Acceptability of intranasal live attenuated influenza vaccine, influenza knowledge and vaccine intent in The Gambia

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ABSTRACT

Background: The burden of influenza is increasingly recognised in Africa. The WHO recommends introducing influenza vaccination to high-risk groups: pregnant women, children <5 years, and the elderly. The Gambia currently has no influenza vaccination policy, but the NASIMMUNE study, a clinical trial of intranasal live attenuated influenza vaccines (LAIV) in young children provided an opportunity to study maternal attitudes towards LAIV for the first time in sub-Saharan Africa. We assess acceptability of LAIV, influenza knowledge and attitudes towards influenza vaccination in Gambian women. Additionally, we investigate predictors of willingness to receive influenza vaccine (intent) in pregnancy or seasonally for children <5.

Methods: A cross-sectional survey was conducted in Gambian women at two urban health facilities. To assess LAIV acceptability, the exposure group (women whose children had received LAIV during the NASIMMUNE study) were compared to a control group (women whose children were not enrolled in the NASIMMUNE study). Demographics and health belief constructs were analysed as predictors of influenza knowledge and vaccine intent.

Findings: The exposure group (n = 150) expressed a higher preference for a nasal spray vaccine than an injection compared to the control group (n = 304) (93.3% vs. 34.9%, OR = 26.15, p < 0.0001). Those in the exposure group who preferred the nasal spray found it less distressing, safer or equally safe, and easier or equally easy to give (all p < 0.001) than injections. Influenza knowledge increased with education level (p = 0.006 for higher education vs. none), and varied between sites (p = 0.0005). Vaccine intent was >98%, but no association with influenza knowledge or difference between groups was observed. Various health belief constructs were associated with vaccine intent.

Conclusion: LAIV acceptability was higher in those with first-hand experience. Influenza vaccine intent was also high. Incorporation of seasonal LAIV into the childhood immunisation schedule in The Gambia would be feasible, particularly if combined with community-based health education.

1. Introduction

Influenza is a major cause of acute respiratory infection globally, leading to a significant burden of morbidity and mortality [1]. Seasonal influenza has been well-studied in high- and middle-income countries, but neglected in Africa [2]. The rate of influenza-associated hospitalisations in children <5 years of age is approximately 3-fold higher in low- and middle-income countries (LMIC) compared to high-income countries [3]. One meta-analysis found that 99% of deaths attributable to influenza-associated acute lower respiratory infections occurred in LMICs [4].

As a result of the increasing awareness of influenza-related disease in LMIC, in 2012 the WHO recommended that countries should consider influenza vaccination in high-risk groups including pregnant women and children <5 years [5]. The Gambia has no influenza vaccination policy and is yet to include influenza vaccination in the Expanded Programme on Immunisation (EPI) [6,7]. The NASIMMUNE study, a systems immunology research study in children aged 24–59 months of intranasal live attenuated influenza vaccine (LAIV) is ongoing (NCT02972957). To our knowledge, this is the first interventional study in The Gambia using intranasal

LAIV and offers a unique opportunity to study, for the first time, attitudes towards a new mode of vaccine delivery in this setting.

Factors that shape parental views on vaccination impact childhood vaccination rates and having insight into parental perceptions can be useful when introducing new vaccinations to a country [8]. High vaccine uptake in The Gambia through the EPI [9] has led to reductions in invasive disease secondary to *Haemophilus influenzae* type b [10] and *Streptococcus pneumoniae* [11]. Yet as more vaccines are added to the EPI, vaccine hesitancy might be a concern [12–14]. Knowledge and attitudes surrounding influenza and influenza vaccination in The Gambia are unknown. Gaining a better understanding of these factors can help guide future influenza vaccination strategies, including maternal influenza immunisation, shown to be beneficial to both mothers and infants in recent studies from South Africa and Mali [15,16].

The Health Belief Model (HBM) provides a framework of psychosocial constructs that may be determinants of health behaviour [17]. It posits that preventative health behaviours are more likely to be exhibited when an individual perceives they are highly susceptible to the disease, that the disease is serious, that the behaviour is beneficial, there are few barriers, and are cued into action [18]. These constructs have been shown to predict uptake of influenza vaccination and other health behaviours [19–24]. However, emotions experienced at the point of decision-making may be as important in health behaviour as a cognitive assessment of the risk, such as worry and anticipated regret, which have also been shown to be predictive of influenza vaccination [20,25,26]. Few studies have used the HBM to study influenza vaccine behaviour in LMICs [27–31].

We aimed to compare attitudes towards the safety, ease of use, and tolerability of LAIV between mothers with direct experience of their children receiving LAIV and mothers without such experience, and to establish whether their attitudes towards intranasal vaccines differ. Additionally, we aimed to quantify knowledge about influenza and to determine possible relationships between influenza knowledge, socio-demographic factors and willingness to accept influenza vaccination in pregnancy or for their children <5 (vaccine intent). Finally, we aimed to explore the relationship between health belief constructs and influenza vaccine intent in this cohort.

2. Methods

2.1. Study design

A cross-sectional survey was conducted in women ≥18 years at two sites (Sukuta and Faji Kunda health centres) five kilometres apart, in the coastal region of The Gambia in August and September 2017. In Sukuta, where NASIMMUNE was conducted, mothers of children who had been vaccinated with the intranasal LAIV (Nasovac-S®, Serum Institute of India Pvt. Ltd.) as part of the study were contacted sequentially and invited to an interview, up to a total of 150 (exposure group). A further 154 women from Sukuta who had not participated in the NASIMMUNE study were recruited at the same health centre. Due to wider community sensitization regarding the NASIMMUNE trial carried out in Sukuta, this group may have had some exposure to information about influenza and LAIV, therefore an additional control group of 150 women were recruited at Faji Kunda health centre (where there could have been no exposure to the study or community sensitization). These women were recruited through opportunistic sampling when attending for routine healthcare. The sample size was determined by the availability of mothers of children in the NASIMMUNE study (n = 168), with a 1:2 exposure to control ratio. Inclusion criteria

were having at least one child <5, maternal age ≥18, resident in the area, and fluency in Mandinka (the most commonly spoken local language in the areas).

2.2. Data collection

Face-to-face interviews were conducted by trained field-workers who entered data in real-time into a questionnaire designed in REDCap™ [32]. The questionnaire was developed using simple terminology and was refined through cognitive pre-testing with field-workers and test participants. The questionnaire included seven sections: inclusion criteria, socio-demographics, vaccine intent, influenza knowledge, health-seeking behaviour, health beliefs, and LAIV acceptability. The influenza knowledge questions were designed *de novo* for this setting, selected and simplified from influenza knowledge questions used previously [31,33–35] and refined following the cognitive pre-testing phase. Questions asked about symptoms, transmission, prevention, treatment, risk, and vaccination (see supplementary material: Appendix A). The responses were collated to form a score out of 15 points, which was converted to a percentage for analysis (score divided by 15, multiplied by 100).

Influenza vaccine intent was assessed for pregnancy and for children <5 by asking participants to respond to two statements: "If I was pregnant, I would get a flu vaccine if it was free" and "I would get a flu vaccine for my child under 5, every year, if it was free". Answers were recorded on a 4-point scale where 1 = agree strongly, 2 = agree, 3 = disagree and 4 = disagree strongly, with a "don't know" option. In follow-up questions, unprompted reasons given for answers were coded into predefined categories by the interviewer.

Health belief constructs were assessed using statements answered on the same 4-point scale. HBM constructs assessed were: perceived susceptibility, severity, benefit, barriers and cues to action. Two additional concepts were also included: worry and anticipated regret. The answers given were converted into binary "agree" or "disagree" responses for analysis.

2.3. Ethical considerations

Ethical approval for the study was provided by The Gambia Government/MRC Joint Ethics Committee (SCC1555). Written informed consent was obtained from all participants. It was made clear that answers were confidential and anonymised, that they could withdraw at any time or decline to answer any questions.

2.4. Statistical analysis

Analysis was conducted using Stata® 12.0. Descriptive statistics were used to compare proportions between groups: Pearson's chi-squared test or two-tailed Fisher's exact test (when one category had <5 participants) for categorical data; and Student's t-test or Wilcoxon rank-sum test for normally and non-normally distributed continuous data respectively. Univariate linear regression analysis was performed for predictors of influenza knowledge. Significance-testing was used for selection of variables to include in the multivariate model at a level of $p < 0.2$ to minimize type II error in selection [36]. The Cochran–Mantel–Haenszel test was used to analyse variations between groups for individual influenza knowledge question responses and to evaluate the difference in preference for intranasal or injection vaccinations between groups. Two-tailed Fisher's exact test was used to analyse perceptions of intranasal LAIV in the exposed group and associations between vaccine intent and health belief constructs. $p < 0.05$ was considered statistically significant.