7.1% chlorhexidine gel for umbilical cord care: implication for WHO's recommendation for a standard cord care practice

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ABSTRACT

Neonatal mortality has been a bane especially in the developing world. Neonatal infection is the second cause of neonatal death after prematurity. The umbilical cord is one such vulnerable route via which newborns are infected, the responsible organisms most likely originate from the maternal genital tract and are acquired during labor and delivery. Such high-infection-related deaths make it necessary to identify simple and cost-effective interventions that can be implemented in all settings across the world. WHO has recommended the use of 7.1% chlorhexidine gel in areas of high neonatal mortality to replace the use of harmful substances on the umbilical stump. However, in Nigeria, studies are needed to establish the umbilical cord separation time, mothers' compliance and satisfaction with use of chlorhexidine.

Keywords: chlorhexidine gel, umbilical cord, omphalitis, neonatal mortality

Introduction

Each year, about 3 million newborns die globally [1]; accounting for 40 % of global under-five mortality [2]. Annually, serious infections account for nearly 30 % of the 3 million neonatal deaths; in settings with high-mortality rates, this proportion is closer to 50 % [3]. Such high-infection-related deaths make it pertinent therefore to identify simple and cost-effective interventions that can be implemented in all settings across the world. Use of topical antiseptics is one such intervention that is been envisaged to reduce the incidence of infections by preventing or limiting bacterial colonization of the skin or umbilical cord in newborns. Five countries namely India, Nigeria, Congo, Pakistan and China alone account for half of the global deaths from infections and 53.3 % (1.636 million) of neonatal deaths [1]. Community based studies from developing countries found that infection accounts for about 8 to 80 % of all neonatal mortality, and as many as 42 % deaths in first week of life [4].

In Nigeria, an estimated 276,000 neonatal deaths occurs annually; 60,000 of these deaths stem from infection, while about 20,000 of these deaths are umbilical cord related [5]. Most of these deaths occur in rural areas and northern Nigeria [6]. Nigeria has the second highest number of neonatal deaths in the world after India [5]. The Nigeria demographic and health survey (NDHS) 2013 [6] estimated its neonatal mortality rate as 37 per 1000 live births, which constituted about 54% of infant mortality. Nigeria contributed 6% to the global neonatal deaths in 2005, while the country moved from the third to the second position in terms of the highest number of neonatal deaths in the world between 2000 and 2010 [7].

Omphalitis is an important cause of neonatal mortality and preventing this condition and its associated neonatal mortality is of high public health importance. While the use of clean birth kits, hand washing and careful attention to hygiene in the days after birth may all be important components of a program to reduce neonatal sepsis; however, none of these interventions have to date provided unequivocal evidence that they can reduce infection-related neonatal mortality. The three randomized controlled trial systematically reviewed by Imdad, Mullany et al (2013) [8], provided substantial evidence that umbilical cord stump treatment with 4% chlorhexidine (CHG) reduces both omphalitis and neonatal mortality, with the impact likely greater in preterm and low birth weight infants.

Current World Health Organization recommendation for umbilical cord care

In January 2014, the WHO issued a new recommendation for umbilical cord care. *Daily application of 7.1% chlorhexidine digluconate aqueous solution or gel, delivering 4% chlorhexidine to the umbilical cord stump during the first week of life for newborns delivered at home in settings with high neonatal mortality (30 or more neonatal deaths per 1000 live births). While clean, dry cord care is recommended for newborns delivered in health facilities and at home in low neonatal mortality settings. The use of chlorhexidine in these situations may be considered only to replace application of a harmful traditional substance, such as cow dung, to the umbilical cord stump* [9]

WHO in 1998 initially recommended dry umbilical cord care (that is, not applying anything to the cord); but study by Chlorhexidine working group (2016) has shown that 90% of mothers apply one substance or the other to the umbilical stump [5]. This practice of mandatorily using substances on the umbilical cord appears to have a psychological and/or cultural inclination that requires thorough health education to curb. It was on this premise that WHO recommended use of chlorhexidine gel if at all something must be applied to the cord stump.

Example of some traditional cord care practices that called for WHO's recommendation of a standard cord care agent

Various health institutions and cultures adopt different methods of cord care. While most orthodox health institutions in Nigeria currently advocate the use of methylated spirit, WHO (2013) recently introduced 7.1% chlorhexidine in countries with high neonatal mortality; while advising no treatment at all but keeping the cord clean and dry for developed countries [9]. Some cord care practices in some countries include:

- **Nigeria:** non beneficial practices such as use of hot compress, herbs, native chalk, salt, sand, saliva, palm oil, menthol-containing balm, petroleum jelly and toothpaste - substances were used alone or in combination and mainly applied at home. Others include fomentation with dry heat, application of white powder, charcoal and bandaging to prevent infection.
- **Turkey**: use of dry coffee, sugared fat, olive oil, rotten tree powder, myrtle, hellebore, black sesame, burnt cloth, tying the belly with a rope and putting a buttered cloth over the infant's infected belly [10].

- **Zambia**: Different substances had different purposes. If cord is too brittle, cracking, bleeding, a substance that increases softness is used (Vaseline, cooking or motor oil, *mabono* (wild fruit), or cream from sour milk). If cord takes too long to separate, items to dry it are used such as: baby powder, charcoal dust, dried cow dung, dried chicken droppings (roaster for male babies and hen for female babies), dust from threshold of home, ash from burnt pumpkin stem, crushed *loma* (wasps nest), or mud. These would be pounded into a fine powder. Medicinal substances: python snake oil, breast milk, banana, cow dung, *mukunku* (tree bark), traditional herbs, and dirt from pounding stick are also used [11].
- **Bangladesh**: Turmeric, boric powder, mustard oil, ash, coconut oil, Nebanol ointment, ginger, chewed rice, heat treatment of cord, talcum powder, *chular mati* (earth from a clay oven) and smashed garlic [12].
- **Uganda:** Herbs, onions, ash from burnt papyrus, petroleum jelly, powder, saliva, ghee, soot mixed with ghee, water, butter, salty water, Vaseline, normal saline, ripe banana, sap, ash, lizard droppings [13].
- **Tanzania**: Saliva, dirty door powder from old door, hot knife, charcoal powder, ground sea shells, burning wood, banana steam, fish bone, talcum powder, and fire steam[14]; traditional herbs + cooking oil or water that was used to wash the genitals of an elderly woman.
- **Pakistan:** Coconut oil, mustard oil, ghee, olive oil, surma/kohl, turmeric, machine oil, Antimony, detol and wheat flour [15].
- **Napel:** Mustard oil, antiseptic, ash, mud, breast milk, herbs/ spices, saliva, plain water, toothpaste [16].
- **India**: Turmeric, burning tip with castor oil lamp, antiseptic ointment.
- **Haiti**: dirt from house threshold, burnt nutmeg, ash burned cotton, crushed charcoal, palm oil, mixture of leaves and animal dung.
- **Sierra Leone**: pounded cassava

Caregivers' reasons for cord care

Studies by Amare, 2014 found out two main reasons behind caregivers' intention of applying a substance to the umbilical cord. The first reason is to promote healing of the so called "unique wound"; secondly, is to hasten the separation of the cord either by keeping the cord stump moist or by drying it out stimulating its occurrence within the first few days of life [17] despite the fact that studies by Imuetinyan (2011) have shown that normal cord separation time can extend for as long as 28 days in some cases [18] Other reasons include preventing "wind" (evil spirit) from going into the baby: to prevent pains and bad smell. In Africa, mothers are often desperate to hasten the time of cord dropping; the longer time the umbilical cord takes to drop, the more likely it is that a more harmful intervention is introduced, and the greater the risk of infection. They tend to indulge in various cultural practices to hasten even the time for a healthy normal cord to separate thereby, introducing infection. This uncalled-for-interventions is common in some cultures where the mother or baby's activity of daily living is restricted (for example, not allowing the mother or baby to go out, delaying baby's bath) until the umbilical stump falls off.

Chlorhexidne digluconate

Chlorhexidine digluconate is a biguanide compound used as an antiseptic agent with topical antibacterial activity. Chlorhexidine gluconate penetrates into the cell and causes leakage of intracellular components leading to cell death [19]. Chlorhexidine has the following advantageous properties as a topical cord care agent: it released slowly, longer duration of action, not affected by the presence of body fluids, dissolve easily in water, it has an excellent safety profile, is rarely associated with bacterial resistance, is easy to administer and costs few naira per application [2]. Available high-quality evidence from the recently conducted Cochrane review indicates that cord cleansing with 4 % chlorhexidine reduces the risk of neonatal mortality by 12 % and omphalitis/infections by 50 % in low-resource community settings including Nepal, Bangladesh, and Pakistan [20]. However, the review showed that in hospital settings, chlorhexidine cord cleansing reduces the risk of omphalitis/infections by 52 % and may lead to no difference in neonatal mortality as compared to dry cord care [20]. In spite of these benefits, studies by Imdad, Mullany et al (2013) have shown that it prolongs the time for the cord to drop when compared with other methods like dry cord care [8]. Contrary to the findings from South Asia countries, the only two randomized controlled trials conducted in Africa (Tanzania and

Zambia) on chlorhexidine use gave no significant reduction in neonatal mortality when compared to dry cord care.

In Nigeria, various state government are investing into the lives of the citizens; programs has been put up to scale up the use of chlorhexidine with Sokoto state government taking the lead, followed by Bauchi and Ogun state government. Recently, on 14th March, 2017 the governor of Kogi state flagged off the adoption of chlorhexidine gel for umbilical cord care to replace the use of methylated spirit in the state with the vision of reducing neonatal mortality.

Now how do we reconcile these high evidence studies from South Asia countries and those conducted in Africa so as to implement best policies? If the use of chlorhexidine gel prolongs umbilical cord separation time when compared with other cord care methods, it means that desperate mothers are likely to introduce other harmful methods to hasten the cord separation thereby, increasing the likelihood of infection thus, the essence WHO introduced chlorhexidine gel is defeated. Also if there is no significant difference in neonatal mortality between the use of chlorhexidine and dry cord care in settings of high neonatal mortality (more than 30 in 1000), then there is no point incurring economic cost from the purchase of chlorhexidine. However, a detailed pooled meta-analysis from different settings across the globe is needed to inform policies.

Conclusion

The desire to care for the umbilical cord has been found to be universal culturally; a myriad of substances are used by different cultural groups. Though some of these substances are not totally harmful, but there therapeutic effect has not been established empirically. WHO has recommended the use of 7.1% chlorhexidine gel especially in settings with high neonatal mortality. To guarantee that mothers will use this gel judiciously as recommended; it is pertinent therefore, to put up more studies on this novel cord care agent so as to inform better policies.

Recommendation

Chlorhexidine gel for umbilical cord care is still a novel intervention in Nigeria, and no study was found on its use in Nigeria; More evidence based studies will be of benefit in the following areas: its effect on cord separation time, effect on mortality/morbidity, Mother's compliance and

satisfaction with use, factors that will impede its use and its effect on very low birth weight babies.

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