DEPARTMENT OF PAEDIATRICS AND CHILD HEALTH
MUHIMBILI UNIVERSITY COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF DAR ES SALAAM

HYPOTHERMIA, ASSOCIATED FACTORS AND NEONATAL OUTCOME

BY

RODRICK RICHARD KISENGE, MD (DAR) 1991

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SUPERVISORS:

1. DR. KARIM P. MANJI MB.BS, M.MED.
   NEONATOLOGIST AND LECTURER
   DEPARTMENT OF PAEDIATRICS & CHILD HEALTH
   MUHIMBILI UNIVERSITY COLLEGE OF HEALTH SCIENCES
   DAR ES SALAAM.

   3/10/97

2. DR.AUGUSTINE W. MASSAWE MD, M.MED, POSTGRADUATE CERTIFICATE IN LACT. MANAGEMENT (CALIFORNIA, USA)
   NEONATOLOGIST AND LECTURER,
   DEPARTMENT OF PAEDIATRICS & CHILD HEALTH,
   MUHIMBILI UNIVERSITY COLLEGE OF HEALTH SCIENCES,
   DAR ES SALAAM.

   5/10/97

ABSTRACT

Hypothermia in newborn babies is a problem in tropical countries despite warm environmental conditions and it contributes to neonatal morbidity and mortality.

This cohort study was done in the Neonatal Care unit, Muhimbili Medical Centre to determine the prevalence of hypothermia on admission, associated factors and neonatal outcome in terms of morbidity, weight loss, duration of stay in the neonatal unit and mortality. The study was conducted from July to October 1996 and the study population included all neonates admitted to the Neonatal Care Unit during the said period.

The prevalence of hypothermia on admission was found to be 22.4% and hypothermia was not recorded or reported to be a reason for admission in any of the neonates in this study, despite that 13.1% of the hypothermic neonates had severe hypothermia on admission. There was no low reading thermometer in the unit.

Hypothermia on admission was significantly associated with maternal intrapartum medications (P = 0.04), delivery by doctor (P = 0.000), delivery at Muhimbili Medical Centre Obstetrics Theatre (P = 0.000) or delivery in other hospitals(P = 0.00) , delivery by lower segment Caesarian section (P = 0.000) or by low cavity vaccum extraction (P = 0.01), low birth weight (P = 0.002), prematurity (P = 0.001), longer duration of transfer from place of delivery to the Neonatal Care Unit (P = 0.000) and inadequate clothing of the baby after delivery (P = 0.000). It was also

found that hypothermic neonates stayed longer in the Neonatal Care Unit than normothermic ones, they had more postnatal weight loss and increased risk of both morbidity and mortality.

It is concluded that hypothermia is a problem in the Neonatal Care Unit, Muhimbili Medical Centre and is associated with increased morbidity and mortality. Efforts should be made to raise awareness among health providers with more emphasis on prevention. Daily use of low reading mercury thermometers is recommended in order to detect severe forms of hypothermia that require more aggressive management.

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DECLARATION

I declare that this dissertation is my own original work and has not been submitted for similar degree in any other University.

RKisenge ..... 29th Sept, 1997 .....

RODRICK R. KISENGE DATE

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DEDICATION

This work is dedicated to my late Mum and Dad who would have liked to see this work. It is through their sacrifice and encouragement that I was able to attain this level.

ABBREVIATIONS

ABD	- Assisted Breech Delivery
APH	- Antepartum Haemorrhage
BF	- Breast-feeding
EPH Gestosis	- Edema, Proteinuria and Hypertension during pregnancy
GA	- Gestational Age
KAP	- Knowledge Attitude and Practice
LBW	- Low Birth Weight
LSCS	- Lower Segment Caesarean Section
LCVE	- Low Cavity Vacuum Extraction
MMC	- Muhimbili Medical Centre
OFC	- Occipital Frontal Circumference
RDS	- Respiratory Distress Syndrome
SD	- Standard Deviation
SPSS	- Statistical Package for Social Sciences
SVD	- Spontaneous Vertex Delivery
TBA	- Traditional Birth Attendant

INTRODUCTION AND REVIEW OF LITERATURE

Definition of hypothermia in newborn babies:

Hypothermia in the neonates is defined as body temperature below 36.5°C, with the normal range being 36.5°C - 37.5°C.[1] Hypothermia in newborn babies is classified into three groups according to the severity.

i) Cold stress - is defined as body temperature between 36.0°C - 36.4°C.

ii) Moderate hypothermia - is defined as body temperature between 32.0°C - 35.9°C

iii) Severe hypothermia - is defined as body temperature < 32°C.

Thermoregulatory Mechanisms in newborn babies:

The temperature control mechanisms in newborn infants, like in adults are aimed at maintaining a close balance between heat gain and heat loss. The newborn baby produces heat by metabolic activity in all body tissues and mainly through the non-shivering thermogenesis which is a cold induced increase in oxygen consumption in the production of heat.[2] The non-shivering thermogenesis utilises brown fat which accounts for about 2 - 6% of total body weight in human infants.[2,3] Brown fat is sympathetically mediated and is rich in mitochondria. It is found at the back of the neck, between the scapulae, in the mediastinum, along the aorta and surrounding the kidneys and adrenals. The newborn baby can also gain heat from the surrounding environment by convection, conduction and radiation if temperature of the baby is lower than that of the environment.[3]

A newborn infant looses heat by convection, radiation, evaporation and conduction.[1,2,3] Heat is lost by convection from the exposed surface of the infant to the surrounding air. This loss of heat is largely determined by the difference in temperature between the body surface and the environment, it also depends on the movement of air current, such that if it is rapid then convective heat loss is high. Convection is the major source of heat loss when neonates are exposed to cool, draughty rooms.[1,3]

Newborn infants loose heat by radiation from the body surface to the cooler objects in the vicinity, even though they are not in contact. The heat loss by radiation is proportional to the difference between these surface temperatures but independent of the temperature and speed of the air in the environment. This heat loss is more marked when a neonate is exposed naked in a delivery room or a single walled incubator.

Heat loss by evaporation from a newborn baby occurs when fluid (amniotic fluid or water) evaporates from the wet skin or from the respiratory tract to the air. Under normal environmental conditions in a term infant, evaporative heat loss amounts to about a quarter of the resting heat production.[4] This loss of heat by evaporation is more pronounced in the first 30 minutes and it exceeds the ability of the neonate to produce heat for the maintenance of the normal body temperature hence resulting in a fall of body temperature. Preterm infants have high evaporative heat losses because their insensible water loss is high compared with term infants.[5,6,7] This loss of heat is a result of a high transepidermal water loss which is up to six times higher per unit

surface area in a newborn baby of 26 weeks gestation than in a term infants.[8,9] The high transepidermal water loss occurs because the immature infant's skin has a thin, poorly keratinized skin that offers little resistance to the diffusion of water.

The care of the newborn baby can cause an increase in evaporative heat loss by several mechanisms, which include, damage of the skin which can be caused by monitoring probes or electrodes.[10] Exposure of the baby to radiant energy is another mechanism which may cause an increase in evaporative heat loss.[6,11,12,13] This increase can be explained partly by the higher surface temperatures, greater air speeds and lower local humidity when infants are exposed to radiant energy since these three physical factors increase evaporative heat loss.[13] Loss of body heat by conduction occurs when there is direct contact of the skin with a cooler object or surface such as a table, weighing scale, or rubber sheets. Fortunately the amount of heat that a newborn infant looses by conduction is small unless the baby is in direct contact with a metallic surface.[1,3]

Certain characteristics of newborn babies put them at an increased risk of heat loss compared to adults. These include, a relatively large surface area in relation to the body weight which is approximately three times that of adult.[14] In addition newborn babies have a large head in proportion to the body size and it is estimated that up to 75% of the body heat loss in neonates can be through uncovered head. Another factor which contributes to increased heat loss in newborn babies, especially those with low