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Factors associated with a successful expansion of influenza vaccination among pregnant women in Nicaragua

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Abstract

Background—Pregnant women are at risk of severe influenza disease and are a priority group for influenza vaccination programs. Nicaragua expanded recommendations to include influenza vaccination to all pregnant women in the municipality of Managua in 2013.

Methods—We carried out a survey among 1,807 pregnant women who delivered at public hospitals in the municipality of Managua to evaluate the uptake of influenza vaccination and factors associated with vaccination.

Results—We observed a high (71%) uptake of influenza vaccination among this population, with no differences observed by age, education or parity of the women. Having four antenatal visits and five or more visits were associated with receipt of influenza vaccination (AORs: 2.58; 95% CI: 1.15, 5.81, and 2.37; 95% CI: 1.12, 5.0, respectively). Also, receipt of influenza vaccination recommendation from a health care provider was positively associated with receipt of influenza vaccination (AOR: 14.22; 95% CI: 10.45, 19.33).

Conclusions—The successful expansion of influenza vaccination among pregnant women in the municipality of Managua may be due to ready access to free medical care and health care providers' recommendation for vaccination at health care clinics that received influenza vaccine.

Keywords

Influenza vaccination; Pregnant women; Acceptability

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Conflict of interest statement

The authors do not report any conflicts of interest.

1. Introduction

Pregnant women who become ill with an influenza virus infection are at high-risk of developing influenza complications, including hospitalization [1–4]. Influenza vaccination has been shown to offer preventive benefits for the mother; the fetus; and children up to 6 months of age, who are not yet recommended to receive influenza vaccination [5–8]. Thus, in 2012, the Technical Advisory Group (TAG) of the Pan American Health Organization and the Strategic Advisory Group of Experts (SAGE) on Immunization of the World Health Organization recommended including pregnant women in the priority group for influenza vaccination [9,10].

In 2007, with Government funding, Nicaragua first introduced influenza vaccination into the national vaccination schedule, targeting adults 50 years and older and children less than 2 years old with certain underlying diseases. During the 2009 pandemic, vaccination with monovalent pandemic (H1N1) influenza vaccine was extended to persons with chronic diseases and to women with high-risk pregnancies [11]. Nicaragua was among the Latin American countries with the highest coverage (88.1%) of pandemic influenza vaccination for women with high-risk pregnancies [12].

In 2013, the Nicaraguan Ministry of Health, with support from the Partnership for Influenza Vaccine Introduction (PIVI) – a collaborative project that includes participation from the Centers for Disease Control and Prevention (CDC), the Pan American Health Organization (PAHO) and the Task Force for Global Health – piloted for the expansion of influenza vaccination to include all pregnant women in the capital city of Managua and the surrounding municipality. Influenza vaccine was distributed by the National Immunization Program and was recommended and offered to pregnant women at their routine antenatal visits at local health care clinics. Various studies in other countries indicate that receiving influenza vaccination recommendations from health care personnel and information about the benefits of vaccination increases vaccination acceptance among pregnant women [13–15]. Nonetheless, uptake of influenza vaccine among pregnant women has varied across studies, with lower coverage observed in certain demographic subgroups, such as racial minorities in North America [16,17].

This article aims to describe the acceptability of influenza vaccination in the context of expanded access to all pregnant women residing in the municipality of Managua. In addition, we investigate if participant and antenatal care characteristics, and health care providers' recommendation for vaccination are associated with receipt of the vaccine.

2. Methods

Nicaragua launched influenza vaccination and recommendation for all pregnant women in the capital city of Managua and the surrounding municipality in July 2013. Between October and December 2013, a convenience sample of 1807 of approximately 3700 women were interviewed when they delivered their infant(s) at Hospital Bertha Calderon Roque and Hospital Fernando Velez Paiz, two large Managua public hospitals out of three with parturition services. Women who did not reside within the municipality of Managua were

excluded, since vaccination access was limited during this time to pregnant women in Managua. The standardized questionnaire included information on demographics, antenatal care, all vaccinations received during pregnancy and reasons for influenza vaccination. Self-reported vaccination status was used for the base analyses; however, self-reported data was corroborated via vaccination cards and/or antenatal medical records when available. Similar to previous studies of this population [18], age was categorized into three groups: <18, 18–34, and ≥35 years. Additional participant characteristics (race, district of residence within the municipality of Managua, education, employment, number of children) and antenatal care characteristics (single vs multiple pregnancy, number of antenatal visits, consumption of antenatal supplements, at least one tetanus vaccine dose received in most recent pregnancy, and influenza vaccination) were examined, as were reasons for receiving or not receiving influenza vaccination.

Similar to previous studies [17,19,20], we analyzed by bivariate and multivariate analyses the relationship of participant characteristics (age, race, district, education, employment, number of children), antenatal care characteristics (single vs multiple pregnancy, number of antenatal visits, consumption of antenatal supplements and at least one tetanus vaccine dose received in most recent pregnancy) and receipt of influenza vaccination recommendation from health care provider with self-reported receipt of influenza vaccine. In sensitivity analyses, we repeated these analyses excluding those who lacked vaccination cards or medical records. We present unadjusted and adjusted odds ratios (ORs and AORs) with 95% confidence intervals. All analyses were performed using R software (version 3.0.2).

2.1. Ethics statement

This study was considered public health practice and not considered to be human subjects' research in accordance with federal human subjects' protection regulations. The study was approved by the institutional review board at the Nicaraguan Ministry of Health.

3. Results

Over three-quarters of participants in this survey were between 18 and 34 years old, mixed race, housewives and had either a primary or a secondary school education (Table 1). Approximately two thirds (65%) of women reported having at least one other child prior to this pregnancy. Nearly all women (99%) reported attending at least one antenatal visit, 73% reported more than four antenatal visits; 98% reported taking antenatal supplements during pregnancy. Seventy-one percent of women reported receiving influenza vaccination at any time in their pregnancy, and 84% reported receiving at least one dose of tetanus vaccination during their most recent pregnancy. Approximately half (54%) of the participants had vaccination cards or medical records which could be used to document their vaccination status; self-reported influenza vaccine recipients were more likely than self-reported unvaccinated women to have vaccination cards or medical records available (63% vs 31%, respectively, $p < 0.01$).

No association was observed between the receipt of influenza vaccine during pregnancy and age, race, district of residence, education, employment, number of children, and single vs multiple pregnancy in either the unadjusted and adjusted models (Table 2). However, the

number of antenatal visits and receipt of influenza vaccination recommendation from a health care provider were associated with receipt of influenza vaccination and these bivariate associations persisted in a multivariate model that adjusted for participant and antenatal care characteristics (p-values <0.01); the association between receipt of influenza vaccination recommendation and vaccination also persisted when the sample was limited to those with vaccination documentation (from vaccination cards or medical records) (data not shown). Specifically, having four antenatal visits and five or more visits were associated with receipt of influenza vaccination comparing to one antenatal visit only (AOR: 2.58; 95% CI: 1.15, 5.81 and AOR: 2.37; 95% CI: 1.12, 5.0, respectively) in the adjusted model. For those who received an influenza vaccination recommendation from a health care provider, the adjusted odds of receiving influenza vaccination increased by a factor of 14.22 (95% CI: 10.45, 18.40; Table 2).

Women who received influenza vaccination recommendation from a health care provider were more likely to be vaccinated against influenza compared to those who did not receive a recommendation (82% vs 24%, $p < 0.01$). Reasons reported for not receiving influenza vaccination included: 44% (234/527) did not receive information about influenza vaccination, 10% (53/527) were not offered influenza vaccination, and 2% (12/527) reported accessibility problems (e.g. transportation, distance); one participant reported not trusting vaccines as a reason for refusal.

4. Discussion

The uptake of influenza vaccination at its introduction to all pregnant women in Managua, Nicaragua observed in this study was 71%. This is higher than influenza vaccination rates among pregnant women in countries that have been vaccinating pregnant women against influenza for several years [16,21–23]. For instance, influenza vaccination coverage among pregnant women in the United States increased from around 10% in 2001–2002 season to 50% in 2010–2011 season [24]. The results from this study are consistent with high rates of vaccination among high-risk pregnant women in Nicaragua achieved during the 2009 influenza pandemic [12].

The successful uptake of influenza vaccination among pregnant women who delivered at public hospitals in the municipality of Managua, as well as the high percentage of pregnant women with at least one antenatal visit, is likely due to ready access to free medical care and influenza vaccination recommendation from health care providers. The Nicaraguan Ministry of Health has developed a family and community health model which prioritizes access to antenatal care and maternal immunizations [25]. Under this framework, health centers conduct a maternity census every year and pregnant women are followed-up and encouraged to receive health care during pregnancy, which has led to high number of women who had at least one antenatal visit (99%) and more than four antenatal visits (73%). Since 2007, health centers have implemented influenza vaccination strategies such as conducting house-to-house vaccination before influenza vaccine is set to expire to reduce vaccine wastage and designating physical space to receive patients seeking influenza vaccination who have been referred from smaller health units that do not provide influenza vaccination.

Antenatal visits are key to promoting the benefits of influenza vaccination and offering vaccination to pregnant women [20]. Scheminske et al. showed higher rates of vaccination in women who engage in healthy behaviors during pregnancy [26]. In this study having four or more antenatal visits, a proxy for engaging in healthy behaviors, was associated with receipt of vaccination. Our results are also consistent with a number of studies that show a higher influenza vaccination rate among pregnant women when they received a recommendation from their doctor [13–15,20,27,28]. In contrast to other studies [14,29–31], the most frequently reported reason for not receiving influenza vaccination was not related to safety concerns but rather not receiving information or recommendation regarding influenza vaccination. Interestingly, we did not find an interaction between the number of antenatal visits and receipt of vaccination recommendation in regard to vaccination (data not shown). We speculate that there might be unmeasured factors such as availability of vaccine at health units or vaccination offer that could describe better these relationships.

Unlike other studies in North America and Europe, however, we did not observe a relationship between participant characteristics (age, race, education, employment, number of children) and receipt of influenza vaccination during pregnancy [17,19,32]. However, Henninger et al. [28] showed that demographic characteristics that were significantly associated with vaccination in univariate analyses became no longer significant after controlling for health beliefs about vaccination, which is consistent with that we observed. In addition, Bingham et al found a higher user acceptability of government-sponsored immunization programs in middle- and low-income countries [33], which seems to be the case in Nicaragua.

This study has at least three limitations. First, the study population may only represent women who deliver at the two study hospitals. Although we covered approximately 49% of women who delivered in these hospitals and even though these two hospitals covered approximately 70% of deliveries in the municipality of Managua [34], the study sample was not randomly selected but rather a convenience sample and the extent to which our findings generalize to all pregnant women in this region is unknown. Second, about half of the sample lacked written documentation of influenza vaccination status. According to Jimenez-Garcia et al. [35], self-reported influenza vaccination tends to overestimate vaccination coverage. This study aimed to overcome this bias by corroborating self-reported influenza vaccination with vaccination registries; thus, increasing the quality of the study. Then, although self-report of vaccination was potentially subject to social desirability and recall biases, we were reassured about our results when we observed similar findings from analysis of a subsample that included only those with written documentation of vaccination. Third, our study did not contain all variables of potential interest; most notably, our study would have benefited from including information on smoking, alcohol consumption and marital status, which have been shown to be associated with influenza vaccination coverage in prior studies [17].

In summary, influenza vaccination and recommendation expanded to all pregnant women in the municipality of Managua was well received, which may be due to the Nicaraguan Ministry of Health strategy to prioritize access to health care to families and communities. Nonetheless, there continues to be room for further vaccination promotion. Our findings

suggest that increasing clinician recommendations of the vaccine and more discussion of the benefits of influenza vaccination could increase uptake. Since influenza vaccine uptake was lower among women with fewer antenatal visits, other strategies may be needed to reach women outside of antenatal care or to incorporate influenza vaccination into other programs that focus on the most vulnerable pregnant women.

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Table 1

Participant and antenatal care characteristics of pregnant women in the Managua Municipality, interviews at delivery (n = 1807), Nicaragua, October 2013–December 2013.

Participant characteristics	Pregnant women n = 1807 n (%)
Age	
<18 years	204 (11.3%)
18–34 years	1478 (81.8%)
≥35 years	125 (6.9%)
Race	
White	113 (6.3%)
Mixed	1585 (87.7%)
Black	109 (6.0%)
District, Managua Municipality	
I	277 (15.3%)
II	283 (15.7%)
III	440 (24.3%)
IV	181 (10.0%)
V	378 (20.9%)
VI	130 (7.2%)
VII	118 (6.5%)
Education	
None	35 (1.9%)
Incomplete primary school	210 (11.6%0
Completed primary school	173 (9.6%)
Incomplete secondary school	608 (33.6%)
Completed secondary school	507 (28.1%)
Technical education	106 (5.9%)
University studies	168 (9.3%)
Employment	
Housewife	1449 (80.2%)
Technical work	150 (8.3%)
Professional work	145 (8.0%)
Other	63 (3.5%)
Number of children	
0	608 (33.6%)
1	637 (35.3%)
2	318 (17.6%)
≥3	244 (13.5%)
Prenatal Care characteristics	
Type of pregnancy	
Single	1784 (98.7%)
Multiple	23 (1.3%)

Participant characteristics	**Pregnant women *n* = 1807 *n* (%)**
Number of antenatal visits	
0	22 (1.2%)
1	43 (2.4%)
2	72 (4.0%)
3	132 (7.3%)
4	213 (11.8%)
≥5	1325 (73.3%)
Consumption of antenatal supplements (iron, folic acid, multivitamins, calcium)	
Yes	1774 (98.2%)
No	33 (1.8%)
Number of tetanus vaccine doses received in most recent pregnancy	
0	291 (16.1%)
≥1	1516 (83.9%)
Received influenza vaccination**	
Yes	1280 (70.8%)
Documented by vaccination card and/or medical records	809 (63.2%)
No	527 (29.2%)
Documented by vaccination card and/or medical records	163 (30.9%)

** Self-reported and confirmed influenza vaccination status by documented vaccination records (vaccination card, antenatal control form).

Table 2

Relationship between participant and antenatal care characteristics and influenza vaccination during pregnancy, bivariate and multivariable analysis, Managua Municipality, Nicaragua, October 2013–December 2013.

Self-reported vaccinated (1 = Yes; 0 = No)				
Variables	**Unadjusted OR**	**95% CI**	**Adjusted OR****	**95% CI**
Age (Ref = 18–34 years)				
<18 vs Ref	0.73	(0.54, 1.0)	0.76	(0.51, 1.12)
≥35 vs Ref	0.80	(0.54, 1.18)	0.81	(0.49, 1.35)
Race (Ref = White)				
Mixed vs Ref	1.33	(0.89, 1.98)	1.14	(0.70, 1.86)
Black vs Ref	1.03	(0.59, 1.79)	1.44	(0.73, 2.82)
District, Managua Municipality (Ref = District I)				
District II vs Ref	1.50	(1.03, 2.18)	1.29	(0.84, 2.0)
District III vs Ref	1.06	(0.77, 1.47)	1.11	(0.75, 1.62)
District IV vs Ref	1.22	(0.81, 1.84)	1.08	(0.67, 1.76)
District V vs Ref	1.19	(0.85, 1.68)	1.16	(0.78, 1.73)
District VI vs Ref	0.94	(0.60,1.47)	1.10	(0.65, 1.88)
District VII vs Ref	0.94	(0.60, 1.49)	1.34	(0.76, 2.36)
Education (Ref = None)				
Incomplete primary school vs Ref	1.41	(0.67, 2.98)	0.74	(0.29, 1.92)
Completed primary school vs Ref	1.30	(0.61, 2.78)	0.57	(0.22, 1.49)
Incomplete secondary school vs Ref	1.38	(0.68, 2.81)	0.73	(0.29, 1.80)
Completed secondary school vs Ref	1.60	(0.78, 3.26)	0.75	(0.30, 1.88)
Technical education vs Ref	1.43	(0.64, 3.19)	0.60	(0.22, 1.67)
University studies vs Ref	1.48	(0.69, 3.17)	0.70	(0.26, 1.92)
Employment (Ref = Housewife)				
Technical work vs Ref	0.76	(0.53, 1.08)	0.94	(0.61, 1.47)
Professional work vs Ref	1.17	(0.79, 1.73)	1.10	(0.66, 1.85)
Other vs Ref	0.70	(0.41, 1.18)	0.85	(0.45, 1.61)
Number of children (Ref = 0)				
1 vs Ref	1.04	(0.82,1.33)	1.24	(0.92, 1.68)
2 vs Ref	0.90	(0.67,1.21)	1.18	(0.81, 1.72)
3 vs Ref	0.95	(0.69,1.32)	1.30	(0.83, 2.04)
Type of pregnancy (Multiple vs single)	1.97	(0.67,5.82)	2.50	(0.72, 8.73)
Number of antenatal visits (Ref = 1)				
0 vs Ref	0.37	(0.12, 1.19)	1.66	(0.31, 8.96)
2 vs Ref	1.34	(0.63,2.85)	0.93	(0.37, 2.30)
3 vs Ref	1.71	(0.86,3.43)	1.25	(0.54, 2.89)
4 vs Ref	2.94	(1.51,5.74)*	2.58	(1.15, 5.81)*
≥5 vs Ref	3.79	(2.05,7.01)*	2.37	(1.12, 5.0)*

Self-reported vaccinated (1 = Yes; 0 = No)				
Variables	**Unadjusted OR**	**95% CI**	**Adjusted OR****	**95% CI**
Consumption of antenatal supplements (Yes vs no)	7.92	(3.55,17.67) *	2.47	(0.70, 8.77)
At least one tetanus vaccine doses received in most recent pregnancy (yes vs no)	2.28	(1.76,2.95) *	0.99	(0.71, 1.39)
Received in.uenza vaccination recommendation from provider (yes vs no)	14.59	(11.05,19.25) *, ≠	14.22	(10.45, 19.33) *, ≠

* p-value < 0.01.

** Adjusted for age, race, district, education, employment, number of children, type of pregnancy, number of antenatal visits, consumption of supplements, number of tetanus vaccine doses received and receipt of influenza vaccination recommendation from provider.

≠ Receipt of influenza vaccination recommendation from provider remained significant when the data was limited to those with documented vaccination records (vaccination card, antenatal control form) only (data not shown) (n = 972).