

**Comparative Study Between Pulse Oximetry
And
Transcutaneous Oxygen Tension Measurements
In Neonatal Oxygen Monitoring**

**Thesis
Submitted In Partial Fulfilment
For the M.S.C. Pediatrics**

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*This simple work is dedicated to my Mother
and my Husband, who were always
a major driving force and support to me
and to whom I owe my success*

ACKNOWLEDGEMENT

It has been a great honour and extreme pleasure for me, to proceed with this work under the supervision of Prof. Dr. Saadia Abdel Fattah, Prof. of Pediatrics of Ain Shams University, for her precious guidance, great support, enormous help, and kind supervision.

I have no adequate words to express my indebtedness for the close supervision, tremendous effort, active participation and kind encouragement of Prof. Dr.M.Hamza Saed El Ahl, Prof. and chairman of Pediatrics Military Medical Academy.

I wish to express my sincere gratitude to Dr. Sherine Abdel Fattah, Assist.Prof. of Pediatrics, Ain Shams University who devoted much of her time to enlighten me to the way of scientific research and without her endless efforts this work would not have been completed.

Lastly, I would like to thank Dr. Sami El-Sheamy, Assist. Prof. of Pediatrics, Ain Shams University for his effort in this work.

Thanks for all who are present and devoted much of their time to attend the discussion of my thesis.

LIST OF ABBREVIATIONS

% Sat	=	Percent Saturation
COHb	=	Carboxyhaemoglobin
F.T.	=	Full term
FIO ₂	=	Fractional Concentration of O ₂ in Inspired Air
Hb	=	Haemoglobin
HB-O ₂ Curve	=	Haemoglobin Oxygen Dissociation Curve
HbF	=	Fetal Haemoglobin
HbO ₂	=	Oxyhaemoglobin
I.R	=	Infra Red
ICUs	=	Intensive Care Units
ITU	=	Internal Data Storage
KPa	=	Kilopascalss
LEDs	=	Light Emitting Diodes
Met Hb	=	Methaemoglobinemia
NICU	=	Neonatal Intensive Care Unit
nm	=	Nanometer
P.T	=	Preterm
PACO ₂	=	Alveolar CO ₂ Tension
PaO ₂	=	Arterial Oxygen Partial Pressure
PAO ₂	=	Partial Pressure of Oxygen
PCO ₂	=	Partial of Pressure CO ₂
PIO ₂	=	Inspired Oxygen Tension
PVO ₂	=	Mixed Venous Oxygen Tension
R	=	Respiratory Exchange Ratio
RLF	=	Retrolental Fibroplasia
ROP	=	Retinopathy of Prematurity
SaO ₂	=	Arterial Blood Oxygen Saturation
SPO ₂	=	Pulse Oxygen Saturation
tcPO ₂	=	Transcutaneous Oxygen Partial Pressure
V/Q	=	Ventilation Perfusion Ratio
VD	=	Physiological Dead Space
VT	=	Tidal Volume

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**1. INTRODUCTION
AND
AIM OF THE WORK**

1. INTRODUCTION

Continuous monitoring of oxygenation in infants with cardio-respiratory problems is vitally important (*Michael S.Jennis and Joyce et al 1987*).

Avoiding both hypoxia and hyperoxia is a major goal in the management of infants with prolonged oxygen dependency. Blood gas monitoring by repeated arterial sampling carries significant risks, is technically difficult, and provides intermittent information only (*Alfonso et al 1986*).

Currently the most frequently used non-invasive device for measuring the arterial oxygenation is the TCPO₂ monitor. This allows for continuous measurements, but response time varies, frequent calibration is necessary, and change of site is required to prevent skin damage. There may be a poor correlation with PaO₂, depending on site of electrode, oxygen levels, cardiac output, peripheral perfusion, and condition of the skin (*Beran A.V. et al 1971*).

Arterial SaO₂ can be measured non-invasively with oximetric techniques (*Sergio Fanconiet al 1985*).

The pulse oximeter which is a newly available monitor, continuously and non-invasively measures the oxygen saturation (SaO₂) of arterial haemoglobin (*YoshiyaI et al 1980*) beat by beat. This devise uses spectrophotometric power principles to determine SaO₂ with each arterial pulsation. (*Michael S. etal 1987*).

Pulse oximetry functions by positioning a pulsating arterial vascular bed between a two wave length light and light detecting sensor. The difference in light absorbance between reduced haemoglobin and oxyhaemoglobin is measured in phase with arterial pulsation (*Alfonso et al 1986*).

In general these reports have been favorable regarding the application of pulse oximetry to neonatal oxygen monitoring, emphasizing the easy application of SPO₂ probes, lack of instrument calibration requirement, in frequency of cutaneous injury as their sensor is unheated so they will not cause skin burns, rapid response of SPO₂ to changes in blood oxygenation, and significant correlation of SPO₂ and SaO₂ (*William et al 1989*).

AIM OF THE WORK

This work is designed to study neonatal oxygen monitoring by the use of pulse oximetry and transcutaneous oxygen measurement.

The study will evaluate and compare the two methods with relevance to, accuracy, reliability and how well does the pulse oximeter compare with currently non-invasive, continuous TcPO₂.

2. REVIEW OF LITERATURE
Chapter I
Physiology of Oxygen

CHAPTER I

1. **OXYGEN MONITORING**
 2. **TERMINOLOGY**
 3. **THE NORMAL ARTERIAL OXYGEN TENSION**
 4. **PHYSIOLOGY OF BLOOD GASES.**
 5. **MECHANISM OF GAS TRANSPORT**
 6. **FACTORS AFFECTING OXYGEN TRANSPORT**
 7. **FACTORS INFLUENCING ARTERIAL OXYGEN TENSION**
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