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The crucial role of maternal care providers as vaccinators for pregnant women

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ABSTRACT

Vaccination during pregnancy is increasingly being recognised internationally a useful means of preventing illness in pregnant women and their newborns. It has been used since the 1960s, when it was found that tetanus vaccine was highly effective in preventing neonatal tetanus, but interest has greatly increased over the last few years. As new data become available showing the numerous benefits of maternal immunisation and its potential for improving maternal and neonatal health in relation to a number of infectious conditions, it is being increasingly incorporated into the national vaccination programmes around the world. However, the development of new vaccines, the existence of clinical trials testing the efficacy of vaccinating pregnant women in order to protect newborns against respiratory syncytial virus and group B *Streptococcus* infections, and the fact that the uptake of influenza and pertussis vaccines during pregnancy is lower than expected in developed countries is making it increasingly clear that existing maternal vaccination programmes need to be strengthened. This review addresses the importance of integrating maternal immunisation and standard obstetrical care in order to promote vaccination administration by maternal care providers (MCPs) because the vaccination goals for pregnant women cannot be achieved without appropriate training and extending the role of MCPs as vaccinators. In order to make meaningful progress, it is necessary to develop and refine targeted messages for pregnant women concerning the benefits of maternal immunisation for themselves and their infants.

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1. Introduction

The targets of the United Nations' third Sustainable Development Goal include reducing the global maternal mortality ratio to less than 70 per 100,000 live births and ending the preventable deaths of newborns and children aged <5 years by 2030 [1]. Vaccination during pregnancy is increasingly being recognised internationally a useful means of preventing illness in pregnant women and their newborns. It has been used since the 1960s, when it was found that tetanus vaccine was highly effective in preventing neonatal tetanus, but interest has greatly increased over the last few years [2]. As new data become available showing the numerous benefits of maternal immunisation and its potential for improving maternal and neonatal health in relation to a number of infectious conditions, it is being increasingly incorporated into the national vaccination programmes around the world [3,4].

However, the development of new vaccines, the existence of clinical trials testing the efficacy of vaccinating pregnant women in order to protect newborns against respiratory syncytial virus [5] and group B *Streptococcus* infections [6], and the fact that the uptake of influenza and pertussis vaccines during pregnancy is lower than expected in developed countries [7–9] is making it increasingly clear that existing maternal vaccination programmes need to be strengthened.

This review addresses the importance of integrating maternal immunisation and standard obstetrical care in order to promote the vaccinating role of maternal care providers (MCPs).

2. Benefits and safety of maternal immunisation

The implementation of maternal immunisation programmes would benefit the two vulnerable populations of pregnant women and their newborns, who are susceptible to developing serious illnesses due to a number of infectious diseases. Maternal immunisation, which arises as a result of the transfer of antibodies from mother to fetus through the placenta, has significantly lowered neonatal tetanus rates worldwide [4,10], and routine immunisation

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against influenza, which has been recommended for pregnant women in the USA since the 1960s [11], has also proved to be effective in protecting pregnant women and their newborns against disease [8]. A clinical trial conducted in Bangladesh found that influenza vaccine was 35.8% effective against episodes of febrile respiratory illness and 63% effective against laboratory-confirmed influenza in the infants of vaccinated mothers [12]. Similarly, Madhi et al. reported an efficacy against laboratory-confirmed influenza in HIV-infected and HIV-uninfected pregnant women of respectively 57.7% and 50.4%, and 48.8% efficacy among HIV-unexposed infants [13]. Retrospective studies carried in Europe and the USA have also shown that influenza vaccine has a significantly protective effect against outcomes such as acute respiratory infection, influenza-like illness or a diagnosis of influenza associated with laboratory-confirmed influenza infection among pregnant women [14–17], and four studies (one in the UK and three in the USA) have shown that maternal immunisation has a significantly protective effect against infant hospitalisation because of influenza [18–21]. Finally, a number of methodologically adequate studies suggest that routine maternal immunisation would have a significant impact on the perinatal morbidity and mortality attributable to prematurity [17,22–24].

The maternal pertussis vaccination programme implemented in UK has proved to be highly effective in preventing illness in newborns: estimated vaccine effectiveness was 91% based on 82 confirmed cases in infants aged <3 months, and 90% when the analysis was restricted to cases in children aged <2 months [25].

Between 1999 and 2015, more than 148 million women have been vaccinated against tetanus, many of them during pregnancy [26], and a number of studies have found no risk of tetanus toxoid (TT) or tetanus toxoid reduced diphtheria toxoid (Td) vaccine in exposed mothers and their infants [27–31]. Similarly, millions of influenza vaccine doses are given to pregnant women every year. During the 2000–2003 influenza seasons, the CDC Vaccine Adverse Events Reporting System (VAERS) registered only 20 adverse events among the estimated two million vaccinated pregnant women vaccinated, 17 of which were minor injection site or systemic reactions [32]. Due to its more recent introduction, there have been fewer safety studies of Tdap (reduced diphtheria toxoid, tetanus toxoid and acellular pertussis vaccine) among pregnant women, but the 2005–2010 data from the VAERS database did not reveal any cause for concern about maternal, fetal or infant outcomes following its use [33,34], and the results from the UK Clinical Practice Research Database revealed no evidence of an increased risk of still births or neonatal deaths [35].

Given the public health impact of maternal immunisation, the available evidence supporting vaccine safety should be used to reassure MCPs and pregnant women, and optimise vaccination uptake during pregnancy.

3. Current maternal immunisation uptake among pregnant women

Given the well-documented efficacy and safety of maternal influenza vaccination, yearly vaccinations are recommended by various immunisation advisory groups throughout the world [8], and more countries are beginning to adopt maternal pertussis vaccinations [9]. However, unlike the acceptance and coverage of tetanus vaccine, which has been historically strong in developing countries [36], the acceptance of influenza vaccine is still suboptimal in most countries [37]. In the USA, the use of maternal influenza vaccination has recently risen to about 50% [38], but the seasonal uptakes reported by some European countries vary widely from 5% to 65% [39], and still lag behind the Healthy People 2020 goal of 80% [40].

In the case of pertussis vaccinations, countries such as the UK have shown better acceptance than that granted to influenza vaccinations, with an uptake rate of up to 70% [25], whereas the USA has lately reported similar figures to those of influenza: i.e. about 50% among pregnant women [41].

4. Factors affecting vaccine uptake by pregnant women

There are various barriers to achieving optimal rates of vaccination uptake among pregnant women. The demographic and clinical factors associated with lower uptakes include being unmarried or not having a partner [42,43], a younger age [44], belonging to an ethnic minority [43,45,46], low socio-economic and education levels [45,47,48], smoking [45,49,50], having a history of pre-term delivery [43,51,52], few or no visits to a pre-natal centre [45,53], and a lack of health insurance [44,52].

A review of vaccine hesitancy by the Vaccine Confidence Project showed that only 42 of the 1164 articles selected concerned vaccinations during pregnancy [54], and a recent review of the factors influencing vaccine acceptance by Wilson et al. found that 73% of the analysed studies concentrated on influenza vaccines and 65% were carried out in North America [55]; it was also found that there were only seven studies of Tdap vaccine as against 113 concerning influenza vaccine. The main vaccination barriers identified among pregnant women were uncertainties about vaccine safety during pregnancy, concerns about vaccine efficacy, little knowledge of vaccines or the diseases they prevent, a lack of recommendations from healthcare providers (HCPs), access issues, costs, religion and conflicting advice. Among HCPs, the vaccination barriers included little knowledge, reimbursement issues, inadequate training, and increased workloads. It is worth noting that, using the SAGE Working Group model of the determinants of vaccine hesitancy, the second biggest category of issues after the risk/benefits category (which includes safety concerns) was the role of HCPs [55].

As maternal care providers (MCPs) are the main providers who come into contact with women during pregnancy, identifying their barriers to immunisation and finding ways of overcoming them would certainly improve the success of maternal immunisation programmes.

5. The role of maternal care providers (MCPs) in recommending maternal immunisation

The most frequently reported barriers associated with MCPs are a lack of knowledge of vaccines [56–61] and, as in the case of pregnant women, concerns about vaccine safety and efficacy [57,59,62,63]. It has been shown that MCPs consider maternal immunisation to fall beyond the scope of routine obstetrical care [59], and are worried about the time needed to administer vaccines in their practices [62]. Other studies have found that MCPs are uncertain as to who is actually responsible for implementing vaccine strategies [61,63–65], concerned that they are unable to monitor vaccinations in their pregnant patients [66], and worried about their liability in the case of an adverse event [60,61]. Finally, they simply may not consider themselves as vaccinators [67].

Understanding MCP vaccination barriers is vitally important because it has been found throughout the world that a compelling recommendation from a provider is the single most important factor in a pregnant woman's decision to undergo a vaccination [46,48,49,63,68–70]. One Swiss study found that a direct recommendation from an obstetrician/gynecologist (ob-gyn) was associated with a 107-fold increase in the likelihood that a pregnant woman will agree to an influenza vaccination [48]: furthermore,

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