Radiant warmers versus incubators for regulating body temperature in newborn infants

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Infants nursed under radiant warmers have higher insensible water loss, but the limitations in the trials included in this review do not permit the use of this conclusion as guidance for clinical practice. Where babies must be cared for under radiant warmers, it may be necessary to increase the calculated fluid requirement of treated infants.

RHL Commentary by Ogunlesi TA

1. INTRODUCTION

Hypothermia occurs commonly in newborn infants, primarily as a result of the physiological transition from the relatively warmer uterine environment to life outside the uterus. The incidence of hypothermia has been shown to be inversely related to the gestational age and body weight of the infant (1): the prevalence rises from 29% at the 10th minute of life to 83% at the 60th minute of life (2). One study in Uganda found that up to 85% of babies hospitalized in the country had hypothermia (3), which can cause morbidities like hypoglycaemia, acidosis and sclerema and can be a factor in specific disease conditions like asphyxia, septicaemia and intra-cranial haemorrhage. In addition, mortality among babies who were hypothermic at the point of admission to hospital was found in one study in Nigeria to be as high as 39.7% (4).

It is vital to keep newborn babies warm and help them to achieve thermoregulation in order to prevent morbidities and minimize the morbidities and mortality associated with hypothermia. Radiant warmers and incubators are some of the heating devices used for this purpose. Apart from the issue of reduced access to the infant, on the one hand, and protection from excessive handling, on the other, there are other important considerations in the use of heating devices. These include possible alterations of the physical environment and the effects in infants with regards to metabolism, oxygen consumption, fluid and electrolyte balance and weight gain pattern (5). These effects have implications for the caloric, fluid and electrolyte requirements of babies nursed under these heating devices and must be taken into consideration in the management of such babies.

The objective of the review was to compare the effects of radiant warmers and incubators on neonatal fluid and electrolyte balance, morbidity and mortality.

2. METHODS OF THE REVIEW
The methods used to search for trials were comprehensive, covering all the relevant databases and using specific search terms, but with the restriction of studies published in English alone. The authors sought only randomized controlled trials and quasi-randomized trials. The exclusion criteria included non-availability of data in formats that could be examined by the reviewers.

Overall, the methodology was sound, the statistical analysis was adequate and the data are presented in prose and tables with clarity.

3. RESULTS OF THE REVIEW

Eight trials with 156 infants were included in the review. Although, most of the infants studied in this review were of very low birth weight, the age at entry into the studies ranged from 4 hours to 35 days. Overall, the only statistically significant finding was increased insensible water loss (Weighted Mean Difference (WMD) 0.94g/kg/day; 95% confidence interval (CI) 0.47–1.41) among infants nursed under radiant warmers compared to infants nursed in incubators. This translates to a mean increase in insensible water loss among babies nursed under radiant warmers as 22.6 ml/kg/day. Similarly, there was higher oxygen consumption among infants nursed under radiant warmers compared with infants nursed in incubators, but the difference did not reach statistical significance (WMD 0.27ml/kg/min; 95% CI ?0.09 to 0.63). In addition, there was no statistically significant difference in other short- and long-term neonatal outcomes such as metabolic rate, time to regain birth weight and diseases such as chronic lung disease, patent ductus arteriosus, infections, necrotizing enterocolitis and intraventricular haemorrhage.

There were important shortcomings in the trials included in the review. The trials were heterogeneous in terms of infant characteristics such as age and weight as well as the duration of exposure to interventions. Indeed, six out of the eight reviewed trials adopted the cross-over design. In addition, there were variations in the kinds of cross-over intervention examined: three trials studied only radiant warmers and incubators, while the another three studied clothing, phototherapy and heat shields in addition to radiant warmers and incubators.

4. DISCUSSION

4.1 Applicability of the results

Since the trials reviewed were conducted in both developed and developing parts of the world, the results would be applicable to under-resourced settings. The authors of the review concluded that infants nursed under radiant warmers had a significantly higher insensible water loss, but the small number of infants in the trials as well as the methodological problems in the trials would disallow the use of this conclusion as guidance for clinical practice. However, the implication of the findings of this review is that increased insensible water loss must be added to the calculated fluid requirements for infants nursed under radiant warmers. This may appear to give the use of incubators an advantage over radiant warmers since the fluid requirement does not have to be altered, but the restriction of access to the infant nursed inside an incubator is a major hindrance in present-day newborn care.

4.2 Implementation of the intervention

Where babies must be cared for under radiant warmers, it may be necessary to increase the calculated fluid requirement of treated infants by 22 ml/kg/day, as suggested in the review. It is important to do this in order to reduce the risk of fluid and electrolytes imbalance in the infants. Additional fluids can be administered as intravenous infusion or as milk given via a nasogastric tube, in cases in which the intravenous route cannot be used. Health-care workers at the primary and secondary levels of care may need to be trained to adopt this practice. However, the requirement of provision of additional fluids should be adapted (and included in the local guidelines) with regards to special situations, such as infants at risk of inappropriate anti-diuretic hormone secretion from perinatal asphyxia, or those with patent ductus arteriosus who really need fluid
restriction as part of their management and yet also need to be nursed under a radiant warmer.

4.3 Implications for research

The scope of new trials should be expanded to include extremely low-birth-weight infants and entry into the study should be at birth, but may extend till the end of the newborn period in order to incorporate all the likely physiological changes that need to be considered in the interpretation of the findings. The effects of the interventions on specific neonatal morbidities like metabolic rate, time to regain birth weight, oxygen consumption need to be studied in addition to staff and parents’ satisfaction. Given that most under-resourced settings of the world rely heavily on warm cots for the care of newborn infants, it may be more useful to study also warm cots versus radiant warmer or warm cots versus incubators, with emphasis on both short- and long-term neonatal outcomes.

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References


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