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"When you are injected, the baby is protected:" Assessing the acceptability of a maternal Tdap vaccine based on mothers' knowledge, attitudes, and beliefs of pertussis and vaccinations in Lusaka, Zambia

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ABSTRACT

Introduction: Severe and fatal pertussis infections are concentrated among infants who are too young to be protected through routine vaccinations. Maternal Tdap (mTdap), which is now the standard of care in the US and UK, is considered to be the most effective way to address this gap in preventative care. Little is known about how pregnant women in low-resource settings might view mTdap. To inform strategies for mTdap implementation in these contexts, public health researchers sought to understand knowledge, attitudes, and beliefs toward pertussis and maternal vaccines and assess the barriers to vaccine acceptance.

Methods: We conducted focus group discussions (FGDs) among mothers who participated in a longitudinal birth cohort study at the Chawama primary health center in Lusaka, Zambia. Since SAMIPS was not a clinical trial, but instead an observational cohort study, registration on clinicaltrials.gov was not required. Trained interviewers conducted the FGDs in January 2016 using a semi-structured interview guide, exploring participants' knowledge, attitudes and beliefs toward pertussis and vaccines. We analyzed the transcripts using Nvivo v.11 software.

Results: Fifty mothers participated across 7 FGDs. Mothers had limited knowledge of pertussis and vaccines, yet expressed generally positive views of vaccinating themselves and their children. Participants conveyed very little vaccine hesitancy around maternal vaccinations, and discussed how they could protect their children's health. Mothers also highlighted barriers and facilitators to vaccine uptake, which included partner involvement, feelings of maternal authority over healthcare decision-making, and community rumors about Western medicine.

Conclusion: Mothers viewed vaccinations as an important method to keep their children healthy, despite cultural myths and misconceptions about pertussis and vaccines. FGD results suggest that vaccine acceptability is high in Zambia, which is a critical factor to vaccine uptake. A strategy addressing myths and misconceptions should be prioritized if and when mTdap is introduced across low-resource settings.

1. Introduction

Whooping cough, caused primarily by *Bordetella pertussis*, is a highly contagious respiratory disease believed to pose a significant threat to child health worldwide [1,2]. Based on data from the UK, a maternal Tdap vaccine (mTdap) has been shown to be highly effective at protecting infants between birth and 3 months of age if administered in the third trimester of pregnancy [3–10]. In fact, a maternal vaccine strategy against pertussis is now recommended by UK Department of Health and the U.S. CDC [11,12].

Pertussis is pervasive in Zambia and other low and middle-income countries (LMICs); in a recent study, we identified a cumulative incidence of 5.2 cases of pertussis per 1000 infants and 2.4 cases per 1000 person-months among infants in Lusaka Zambia [13]. One similar study in Pakistan found an incidence of 3.96 cases per 1000 infants, and another comparing HIV-infected

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and -uninfected mothers and their infants in South Africa revealed an incidence rate of 6.8 vs. 3.9 episodes per 1000 person-months, respectively [14,15]. The high incidence of pertussis in several LMICs points to the potential value of an mTdap strategy. However, Zambia and other similar countries follow the WHO guidelines on maternal vaccinations, which currently recommend that the tetanus toxoid vaccine (TT) be the only vaccine administered during pregnancy [16–18]. While mTdap could supplant one or more doses of maternal TT, there has not been any attempt to canvas mothers about acceptability of such an intervention in Zambia.

To successfully implement an mTdap strategy in Zambia, health officials must first understand the knowledge, attitudes and beliefs around maternal immunizations, and be able to address any concerns or knowledge gaps in the community to effectively promote vaccine uptake. Some studies in higher income countries revealed strong levels of support for the maternal vaccine, but there have also been incidences of vaccine hesitancy, which have contributed to pertussis outbreaks [19–26]. Support of maternal vaccines in LMICs has not been studied systematically. Our research aimed to assess the feasibility of implementing a maternal vaccination strategy against pertussis and potentially other pathogens in Zambia. Specifically, we addressed three main research questions: (1) what do mothers know about whooping cough, (2) what are mothers' attitudes about vaccines in general and maternal vaccines in specific, and (3) what factors promote or block uptake of vaccines in their families and communities?

2. Methods

This qualitative analysis was embedded within a larger research project, the "Southern Africa Mother Infant Pertussis Study" (SAMIPS), which aimed to determine the incidence of severe and non-severe pertussis in Zambia by enrolling 1981 mother/infant pairs and following the dyad when the infant was 2 to 14 weeks old, collecting nasopharyngeal swabs at approximately three-week intervals and testing the samples for pertussis [13]. The SAMIPS cohort enrolled mothers aged 18–39 who did not use any immunosuppressive agents during pregnancy, and their otherwise healthy infants who were less than 2 weeks of age at the time of enrollment. SAMIPS was approved by the Boston University Institutional Review Board and the Zambian ERES Converge IRB. Since SAMIPS was not a clinical trial, but instead an observational cohort study, registration on clinicaltrials.gov was not required.

We conducted focus group discussions (FGDs) with mothers in Lusaka, Zambia in January 2016 at the Chawama Clinic, which serves a low-income population of approximately 150,000 individuals over an area of about 25 km^2. A purposive sampling strategy was used to identify participants: Nurses chose women from the existing SAMIPS cohort whom they believed would be willing to participate. A researcher trained all FGD facilitators in qualitative methodologies and how to elicit responses from participants respectfully and in a way which reduces social desirability bias. Upon obtaining informed consent and explaining study procedures, the nurses facilitated the FGDs following a semi-structured guide. The interviews probed participants' knowledge about whooping cough; vaccine attitudes and beliefs; and factors that they viewed as influential to vaccine uptake. Participants in the FGDs were not linked via personal identifiers. The sessions were recorded in Nyanja or in English, translated and transcribed into English, and then destroyed. Facilitators of the FGDs fluent in Nyanja and English validated the translation quality. Participants were compensated for their participation with refreshments and reimbursement for transportation costs.

A team of four researchers trained in qualitative analysis read the FGD transcripts and generated a consensus-based list of themes related to the research questions. Two of the four researchers coded each FGD using NVivo v.11 software to ensure that the transcripts were coded to systematically avoid errors.

3. Results

We conducted 7 FGDs with a total of 50 participants. Each FGD had 6–8 participants and lasted between 1 and 1.5 h. All of the respondents were women who lived in the Chawama compound, and the average age was 27. While 46% of participants reported completing some secondary education, only 10% completed secondary school. All women had received one or more doses of TT during the most recent pregnancy. Table 1 further describes the participants' demographic characteristics. The participants echoed similar themes across FGDs, suggesting that the sample size was sufficient for saturation to be achieved. We present here the predominant themes we found to be salient to our research questions, detailed by exemplar quotes. Fig. 1 summarizes additional illustrative statements within each theme.

3.1. Knowledge of whooping cough and perceived causes

Participant knowledge of pertussis was limited; many were able to list the disease symptoms, including cough and wheezing, but other associations with the disease were restricted to notions of the severity of the disease rather than insights into its causes. Some mothers knew that the disease is transmitted through the air, and can be passed from mother to infant. However, others thought that a contaminated air or environment could cause a child to contract the disease. One woman remarked, *"In the community we live in, the houses are too close and the toilets are too close to each other so when breathing, we breathe that air from the toilets and then you the mother gets sick and you give it to the baby*" (FDG 4).

Table 1
Demographic characteristics of FGDs.

	Total N = 50
Age, mean (SD), years	27 (5.06)
Sex, No. (%)	
Female	50 (100%)
Race, No. (%)	
Black African	50 (100%)
Languages spoken, No. (%)	
English	1 (2%)
Nyanja	20 (40%)
Bemba	13 (26%)
Other	17 (34%)
Educational background, No. (%)	
None	2 (4%)
Some primary education	15 (30%)
Completed primary education	1 (2%)
Some secondary education	23 (46%)
Completed secondary education	5 (10%)
Some post-secondary education	0 (0%)
Completed post-secondary education	4 (8%)
Mother's marital status, No. (%)	
Unmarried	4 (8%)
Married	46 (92%)
Living arrangements, No. (%)	
Father does not live with child	4 (8%)
Father lives with child	46 (92%)
Vaccine history, No. (%)	
Completed at least three doses of maternal tetanus toxoid	42 (84%)
Completed fewer than three doses of maternal tetanus toxoid	8 (16%)
Completed no doses of maternal tetanus toxoid	0 (0%)
HIV status, No. (%)	
HIV positive	17 (34%)
HIV negative	33 (66%)

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