PULSE OXIMETRY IN COMPARISON TO ARTERIAL BLOOD OXYGEN SATURATION IN RESPIRATORY DISTRESS IN NEONATES

Thesis By

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Dedication

To my Father and my Mother who taught me the principles and patience

To my husband who support me

To my daughters Razan and Renad

To all my professors and colleagues

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List of Abbreviations

Abbreviation	Meaning
(A-a) pO2	Alveolar-arterial oxygen gradient
A/C	assist/control
ABG	Arterial blood gas analysis
AC	pulsatile component
AGA	Appropriate for gestational age
AR	Arterial blood
BE	The base excess
BPD	bronchopulmonary dysplasia
C -XR	Chest X-ray
CBC	Complete blood count
CHD	Congenital Heart Disease
CNS	Central nervous system
CO Hb	carboxyhemoglobin.
COPD	Chronic obstractive lung disease
CPAP	Continuous Positive Airway Pressure
CRP	C_reactive protien
DC	non-pulsatile components
DKA	Diabetic ketoacidosis
DST	Discrete Saturation Transform Algorithm
ECG	Electrocardiography
FIO2	fraction of inspired oxygen
FRC	functional residual capacity
GBS	group B streptococci
GIT	Gasterointestinal tract
HCO	Bicarbonate
HFOV	High-frequency oscillatory ventilation
HMD	Hyaline Membrane Disease
HR	heart rate
HRPO	High resolution pulse oxietry
IEM	Inborn Errors of Metabolism
IPPV	Intermittent positive pressure ventilation
IV	Intravenous
LEDs	Light emitting diodes
MAS	Meconium Aspiration Syndrome
MetHb	methemoglobin
NICU	Intensive Care Unit
NV	Nasal ventilation
O2Hb	oxyhaemoglobin

PaCO2	Arterial carbon dioxide partial pressure
PCV	packed cell volume
PDA	patent ductus areteriosus
PO	Pulse oximetry
pO2	Partial oxygen pressure
PPHTN	Persistent Pulmonary Hypertension of the Newborn
PSV	pressure support ventilation
PTV	Patient-triggered ventilation
RD	Respiratory distress
RDS	Respiratory distress syndrome
RHb	Reduced haemoglobin or deoxyhaemoglobin
RPO	Reflectance pulse oximetry
RTA	Renal tubular acidosis
RV	Venous blood
SaO2	Arterial oxygen saturation
SD	Standard deviation
SET	Signal Extraction Technology
SIM	synchronized intermittent mandatory ventilation
SpO2	Saturation of peripheral oxygen
TPO	Traditional pulse oximety
TTN	Transient Tachypnoea of the Newborn PPHN
USG	ultrasonography
V/Q	ventilation-perfusion

ABSTRACT

OBJECTIVE. Our aim was to define the relationship of PaO2 and pulse oxygen saturation values in newborn with respiratory distress to evaluate whether pulse oxygen saturation value related to PaO2. **METHODS.** Prospective comparison of PaO2 and pulse oxygen saturation values in 80 patient was performed. The PaO2 measurements were obtained from blood gas analyzer; simultaneous pulse oxygen saturation values were recorded. **RESULTS**. We evaluated PaO2/ pulse oxygen saturation values in 80 neonates. Of the 80 samples, 30 (37.5 %) of cases were breathing supplemental oxygen by CPAP, 27 (33.7 %) of cases were on nasal pronge, 21 (26.3 %) were on ventilator and 2 (2.5 %) were on head box. A mean pulse oxygen saturation of (90.7 ± 7.1%) and the mean PaO2 of (64.9 ±15.9) mmHg. there was a statistically significant positive (direct) correlation between PO_2 and SpO_2. An increase in PO_2 is associated with an increase in SpO2 ($p<0.001$). **CONCLUSIONS:** pulse oximetry measured from neonates and infants with respiratory distress syndrome shows statistically significant positive (direct) correlation with PO2 .

KEY WORDS

PULSE

RESPIRATORY

ARTERIAL

INTRODUCTION

Respiratory distress syndrome (RDS) of the newborn, also known as infant RDS is an acute lung disease present at birth. It is a syndrome caused in preterm infant by developmental insufficiency of surfactant production and structural immaturity in the lung. It can also result from a genetic problem with the production of surfactant associated proteins. RDS affects about 1% of newborn infants and is the leading cause of death in preterm infants. The incidence decreases with advancing gestational age (***Rodriguez et al., 2002)***.

High-risk infants require prompt attention by a neonatal resuscitation team ***(Cole, 2006).***

Despite greatly improved RDS treatment in recent years, many controversies still exist. Neonates are given warm, moist oxygen. This is critically important, but needs to be given carefully to reduce the side effects associated with too much oxygen ***(Courtney, 2007).***

Pulse oximetry is a non invasive, medical device that indirectly measures the oxygen saturation of a patient's blood, it is often attached to a medical monitor so staff can see a patient's oxygenation at all times. Most monitors also display the heart rate. Portable, battery-operated pulse oximeters are also available for home blood-oxygen monitoring ***(Brand et al., 2002).***

Pulse oximetry is not invasive, easy to use, has no side effects, is accurate and allows continuous monitoring and is the preferred method of oxygen monitoring in neonates ***(Mower et al., 1997).***

An arterial blood gas (ABG) is a blood test that is performed using blood from an artery. ABG testing is used to determine the pH of the blood, the partial pressure of carbon dioxide and oxygen(PaO_2), and the bicarbonate level ***(Baillie, 2008).***

Portable pulse oximeters are now widely available for the assessment of arterial oxygenation, and the United State Medicare Program considers saturation readings to be acceptable substitutes for arterial PO_2 in selecting patients for long-term oxygen therapy. Current oximeters are reasonably accurate (plus or minus 4 or 5 percent of the co-oximetry value) in assessing patients for desaturation during exercise, for sleep studies, and for in-home monitoring ***(Pierson, 2007).***

AIM OF THE WORK

Our aim was to define the relationship of PaO_2 and pulse oxygen saturation values during routine clinical practice.