Chlorhexidine for Umbilical Cord Care:
A new, low-cost intervention to reduce newborn mortality

Cord care with 7.1% chlorhexidine digluconate saves newborn lives

Key facts:

- Each year 3 million newborns die globally, and infection causes approximately 13% of these deaths.[1] Poor hygiene and antisepsis at birth and in the first week of life increases the risk of deadly but preventable infections.

- 7.1% chlorhexidine digluconate was added to the 2013 World Health Organization (WHO) List of Essential Medicines for Children, specifically for umbilical cord care.

- Chlorhexidine has an excellent safety record and is an acceptable, feasible, and cost-effective intervention. It can be easily administered by health professionals, including community health workers, as well as family members.

- In January 2014, the WHO issued a new recommendation for umbilical cord care. *"Daily chlorhexidine (7.1% chlorhexidine digluconate aqueous solution or gel, delivering 4% chlorhexidine) application to the umbilical cord stump during the first week of life is recommended for newborns who are born at home in settings with high neonatal mortality (30 or more neonatal deaths per 1000 live births). Clean, dry cord care is recommended for newborns born in health facilities and at home in low neonatal mortality settings. Use of chlorhexidine in these situations may be considered only to replace application of a harmful traditional substance, such as cow dung, to the cord stump".[2]*

Pathogenesis and prevention

The recently-cut umbilical cord is an entry point for bacteria that can cause newborn sepsis and death. Bacteria rapidly colonize the moist cord stump and have direct access to the bloodstream through umbilical vessels that remain patent for the first few days after birth. In addition, bacterial colonization may lead to cord infection (omphalitis) with potential spread to the surrounding tissues and blood stream. Ensuring optimal cord care at birth and in the first week of life (including use of chlorhexidine), especially in settings with poor hygiene, is a crucial strategy to prevent life-threatening sepsis and cord infections, and avert preventable neonatal deaths.

2.95 million
Annual number of newborn deaths[1]

Hundreds of thousands
Potential annual number of newborn lives saved globally from widespread chlorhexidine use[3]

Countries moving forward

In late 2011, Nepal became the first country to introduce chlorhexidine at scale for umbilical cord care. The Government of Nepal approved the use of chlorhexidine as part of essential newborn care for both home and facility births. The product is now included in the national essential drug list and is provided by a local pharmaceutical company.

Scale-up involves the integration of chlorhexidine into ongoing government services and incorporation into pre-service and in-service training curricula for professionally qualified birth attendants.

Countries in sub-Saharan Africa have also begun to move forward with chlorhexidine for umbilical cord care. Recently, chlorhexidine was introduced for cord care in the Nigerian state of Sokoto through community-based distribution. As a result of this successful effort, the Nigerian Ministry of Health has made 7.1% chlorhexidine digluconate a priority commodity for newborn health and has committed to scaling it nationally. Efforts to establish local production capacity in the country are also underway. Both Liberia and Madagascar have completed formative research and are now beginning pilot introduction programs of 7.1% chlorhexidine digluconate for umbilical cord care. Further, the adoption of chlorhexidine for umbilical cord care is under earnest consideration by the ministries of health in several other countries in sub-Saharan Africa and South Asia.

Mother and newborn in Bangladesh.
Photo: PATH/Mutsumi Metzler.

Context for research trials: Nepal, Bangladesh, and Pakistan

The three countries where chlorhexidine research has been conducted have many factors in common. Neonatal mortality is a high proportion of under-5 mortality, and progress has slowed in the latter half of the first decade of this century. In each, institutional deliveries are increasing but the majority of births still take place at home. All three countries have well-developed essential newborn care policies and guidelines, as well as policies on "clean and dry" umbilical cord care. The national neonatal mortality rates range from moderate to high. Challenges to the health systems are similar including insufficient coverage of existing high-priority interventions. All studies applied 7.1% chlorhexidine digluconate liquid on the day of birth, followed by once-daily applications ranging from 7 to 14 days post-birth. The studies were cluster randomized control trials, so the evidence is high grade. Over 90% of the births included in the studies happened at home.

Key Findings: Nepal[4]

- Chlorhexidine was applied to the umbilical cord by project field workers 7 times in the first 10 days, according to a specified regimen.

- Compared to dry cord care, chlorhexidine cord care reduced newborn deaths among those enrolled in the study by 24% and reduced severe omphalitis by 75%.

- Neonatal deaths were reduced by 34% if chlorhexidine was first applied within 24 hours of birth (but deaths were not reduced among those who had the first application more than 24 hours after birth).

Key Findings: Bangladesh[5]

- Two regimens were compared to the standard recommendation of dry cord care: a single chlorhexidine application only on the day of birth, and 7-day chlorhexidine application.

- Single chlorhexidine application on the first day of life reduced newborn deaths among those enrolled in the study by 20%, and moderately reduced severe omphalitis, as well as cord bacterial colonization 7-day chlorhexidine application reduced severe cord infection by 65% and reduced bacterial colonization; but neonatal mortality was only 6% lower in this group than among controls (not statistically significant). The investigators concluded that the relative lack of mortality effect in the 7-day chlorhexidine application group had occurred as a result of chance.

- Mortality reduction was greatest in preterm babies.

Key Findings: Pakistan[6]

- In this effectiveness trial and within the context of existing government programs, traditional birth attendants applied chlorhexidine on the day of birth and promoted and distributed chlorhexidine for umbilical cord care for home births for use during the first two weeks after birth, with members of the control group counseled to practice dry cord care.

- Neonatal deaths were 38% lower in the chlorhexidine group compared to the dry cord care group.

- Severe cord infection was 42% lower in the chlorhexidine cord care compared to the dry cord care group.

Acceptability and feasibility

Independent operational research in Bangladesh, Nepal, and Pakistan demonstrated that different formulations (e.g., liquid, gel) of chlorhexidine were acceptable to families, and that families typically were able to use the product as recommended. A pilot study in four districts in Nepal showed that chlorhexidine cord care could feasibly be delivered through the government's existing cadre of Community Health Workers and Female Community Health Volunteers at relatively high coverage.[7] Based on these findings, the government of Nepal is now scaling the use of chlorhexidine for umbilical cord care nationally.

Products examples. *Photo: PATH/Patrick McKern.*

Product description

- Chlorhexidine is an antiseptic with a broad spectrum of activity against gram-negative and gram-positive bacteria.

- There is a 40-year history of chlorhexidine use for the umbilical cord from developed countries, as well as widespread experience using chlorhexidine as a presurgical and an oral antiseptic.

- The safety record has been well established, in adults as well as in newborns. For umbilical care, a concentration of 7.1% was selected to be sufficiently potent as an antiseptic.[8]

- Beyond the direct antiseptic effect, chlorhexidine cord care may replace common, harmful practices such as applying substances to the cord.

Cost effectiveness

Preliminary cost-effectiveness estimates from the Bangladesh research study suggest that if chlorhexidine is added onto an existing community-based essential newborn care program, the mean incremental cost per DALY averted is less than US $10.00.[9] This estimate falls well within the range of other low-cost, high-priority interventions recommended for adoption in South Asia by the Disease Control Priorities Project, 2nd Edition, including childhood immunizations for TB, DPT, polio and measles ($8.00); HIV/AIDS services voluntary testing and counseling, ARVs to prevent vertical transmission, etc. ($68); surgical services and emergency care ($109); community case management of childhood pneumonia ($146); and maternal and newborn care, inclusive of increased primary care, targeted newborn care, and improved emergency and newborn care ($261).[10]

Mother Rihana Maniyar, with assistance from a Female Community Health Volunteer, applied chlorhexidine to her baby's umbilical cord soon after birth to prevent infection. Banke District, Nepal. *Photo: Save the Children/ Nayan Pokhrel Sindhuliya.*

Delivery strategies

Chlorhexidine can be delivered through existing health services and initiatives such as antenatal and delivery care, and postnatal care in the first days and week of life including essential newborn care. It can also be provided through retail outlets including pharmacies, providers working in in public facilities and/or communities (e.g., traditional birth attendants), and community health workers who have contact with pregnant women.
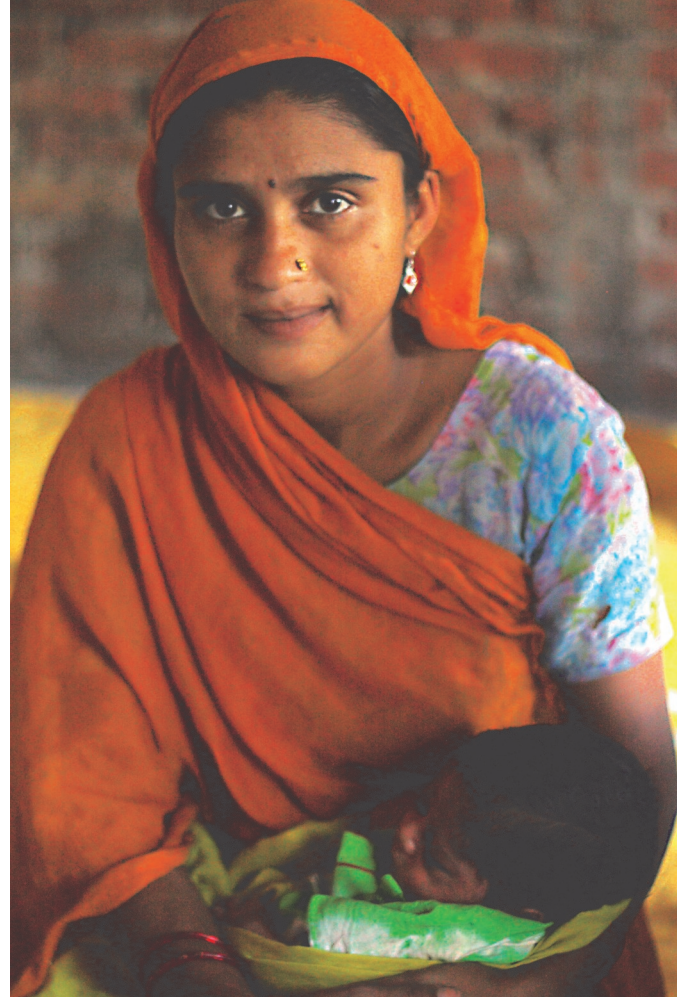
How to apply

Immediately after cutting the cord, apply chlorhexidine to the tip of the cord, the stump and around the base of the stump. If feasible, repeat application once daily through the first week of life or until the cord separates. It is most important that chlorhexidine be applied early; further benefits may be realized from multiple applications, including reduced local infection and displacement of non-hygienic traditional applications.

Product Availability

Chlorhexidine for umbilical cord care comes in both gel and liquid forms. The gel is currently available from Lomus Pharmaceuticals in Nepal (http://www.lomus.com.np/; info@lomus.com.np) and Drugfield Pharmaceuticals in Nigeria (http://www.drugfieldpharma.com/en/) . The liquid is available through the UNICEF Supply Division Catalogue (https://supply.unicef.org).

7.1% chlorhexidine digluconate as gel or liquid is relatively simple to produce and would be amenable to local production by facilities that meet GMP. Technical assistance may be available to help countries identify local/regional manufacturers to make this product more accessible and available.

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For more information about chlorhexidine for umbilical cord care, please visit the chlorhexidine technical resource page on the Healthy Newborn Network site:

www.healthynewbornnetwork.org/topic/chlorhexidine-umbilical-cord-care

The Chlorhexidine Working Group

The Chlorhexidine Working Group is an international collaboration of organizations committed to advancing the use of 7.1% chlorhexidine digluconate (delivering 4% chlorhexidine) for umbilical cord care through advocacy and technical assistance.

PATH is the chair of the CWG, and members include individuals representing (alphabetically): Bill & Melinda Gates Foundation; Boston University; Clinton Health Access Initiative; GlaxoSmithKline; Global Health Action; Jhpiego; John Snow, Inc., Johns Hopkins Bloomberg School of Public Health; Lomus Pharmaceuticals Pvt. Ltd., the Maternal and Child Health Integrated Program; PATH; Promoting the Quality of Medicines Program/United States Pharmacopeia; Population Services International; Save the Children/Saving Newborn Lives program; Systems for Improved Access to Pharmaceuticals and Services Program/Management Sciences for Health; United Nations Children's Fund; the United States Agency for International Development; University of Illinois at Chicago, College of Nursing, Venture Strategies Innovations; and the World Health Organization.

During an antenatal visit, Female Community Health Volunteer Sita uses a doll to show mother Bimala how to apply chlorhexidine properly. Banke district, Nepal.

Photo: Save the Children/Nayan Pokhrel Sindhuliya

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3. Segre, Coffey, Metzler, et al. Chlorhexidine for Umbilical Cord Care. A case study prepare for the UN Commission on Life-Saving Commodities for Women and Children. February 2012.

4. Mullany LC, Darmstadt GL, Khatry SK, et al. Topical applications of chlorhexidine to the umbilical cord for prevention of omphalitis and neonatal mortality in southern Nepal: A community-based, cluster-randomised trial. *Lancet.* 2006;367(9514):910–918.

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6. Soofi S, Cousens S, Imdad A, et al. Topical application of chlorhexidine to neonatal umbilical cords for prevention of omphalitis and neonatal mortality in a rural district of Pakistan: a community-based, cluster-randomised trial. *Lancet.* 2012;379(9820):1029–1036.

7. PATH for the Chlorhexidine Working Group. Chlorhexidine for Umbilical Cord Care: Evidence Base and the Way Forward. November 2011.

8. Mullany LC, Darmstadt GL, Tielsch JM. Safety and impact of chlorhexidine antisepsis interventions for improving neonatal health in developing countries. *Pediatric Infectious Disease Journal.* 2006;25(8):665–675.

9. Costs were derived incrementally on top of existing platform of maternal and newborn health services, from a program perspective and included operational and support costs as well as costs associated with product delivery through village health workers and supervising community health workers. Costs may be higher or lower in non-effectiveness trial settings, and/or where an existing platform and infrastructure for community based maternal and newborn health does not exist.

10. Musgrove, Fox-Rushby. Cost-effectiveness analysis for priority setting. Chapter 15 in: Jamison D et al. *Disease Control Priorities in Developing Countries* (2nd edition). The World Bank and Oxford University Press; 2006.

PATH is the Secretariat for the CWG, which includes representation from the following organizations: