Thermal Protection of Newborns: The World Health Organization Guidelines Need to Include Clear and Feasible Options for Low-Resource Settings

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ABSTRACT

Backgorund: Hypothermia in babies may increase mortality, directly or indirectly, by potentiating the effect of the other morbidities. Guidelines published by The World health organization (WHO) on newborn health (2015) may be inadequate to address the issue in a low-resource setting. To be relevant in such a context, they should be user-friendly for the trainers of health workers (HW) who may be responsible for interpreting the recommendations and training the HW.

Text: According to earlier guidelines (2013), 'No randomized or quasirandomized trial that evaluated the impact of keeping infants warm after discharge (hospital births) or after 24 hours (home births) was identified'. However, kangaroo mother care (KMC), a strong recommendation with moderate-quality evidence, and thermal protection are inseparable, as the most crucial component of KMC is skin-to-skin contact, which keeps a baby warm. A HW may be surprised when the guidelines or the basis change and, the move comes at a time when the earlier guidelines (1993) are just finding roots in patient care practices. Current guidelines are based on the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology, where randomized trials assume more importance. The guidelines recommend the following methods to keep infants warm after birth: KMC (strong recommendation, moderatequality evidence), intermittent KMC (strong recommendation, moderatequality evidence), and radiant warmers or incubators (strong recommendation, very low-quality evidence). The divergence between the evidence and the recommendations may be difficult for the HW to comprehend.

Conclusions: The guidelines for postnatal care need to be revisited and revised so that clear and feasible options for keeping infants warm in lowresource settings are offered. Besides KMC, warm rooms, heated mattresses, plastic wraps and Styrofoam boxes may be suggested.

What is already known about this subject?

- In the absence of a randomized or quasi-randomized trial that evaluated the impact of keeping infants warm, there are fewer options in a low-resource setting.
- They include Kangaroo mother care and incubators/radiant warmers.

What does this study add?

- Options that may not have been supported by randomized trials but have consistent results may be suggested.
- They include warm rooms, heated mattresses, plastic wraps and Styrofoam boxes.
- In future revisions, the level of evidence should be paired with the recommendations.

How might this impact on clinical practice or future developments? The health worker may choose the most feasible option at home or at a facility.

Keywords: GRADE methodology, hypothermia in a newborn, keeping babies warm, WHO guidelines on newborn care.

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I. INTRODUCTION

World Health Organization (WHO) guidelines are considered sacrosanct in developing countries. Guidelines on newborn care [1] are particularly valued as high-quality studies to support evidence-informed decisions are often difficult to conduct in low-resource settings. However, the WHO has been criticized for making recommendations that are not based on systematic reviews of the best available evidence, as well as for the quality of some of its guidelines [2]. In 2007, the WHO took measures to develop evidencebased guidelines based on the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology [3]. GRADE is a common and transparent approach to grading quality of evidence and strength of recommendations. However, guidelines based on this system may need suitable modifications when used in low-resource situations. The focus on evidence from randomized trials in these guidelines' risks overlooking relevant evidence from non-randomized trials or experience of field workers.

II. CHALLENGES WITH CURRENT GUIDELINES

In low-resource settings, hypothermia in newborns is a significant contributor to neonatal morbidity and mortality. Even in tropical environments, it is common among newborns at hospitals (prevalence range: 32% to 85%) and within homes (prevalence range: 11% to 92%) [4]. Thermal protection is an underappreciated neonatal intervention. Although hypothermia as a direct cause of death is rare, it contributes to adverse outcomes associated with severe neonatal infections, preterm birth, and asphyxia, which are the most common causes of neonatal deaths; however, the direction of causality is unclear [4]. In the WHO guidelines (2013), thermal protection receives nominal mention, which might be due to overlooked evidence or poor interpretation of included evidence. In effect, thermal protection is considered inconsequential to newborn care in the WHO guidelines.

Clinical practice guidelines are a recognized way of recommending courses of action based on research and established evidence. Where such evidence is not available, guidelines may use consensus-based practice points and identify areas requiring further research. This paper makes a case for thermal control as crucial to newborn care and proposes ways of implementing it in low-resource contexts. Further, this article presents considerations about practical ways of achieving thermal control in low-resource settings, where it might be a key to disease prevention and management.

The format and content of guidelines play an essential role in their adoption and integration into clinical practice. A field worker may be surprised when directions change, especially if the change comes at a time when the previous version of the guidelines is just becoming established in-patient care [5].

According to 2013 WHO guidelines on postnatal care, "No randomized or quasi-randomized trial that evaluated the impact of keeping infants warm after discharge (hospital births) or after 24 hours (home births) was identified" [6]. The recommendations all but directly question the importance of this intervention. In reality, kangaroo mother care (KMC), which is a strong recommendation, is inseparable from

thermal protection. The most critical component of KMC is skin-to-skin contact, which aims to keep a baby warm; the other ingredients are context-specific [7].

Accurate measurement of the impact of thermal control alone might not be possible, creating an impression that its effect might not be significant. In such a case, it may be useful to consider a bundled approach to evidence, with thermal control as a component [8]. This approach is particularly relevant given that thermal protection, in general, is not offered in isolation from other interventions recommended in the care of a preterm or sick infant. Feeding support, antibiotics, and oxygen administration tend to be provided concurrently.

III. PROPOSED CHANGES TO THE CURRENT GUIDELINES

The WHO guidelines recommend the following methods to keep infants warm after birth: KMC (strong recommendation, moderate-quality evidence), intermittent KMC (strong recommendation, moderate-quality evidence), and radiant warmers or incubators (strong recommendation, very low-quality evidence). Efforts should be made to bring about the socio-cultural change necessary to enhance the implementation of the KMC and, more options for keeping babies warm, based on currently available evidence, need to be offered. For example, in many countries, a warm room may be the most practical solution possible [5]. A "warm room" is a form of space heating to meet the needs of preterm and sick babies. The warm area so designed can be achieved by electrical [8] (Fig 1) or solar heaters [9] (Fig 2). A previous study has shown that warm rooms are effective at keeping infants warm [8]. Graded warm rooms go a step further in meeting the thermal needs of babies with different birth weights [5]. In general, infants that weigh 1-1.5 kg at birth need room temperature between 34-35.5 °C (93-96 °F) during the first weeks of life, while infants that weigh 1.5–2 kg need an initial temperature within 32–34 °C (90–93 °F). For infants that weigh more than 2.5 kg at birth, warm room temperature within 28–30 °C (82–86 °F) is sufficient [5].



Fig. 1. Electrically-heated warm room at rural hospital, Kasa.



Fig. 2. Solarly heated warm room at J. J. Hospital, Mumbai.

A Styrofoam box is another low-cost option that may be used as a home or transport incubator and may complement KMC as a home incubator (Fig. 3 and 4). As a minimum, a premature baby should be placed in a Styrofoam box for thermal protection when not in KMC [10]. However, extensive, well-designed studies are needed to confirm the safety and efficacy of these boxes for keeping premature babies warm, reducing early neonatal mortality, and optimizing or complementing KMC in resource-limited settings.

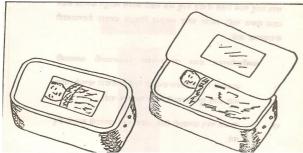


Fig. 3. A baby in a Styrofoam box at home: a graphic representation.



Fig. 4. Styrofoam box for transportation from home to hospital

A different option for keeping babies warm, which is relatively expensive, is a heated, water-filled mattress consisting of a polyvinyl chloride bag filled with 10 liters of water [11]. The mattress includes a coil within a pad that heats it. In one study, healthy preterm babies were provided warmth in their cots by thermo-controlled, heated, water-filled mattresses; these infants were compared with infants of the same weight who were kept warm in air-heated incubators, and no differences were found in minimal oxygen

consumption, rectal and mean skin temperatures, or daily weight gain. The infants were kept just as warm on the heated, water-filled mattresses as in air-heated incubators [11]. Other studies have also found that water-filled mattresses are effective in keeping babies warm [12]-[14].

A randomized controlled trial (RCT) tested an intervention in which the babies were wrapped in a plastic bag, wrap, or cap immediately following vaginal birth or cesarean section (before drying) [15]. The bag, wrap, or cap remained on until the neonate had been stabilized or had a normal body temperature. Materials used for wrapping included saran wrap (a transparent polythene film or sheet), shopping bags, and other manufactured plastic sheets. In the control group, thermal care was provided using incubators or radiant warmers, or by keeping the baby wrapped in cloths in a warm room. Three RCTs involving 229 very preterm neonates (≤29 weeks) showed a 42% reduction in the risk of hypothermia (temperature <36.5 °C) with the use of a plastic bag, compared to controls (absolute risk: 46.0% vs. 79.0%; RR 0.58, 95% CI 0.46–0.72) [15]. Plastic wraps were also associated with a reduction in risk of hypothermia in more mature preterm neonates. Plastic materials are affordable and ubiquitous, even in low-resource settings, where incubators might not be available; thus, this type of intervention may be included in the recommendations to improve outcomes of preterm infants in low-resource settings.

Given the challenges present in low-resources settings, adding to the guidelines a simplified method of assessing thermal adequacy (in the absence of thermometry) might be relevant. For example, examining an 'infant's plantar soles may be useful for this purpose (Fig. 5), as soles that are pink and warm indicate thermal adequacy [16].

Plantar soles for assessment of thermal adequacy

Adequate warmth

(Plantar soles: warm and pink, abdomen warm)



Cold Stress

(Plantar soles: cool and pale, abdomen warm)



Hypothermia

(Plantar soles: cold and blue & abdomen cool) Fig. 5. Simplified way to assess thermal adequacy.

The current WHO guidelines do not adequately consider

the methods for keeping infants warm described above and lack recommendations for practical interventions that can supplement KMC in low-resource settings. Moreover, the current systems for grading evidence do not always accurately reflect the strength of evidence [17], [18] reported by non-randomized trials.

In future revisions, the evidence should be paired with recommendations, and that the rationale for the proposal is clearly stated, particularly in cases where the strength of evidence on which the recommendation is based is low. This is particularly important for the interventions that are not supported with randomized clinical trials or those assessments that delivered consistent results, such as warm rooms, heated mattresses, plastic wraps, and Styrofoam boxes.

IV. CONCLUSIONS

Improved newborn care, including thermal protection, can play a crucial role in achieving the sustainable development goal (SDG 3.2) of reducing mortality among children under 5-years-old [19]. The WHO guidelines need to include a wider variety of options for keeping infants warm, allowing field workers such as nurses or community health workers in low-resource settings to choose the most feasible option in their context. Moreover, the addition of a simplified method for assessing thermal adequacy may be worthwhile. Finally, any revision of the guidelines should be presented clearly and direct, so that the trainers of HW can interpret them. The instructions might include formatting with definite do or don't for various scenarios.

In summary, WHO guidelines for postnatal care need to be revised to offer clear and feasible options for keeping infants warm in low-resource settings. Additionally, grading systems used for making evidence-based decisions should consider the difficulty of implementing randomized studies in these settings.

LIST OF ABBREVIATIONS

WHO, World Health Organization; GRADE, Grading of Recommendations Assessment, Development Evaluation; KMC, kangaroo mother care; RCT, randomized controlled trial; SDG, sustainable development goal.

ETHICS APPROVAL

The consent was waived due to the retrospective nature of the review.

CONSENT TO PARTICIPATE

Not applicable (This is not an original study. In this commentary, the studies from literature are simply referred to).

AVAILABILITY OF DATA AND MATERIAL

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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