence of acidosis (pH below 7.30); whereas, only single case was observed with the incidence of hypercarbia (PaCO₂ above 40 mm Hg). The bicarbonate measurements and the base excess among majority of the patients was observed as in the normal range.

Conclusions: It was observed that the analysis of the blood gas was essentially normal in majority of the collected samples which also suggested the unnecessary and inappropriateness utilization of this costly and painful process; on the other hand, in the in the stable newborn children with the respiratory distress. On the basis of these results we also found another alternative method which a combination of the pulse oximeter was reading, clinical parameters and chest x-ray outcomes; which suggested its possible usefulness for the neonate management diagnoses with respiratory distress. The objective was to minimize and reduce the over utilization of the painful invasive procedure.

Keywords: Blood gas, tachypnea, neonates, chest x-ray, pulse oximetry and non-invasive.

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INTRODUCTION:

The most repeated routine in the neonate admission is the analysis of the blood gas in all the children having respiratory distress, the research objective was also the awareness of the acid-base status and also the decision of the possible implementation of the intervention. We have also observed in the previous research studies that analysis of the blood gas is utilized by the very commonly and excessively [1]. The analysis of the blood gas which was taken from the arterial puncture and capillary becomes a very painful experience by the patients; it is suggested that its use may be reduced and minimized. The process is carried out through automatic analyzers, it is also costly and burden on the healthcare department. In the analysis of the blood gas by the patient from whom the specimen is being drawn for the test procedure; which takes a lot of time and it needs special attention. Additionally, to the blood gas analysis utilization, the neonates diagnosed with the distress of respiration can be monitored through clinical investigations with the help of pulse oximetry. The primary objective of the research was the establishment of the appropriateness of blood gas analysis in the neonates diagnosed with the problem of respiratory distress.

PATIENTS AND METHODS:

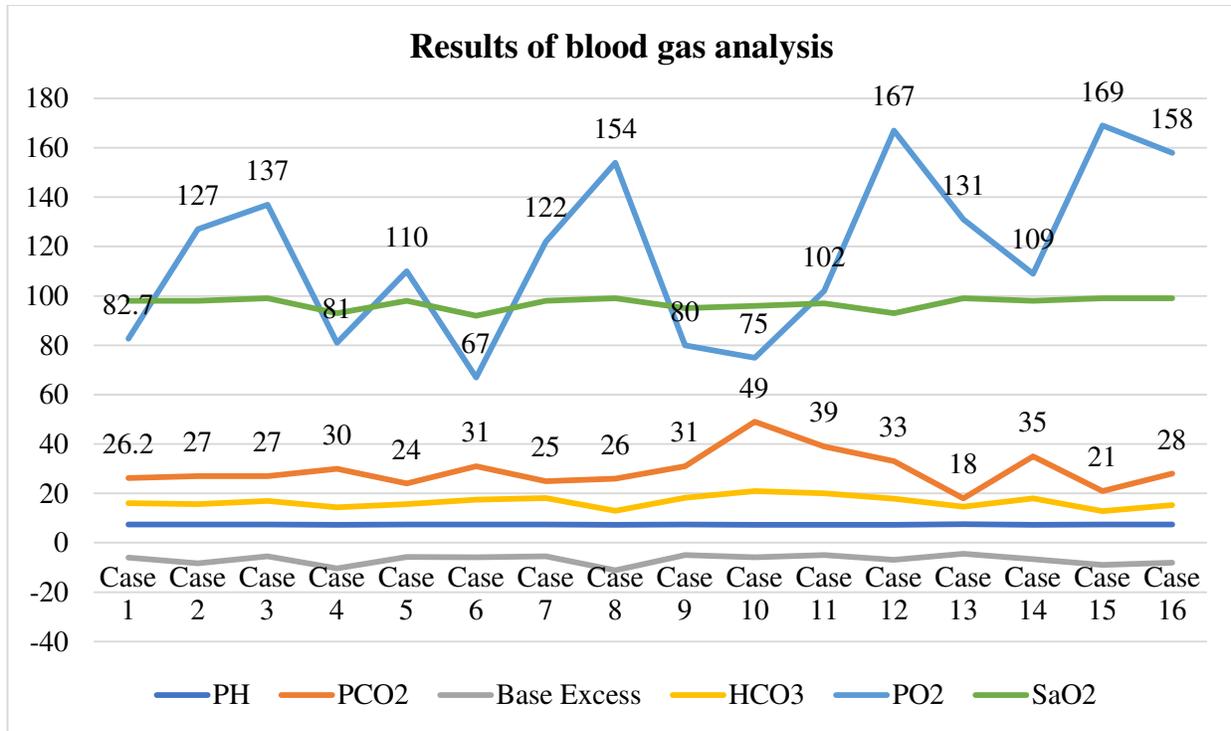
The research was carried out in Mayo Hospital, Lahore. All newborn who got admitted to the NICU when diagnosed with the respiration issues in the period of January – April, 2017. The neonates were treated with oxygen as a support for the respiration. No case was intubated or no case received positive pressure ventilation. In the available data and records of the 16 new born children hospitalized for the analysis of the blood gas were also taken in to review as shown in Table – I.

RESULTS:

In the Table – I the outcomes have been summarized in this research. In most of analysis of the blood gas the arterial puncture was used. During analysis of the blood gas every neonate was managed through variable amount of fraction inspired oxygen in the range of 30% – 50%. With an exception of two cases that is case number six and ten no case was diagnosed with hypoxemia (PaO₂ below 80 mm Hg). In the same way case number four and ten were observed with acidosis (pH below 7.30); whereas in one case we diagnosed hypercarbia (PaCO₂ above 40 mm Hg). The bicarbonate measurements and the base excess among majority of the patients was observed as in the normal range.

Table – I: Results of blood gas analysis

Case	PH	PCO ₂	Base Excess	HCO ₃	PO ₂	SaO ₂
Case 1	7.4	26.2	-6	16.1	82.7	98
Case 2	7.35	27	-8.3	15.6	127	98
Case 3	7.4	27	-5.5	16.9	137	99
Case 4	7.29	30	-10.4	14.4	81	93
Case 5	7.43	24	-5.8	15.7	110	98
Case 6	7.36	31	-5.9	17.5	67	92
Case 7	7.37	25	-5.5	18.1	122	98
Case 8	7.3	26	-11.1	13	154	99
Case 9	7.38	31	-5	18.2	80	95
Case 10	7.25	49	-5.9	21	75	96
Case 11	7.33	39	-5	20	102	97
Case 12	7.33	33	-6.9	17.9	167	93
Case 13	7.51	18	-4.4	14.6	131	99
Case 14	7.32	35	-6.7	18	109	98
Case 15	7.39	21	-9	12.8	169	99
Case 16	7.35	28	-8.1	15.3	158	99



Majority of the cases were of arterial puncture; PO2 and PCO2 as mm of Hg (for kPa readings with the factor of conversion was 7.5) and Base Excess and HCO⁻³ as mmol/l

DISCUSSION

In the presence of respiratory symptoms and signs, the primary indication for the attainment of the blood gas is known about the oxygenation status (PaO₂) and (pH & PaCO₂) ventilation. Awareness about the base excess and bicarbonate helps in the differentiation of the acidosis type but it is not the primary objective of such kind of respiratory cases [2]. We also observed in this research that cohort

acid-base status was observed normal that indicates that the hospitalization of the blood gas analysis in the new born children having respiration distress did not assist in the intervention application decision [3]. Our research outcomes had poor yield and unnecessary application of the analysis of the blood gas which is same as observed by previous research studies.

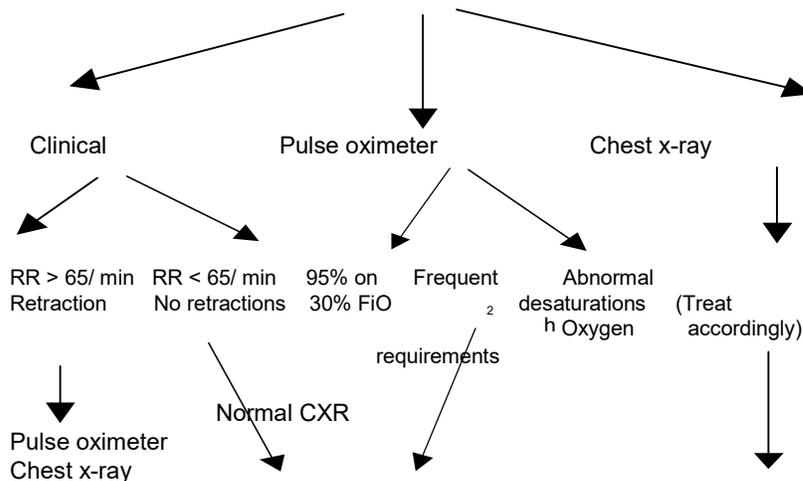


Figure 1: Algorithm for neonates with respiratory distress without assisted ventilation

Another aspect of the analysis of the blood gas is linked with the cost and pain. There is vast literature available on the pain experienced by the neonates. Invasive procedure further enhances the painful experience which is applied on the neonates hospitalized in the NICU [4]. The analysis of the blood gas (arterial or capillary) is also a procedure which is painful and invasive in nature. It is recommended that it should be used only when no other option is left [5]. This procedure is exclusive of the personnel and automated analyzer cost. For the restriction of the invasive and painful procedure other alternates can be utilized for exploration; a possible solution may be the combination of pulse oximetry, clinical and radiological outcomes [6]. Pulse oximetry is considered as an alternative which is non-invasive, which has been proved in the earlier research studies. The pulse oximetry in the newborn children having the respiration issues does not require ventilation which also has an advantage over the analysis of blood gas because of the fact that it is reusable and non-invasive procedure. Its application may be intermittent in the overworked nursery which has lack of resources and equipment as well [7].

Our research also suggests another method which can be used as an alternative to minimize the frequency of analysis of the blood gas as shown in Figure – I. In the new born children suffering from tachypnea, the decision can be taken on the grounds of a combined therapy which has clinical features (tachypnea degree, extent of requirement of oxygen and cyanosis), reading observed through pulse oximeter (desaturations episodes) and a chest x – ray single view (diaphragmatic hernia and pneumothorax) [8].

The focus is to be put on the involvement of the cost in the analysis of the blood gas and also the factor of pain which is caused during the neonatal arterial puncture where indwelling catheters cannot be managed. A tachypneic neonate (respiration @ 60 / minutes) with no suprasternal or subcostal retraction, saturating at 95% on oxygen as 30%, having chest x – ray as normal can be safely observed without any invasive blood gas measurement, it is expected that it will be in the limit of the normal range which has also been observed in this research study [9]. A randomized controlled neonates trial having respiratory distress need no assistance of the ventilation with one group in the presence of the non-invasive observation approach; whereas, in the analysis of the blood gas validation is to be warranted to draw the conclusions which can be extrapolated from the in-hand research [10].

CONCLUSIONS:

It was observed that the analysis of the blood gas was essentially normal in majority of the collected samples which also suggested the unnecessary and inappropriateness utilization of this costly and painful process; on the other hand, in the in the stable newborn children with the respiratory distress. On the basis of these results we also found another alternative method which a combination of the pulse oximeter was reading, clinical parameters and chest x-ray outcomes; which suggested its possible usefulness for the neonate management diagnoses with respiratory distress. The objective was to minimize and reduce the over utilization of the painful invasive procedure. However, more research work is required to identify the possible alternates and techniques to address the problem in the neonates.

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