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REVIEW ARTICLE

Traditional preparations used as uterotonics in Sub-Saharan Africa and their pharmacologic effects

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ABSTRACT

Background: Little is known about the use of traditional preparations for uterotonic effects at or near delivery in Sub-Saharan Africa. *Objective:* To describe (1) use of traditional preparations in Sub-Saharan Africa intended to have uterotonic effects at or near birth; and (2) results of pharmacologic investigations of the uterotonic properties of such preparations. *Search strategy:* Structured review of 13 databases. *Selection criteria:* Articles describing use of traditional preparations in Sub-Saharan Africa with primary data, published in English between January 1, 1980 and June 30, 2010. *Data collection and analysis:* Full-text review using standard spreadsheet templates. *Main results:* Objective 1 analysis identified 208 plant species used for uterotonic effects at or near delivery. The most common use was labor induction/augmentation (n = 185). Other uses were to expel the placenta, shorten the third stage of labor, manage retained placenta (n = 61), and prevent/manage postpartum hemorrhage (n = 20). Objective 2 analysis identified 82 species with uterotonic activity confirmed through pharmacologic evaluation. Studies also identified potentiating/inhibiting effects of extracts on pharmaceutical uterotonics. *Conclusion:* Numerous plants are used for uterotonic effects in Sub-Saharan Africa; uterotonic activity has been confirmed in many through pharmacologic evaluation. Such use may increase the risk of adverse outcomes. Further research is needed on the uterotonic efficacy of traditional preparations and on interventions to address use during labor.

1. Introduction

Around 350 000 women die of maternal causes annually [1,2]. Most of these deaths occur in low-resource countries, and nearly three-fifths in Sub-Saharan Africa [2]. The most common cause of maternal mortality in Sub-Saharan Africa is obstetric hemorrhage [3]. Most maternal deaths are preventable through access to emergency obstetric care (EmOC) and evidence-based interventions such as active management of the third stage of labor (AMTSL). AMTSL includes administration of a pharmaceutical uterotonic (e.g. oxytocin or misoprostol) immediately following delivery to prevent postpartum hemorrhage (PPH) due to uterine atony [4,5].

As less than half of births in Sub-Saharan Africa are attended by a skilled provider, universal access to interventions such as AMTSL is low [6]. In this context, it is important for policies and programs to consider the widespread use of traditional medicines in the region during pregnancy and delivery. Hospital-based studies in South Africa have estimated that 43%–55% of women have used traditional preparations during pregnancy [7]. A South African study found that 32% of pregnant women utilized traditional preparations known as *imbelikisane* to induce or augment labor [8]. A recent Nigerian study found that 62% of surveyed women had utilized herbal medicines during pregnancy [9]. High proportions of traditional birth attendants (TBAs) provide herbal medications to women during pregnancy or at or near delivery, including for intended uterotonic effects [10–12]. Studies in Nigeria and Kenya documented that nearly 25% of TBAs utilized herbal preparations to expel retained placenta [13,14]. The Kenya study also noted that TBAs consider labor prolonged only after herbal medicines to augment labor have failed [14].

The fact that traditional medicines may have uterotonic effects is an important public health consideration [15]. A trial comparing a Tibetan traditional product with misoprostol for PPH prevention found that although misoprostol was more effective in reducing PPH, the traditional product had uterotonic effects [16]. While there may be potential for utilizing traditional preparations in PPH prevention, their uterotonic effects can also have adverse consequences, particularly if used to induce or accelerate labor. Studies in Malawi and Uganda have suggested that traditional medicines may be implicated in a substantial proportion of analyzed maternal deaths [17,18]. Other studies have suggested that herbal medicines are involved in adverse maternal and fetal outcomes such as uterine rupture and meconium aspiration [19–22].

A number of studies have investigated the pharmacologic activity of individual plants used at or near delivery. Resources such as the

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Prelude Medicinal Plants Database have documented the use of plants for numerous indications [23] and some reviews have documented plants used in traditional herbal mixtures taken during pregnancy and at or near delivery [24,25].

However, the literature is lacking a systematic investigation of traditional preparations used for intended uterotonic effects at or near time of delivery across Sub-Saharan Africa, as well as a systematic documentation of findings of pharmacologic investigations of preparations taken for these purposes. Finally, much relevant anthropological and ethnobotanical literature has not been organized and targeted for a public health audience.

2. Review objectives

The present structured review was undertaken with 2 objectives: (1) to describe the use of traditional preparations in Sub-Saharan Africa intended to have uterotonic effects at or near birth including inducing, augmenting, or speeding labor, or for preventing and treating PPH; and (2) to describe the results of pharmacologic investigations of uterotonic properties of traditional preparations used in Sub-Saharan Africa at or near time of delivery.

3. Materials and methods

A review of 13 medical, public health, and social sciences databases was conducted, restricted to periodical literature published between January 1, 1980 and June 30, 2010. Databases included Scopus, Global Health, Embase, JSTOR, CINAHL, PubMed, POPLINE, IndMED, CSA Sociological Abstracts, Anthropology Plus, AnthroSource, Development Experience Clearinghouse, and ProQuest Dissertations. The journal *Medical Anthropology* was also reviewed. Search terms combined words and phrases such as: home birth; traditional medicine; pregnancy; herbal; uterotonic; oxytocic; postpartum; hemorrhage; developing country; Africa; pregnancy outcome; labor (obstetric); and delivery (obstetric). Searches were adapted to databases' terminology and topic categories.

Journal articles identified through searches were included based on citation/abstract review if they were published in English within the specified period, contained primary data, and discussed use of traditional preparations in Sub-Saharan Africa. Articles were excluded based on citation/abstract review if they were review articles without primary data, referred solely to hospital practices, or exclusively addressed practices before 1980. Dissertations, conference publications, and books were excluded.

Articles meeting these criteria that could be located received full-text review. During full-text review, articles were excluded from analysis if exclusively describing:

- General classes of preparations (e.g. South Africa's *isihlambezo* and *imbelikisane*) without identification of specific plants.
- Use of traditional preparations early in pregnancy or in prenatal care, rather than at or near delivery.
- Use of traditional preparations for newborn care.
- Preparations that do not come into contact with the pregnant/delivering woman's body, e.g. "buried at door."
- Use of traditional preparations at or near delivery solely to prevent or manage infections or pain.
- Use of preparations to prevent or treat postpartum bleeding due to lacerations and other wounds (versus uterotonic mechanisms).
- Use of preparations derived from animal parts (few such preparations were identified, e.g. pangolin and sheep placenta).

For Objective 1, articles were also excluded if they were exclusively zoological or veterinary in focus, or described use of traditional preparations solely to prevent spontaneous abortion, induce abortion, or address menstrual disorders. For Objective 1 analysis, all plants with intended uterotonic effects were classified as used for one or more of the following indications: induce or augment labor; expel placenta or manage retained placenta; prevent or treat PPH; induce "oxytocic effect" without specification; induce another effect that may be uterotonic (e.g. "expel dead fetus"); and promote general maternal/fetal health.

Articles related to Objective 2 were excluded if they only conducted phytochemical or toxicity screening to identify constituents without testing of uterotonic activity. Articles related to Objective 2 were included even if their primary focus was preparations believed to have contraceptive or abortifacient effects, as long as uterotonic activity was evaluated. For Objective 2 analysis, 3 indication classifications were added: abortifacient, antifertility/contraceptive, and menstrual disorders. All included articles were abstracted using standard spreadsheet templates.

4. Results

4.1. Overview

Supplementary Material S1 (online only) provides a review flow diagram. Based on the search strategy, 12 076 non-duplicative references were identified. This large number resulted from using general search terms such as "traditional medicine" to ensure that relevant articles were not omitted. Inclusion and exclusion criteria were applied to these citations/abstracts leaving 271 references for full-text review. Of these, 187 met Objective 1 and 84 met Objective 2. If an article was included in the analysis following full-text review, inclusion and exclusion criteria were also applied to its bibliography, generating additional references for full-text review. Following full-text review of all relevant resources, 48 articles were included in Objective 1 analysis, and 54 articles were included in Objective 2 analysis. One study was included in both analyses because it gathered primary data regarding herbal agent use and conducted pharmacologic evaluations of identified plants [26]. Supplementary Material S2 (online only) lists all of the references included in the Objective 1 and Objective 2 analyses.

A number of articles with relevant content were not included owing to publication earlier than the inclusion period. The oldest identified resource documenting uterotonic effects of traditionally used plants was published in 1915, indicating that there has been awareness of the potential uterotonic activity of traditional medicines for much of the past century. Over 50 identified articles described use of traditional preparations during pregnancy in Sub-Saharan African countries (particularly Ghana and Nigeria) including for uterotonic purposes, but were excluded owing to absence of information about the specific plants utilized. Similarly, several studies were excluded because they documented the use of herbal mixtures (e.g. *sunungure* in Zimbabwe) to induce or augment labor without noting the specific plants used [27–29].

Many resources included in the analysis were published in journals from low-resource countries. This may partly be owing to the greater recognition of traditional medicine in these countries, including formal establishment of Centers for Traditional Medicine within Ministries of Health (e.g. in South Africa and Tanzania) as well as at the World Health Organization (e.g. The Collaborating Center for Traditional Medicine).

4.2. Objective 1 results

The 48 articles included in the Objective 1 analysis described usage of traditional uterotonics in 13 countries (Table 1). The most frequently studied countries were Tanzania (n = 12), Ethiopia (n = 9), and South Africa and Uganda (n = 7 each). Researchers interviewed traditional healers/herbalists (30 studies), general community members (12 studies), TBAs or other traditional midwives (10 studies), women (6 studies), and elders (4 studies). Sample sizes ranged from