

Influenza and Tdap Vaccines: Practices and Perception among Hispanic Women attending Tertiary Center in Puerto Rico

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Objective: Explore influenza and Tdap immunization knowledge, attitudes, and practices among Hispanics patients attending prenatal care in a tertiary hospital in Puerto Rico as well as barriers encountered by patients regarding vaccination practices during pregnancy.

Methods: Descriptive study conducted at the University District Hospital prenatal care clinics in the Medical Sciences Campus of Puerto Rico from September 2016 to June 2017.

Results: A total of 189 pregnant women were recruited. Regarding Influenza vaccine: 75.6% were offered or oriented about Influenza vaccination, 51.8% had received the vaccine at least once (only 12.2% during current pregnancy) and, 57.1% reported receiving information about influenza infection risks in pregnancy, mainly from health care professionals and media. For Tdap only 20.6% of women were offered or oriented about the vaccine and 7.4% received the vaccine during pregnancy. 55.6% of patients had not been oriented about potential dangers of the pertussis infection; for the few oriented, health professionals were their predominant source. In terms of barriers, lack of information about vaccination and its benefits during pregnancy were the most frequent.

Conclusion: Our study identifies the existing gap of information regarding Influenza and Tdap vaccine. Physicians play a pivotal role in preventive care and new strategies are needed to optimize education to our patients. [*PR Health Sci J* 2022;41(2):68-73]

Key words: Vaccines, Tdap, Influenza, Pregnancy, Hispanic

Unvaccinated pregnant women and their newborns are at risk of contracting easily preventable infections such as *Influenza virus* and *Bordetella pertussis*. Influenza during pregnancy presents greater risk of maternal morbidity and mortality, including severe respiratory infections, hospitalization and preterm labor (1, 2). Since infants cannot receive the influenza vaccine until they are 6 months old, trans-placental transmission of antibodies has been suggested to be the best prevention strategy for early immunization (3-5). Since 2004, the Advisory Committee on Immunization Practices (ACIP) has recommended that the influenza vaccine be administered to women pregnant during flu season in any of their trimesters (6). Even though influenza immunization is the best method for preventing disease and subsequent complications, and the vaccine is readily available, statistics suggest that half of the pregnant patients in the United States (US) comply with these recommendations (1). In Puerto Rico (PR), there is very little known about the immunization rates in our population. The latest available statistics report 614 pregnant women vaccinated for influenza during the 2016-2017 season, without reporting the absolute number of pregnancies in that specific time frame

(7). With 28,000 births in 2016, this number suggests that only 2% of living neonates benefited from maternal vaccination.

In regards to the Tdap vaccine, morbidity and mortality rates of pertussis are highest in infants who have not completed the immunization series of diphtheria-tetanus-acellular pertussis (DTaP) vaccines (8-9). In 2013, ACIP recommended the Tdap vaccine to be administered during their third trimester (27-36 weeks) (10). Tdap vaccination rates in US range around 48.8% in women with live births (11) but no information is available regarding Tdap immunization rates of pregnant women in Puerto Rico.

Despite national recommendations by different agencies, optimum Influenza and Tdap vaccination rates have not been

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achieved among pregnant women (3, 4, 12). According to previous studies, among the most common reasons for refusing vaccination are safety concerns and the belief that vaccination is not needed during pregnancy (13). However, when physicians recommend immunization, most pregnant women agree on administration (14). Based on the available evidence, the goal of this study is to assess the knowledge and attitudes concerning influenza and Tdap immunization among Hispanic pregnant women seeking prenatal treatment in a tertiary care center in Puerto Rico and to correlate these findings with their immunization practices during pregnancy. This information will help to seek ways for further spread immunization principles in our high-risk population.

Methods

The study is a cross-sectional study conducted at the prenatal care clinics of the University of Puerto Rico University District Hospital in the Medical Sciences Campus. The University of Puerto Rico Medical Sciences Campus Institutional Review Board approved the protocol.

The instrument utilized for the study was a previously-validated questionnaire as part of a previous pilot study given to 26 participants with similar characteristics to the population under study. It consists of a 79-item self-administered questionnaire which was offered to consenting pregnant women from September 2016 to June 2017. Inclusion criteria for the study consisted of legal adult pregnant women, as defined in Puerto Rico as aged 21 years or older, who can read and write in Spanish. Patients were invited to participate during their prenatal visit. Those agreeing to participate were consented by principal investigators or research team and a copy of the written consent provided to each of them prior to answering the questionnaire. The data was gathered in two distinct ways: self-administered and study-staff administered interview, as per patient request. Data obtained from the consent form and questionnaire was de-identified and stored safely in a lock room with access granted only to principal investigator and co-PI.

Study questionnaire

The questionnaire included seven sections: demographics, medical history, lifestyle, sexual practices, reproductive history, immunization history, and knowledge and attitudes about influenza and Tdap vaccines. For the purpose of this study, we analyzed the demographics and immunization history as well as questions on knowledge, attitudes and practices about influenza and Tdap vaccination.

Statistical analysis

Descriptive statistics was done to report the demographic characteristics, immunization history and knowledge and attitudes about the influenza and Tdap vaccines. Continuous variables were analyzed using means or medians and their respective standard deviations or interquartile percentiles.

Categorical variables were described using frequency and percentage. To assess the association of the demographics characteristics, immunization knowledge and attitude with behavior of immunization we used Chi-square (χ^2) test or Fisher's exact test. T-test and Wilcoxon rank-sum were done to observe and quantify possible associations between behavior of immunization and continuous predictors.

Results

A total of 189 Hispanic pregnant women living in Puerto Rico were recruited for the study. The average participant was a 27.8-year-old Puerto Rican, obese pregnant woman, with some university education or less, who came seeking care using public health insurance due to her poverty level income. The specific socio-demographic features of the participants are presented on Table 1.

Table 1. Demographics characteristics of participating pregnant women, 2016-2017 (N=189).

| Characteristic | Frequency | Percent |
|-------------------------------------|-----------|---------|
| <i>Age group in years (n=189)</i> | | |
| 21-30 | 117 | 61.9 |
| 31-40 | 64 | 33.9 |
| >40 | 8 | 4.2 |
| <i>Body Mass Index (n=187)</i> | | |
| <18.5 | 3 | 1.6 |
| 18.5-24.9 | 48 | 25.4 |
| 25-29.9 | 47 | 24.9 |
| 30-34.9 | 32 | 16.9 |
| 35-39.9 | 28 | 14.8 |
| >40 | 29 | 15.3 |
| <i>Place of Birth (n=188)</i> | | |
| Puerto Rico | 169 | 89.9 |
| Continental USA | 13 | 6.9 |
| Dominican Republic | 6 | 3.2 |
| <i>Education (n=187)</i> | | |
| ≤ High school | 81 | 43.3 |
| Some University | 57 | 30.5 |
| Bachelors or higher | 49 | 26.2 |
| <i>Marital Status (n=187)</i> | | |
| Single | 77 | 41.2 |
| Married | 47 | 25.1 |
| With Partner | 63 | 33.7 |
| <i>Annual Income, US \$ (n=131)</i> | | |
| < 10,000 | 78 | 59.5 |
| 10,000-19,999 | 20 | 15.3 |
| 20,000-49,999 | 24 | 18.3 |
| >50,000 | 9 | 6.9 |
| <i>Healthcare Insurance (n=173)</i> | | |
| Public | 122 | 70.5 |
| Private | 35 | 20.2 |
| Medicare | 16 | 9.3 |

Influenza vaccine

About 48% of participants did not know if influenza vaccine was risky for pregnancy and a 76.7% reported unknown effects of vaccination during breastfeeding. However, 90% of participants responded that pregnant women should be protected against

influenza. Additionally, 38.6% indicated the severity of influenza infection is similar for pregnant and non-pregnant women. When asked for the best time for immunization, 65% reported before pregnancy, with 52.4% identifying the annual frequency. Most women (136, 75.6%) stated that the vaccine was offered or that they received orientation about influenza vaccination during pregnancy mostly from healthcare professional (48.7%) or the media (9.5%). However, only 57.1% received information about the effects of the influenza infection during pregnancy.

Regarding attitudes and practices, 51.8% had received the influenza vaccine at least once but only 12.2% during pregnancy. Most vaccinated patients had only received it once in their lifetime, mainly at health clinics or physician’s offices. On the downside, only 68% of vaccinated patients stated that they would be willing to receive the influenza vaccine again. Table 2 through 3 summarize information regarding attitudes and practices.

Tdap vaccine

Most participants (76.7%) did not know if the Tdap vaccine was risky during pregnancy and 79.4% did not know about if it was risky during breastfeeding. In terms of vaccination, 58.7% did not know the timing to administer Tdap, 30.7% thought it was before pregnancy, and 74% lack knowledge about frequency of Tdap vaccination.

The Tdap vaccine was offered to only 20.6% of participants and 55.6% of patient had not been oriented about the pertussis infection. For the few oriented, most identified health professionals as their resource.

Only 23.3% of participants received the Tdap vaccine. When asked if would repeat vaccination, 30.2% said they would; results are higher than those vaccinated, suggesting that those who did not know if they were vaccinated could consider it.

As seen in Table 3, for all patient who would not receive the vaccine, the main two reasons to avoid it were lack of information

by a health professional (15.3% and 9.5%; Influenza and Tdap respectively) and fear of effects during pregnancy (14.8% and 35.9%; Influenza and Tdap respectively).

Predictors of influenza or Tdap vaccination

When performing bivariate analysis, there was no statistically significant association between demographic variables and the vaccination rate for either vaccine. A healthcare professional recommendation for vaccination and having received the vaccine at a medical center were statistically significant associated with being vaccinated. When using Logistic Regression method, having a healthcare professional recommendation for influenza vaccine correlated positively with getting vaccinated with an unadjusted Odds ratio (OR) = 4.087 (95% confident intervals (CI) from 1.95 to 8.54). The same regression done for Tdap vaccine, proved a positive correlation with an unadjusted OR = 5.929 (95% CI 2.5-14.06). Also, prior influenza vaccination has a positive prediction of repetitive behavior. However, this association was not replicated for the Tdap vaccine.

Lastly, statistics showed a positive correlation between being afraid of children contagious with pertussis and vaccination rates. At the same time a positive correlation was observed when comparing the fear of contracting influenza and the need to protect patients during their pregnancy. Although these last two variables didn’t demonstrate statistical significance, it shows a positive correlation which is frequently encountered in the clinical setting.

Discussion

Immunization plays an essential role in pregnancy, and is particularly important in high-risk populations. Health care professionals and primary care physicians are the key to achieve prevention of vaccine-preventable diseases in pregnant women

Table 2. Knowledge, beliefs, and practices about influenza and Tdap vaccination during pregnancy (N=189)

| | Influenza | | | Tdap | | |
|--|------------|-----------|----------------|------------|------------|----------------|
| | Yes (n, %) | No (n, %) | Unknown (n, %) | Yes (n, %) | No (n, %) | Unknown (n, %) |
| <i>Vaccine general knowledge</i> | | | | | | |
| Pregnant women should be vaccine | 170 (90) | 14 (7.4) | 5 (2.6) | 58 (30.6) | 15 (7.9) | 116 (61.4) |
| Risk of the disease are the same regardless of pregnancy status | 73 (39) | 58 (31) | 56 (29.9) | N/A | N/A | N/A |
| Vaccine is dangerous during pregnancy | 46 (24.3) | 52 (27.5) | 91 (48.1) | 19 (10) | 25 (13.2) | 145 (76.7) |
| Vaccine is dangerous during breastfeeding | 32 (16.9) | 31 (16.4) | 126 (66.7) | 20 (10.5) | 19 (10) | 150 (79.4) |
| <i>Practices</i> | | | | | | |
| Vaccinated at least once | 98 (51.8) | 81 (42.9) | 10 (5.3) | 44 (23.3) | 76 (40.2) | 69 (36.5) |
| Willing to receive the vaccine again | 68 (35.9) | 19 (10) | 102 (53.9) | 57 (30.2) | 6 (3.2) | 126 (66.7) |
| <i>Experiences and Beliefs</i> | | | | | | |
| Received information about the vaccine | 108 (57.1) | 76 (40.2) | 5 (2.6) | 39 (20.6) | 105 (75.5) | 45 (23.8) |
| Information about the vaccine was offered by a healthcare professional | 136 (75.6) | 44 (23.3) | 9 (4.8) | 52 (27.5) | 98 (51.8) | 39 (20.6) |
| Participant was informed about the effects of the disease | 108 (57.1) | 76 (40.2) | 5 (2.6) | 39 (20.6) | 105 (55.6) | 45 (23.8) |
| Information about this vaccine should be administered during pregnancy | 170 (89.9) | 4 (2.1) | 15 (7.9) | 58 (30.7) | 15 (7.9) | 116 (61.4) |

(15). Influenza vaccination is an essential element during preconception, prenatal and post-partum care as pregnant women are at increased risk of serious illness due to seasonal and pandemic influenza (3). This study is consistent with national data, as most patients had received influenza vaccine at some point in their life (16), most referred receiving it more than once and being willing to receive it in the future. It is essential for patients to receive immunizations, as it will promote vaccination conduct in their future medical care. Moreover, as previously reported, participants proved that access to health care professionals and medical settings improve vaccination rates, being pivotal to such results. Obstetricians must embrace their role as a vital resource of information, advice and counselling in women's health issues (15).

According to internet panel survey conducted by the CDC in the U.S. in 2016 and 2017, 53.6% of pregnant women received the influenza vaccine (1). Data obtained from Hispanic patients in this population presents similar findings. This acknowledges that, although influenza vaccination rates in pregnant patients have increased, significant improvement still is needed (3). The 80% vaccination rate expected by the World Health Organization Healthy People 2020 still is far from reality. Moreover, mixed data gathered from immunization perception and practices during pregnancy suggest uncertainty and unclear concepts conceived by patients.

Answers involving timing and frequency of influenza vaccine administration as well as complications of influenza disease during pregnancy are consistent with others in literature. Demonstrating, that most participants are not familiarized with immunization practices during pregnancy, severity of such disease during pregnancy, and the adverse fetal outcomes (17-18). Perceived danger linked to vaccine administration during pregnancy or in the post-partum period when breastfeeding results from unrecognized benefits to patients during these periods. Obscured immunization knowledge about improving pregnancy outcomes and passive immunization for the neonates can be implied in the results, as seen in other studies (19). Again, access to information from reliable sources, as health care professionals, is essential to clarify perspectives, provide correct information and increases prenatal vaccination, improving morbidity and mortality of pregnant patients and their neonates.

Ways to endorse vaccination practices in the healthcare environment in a standardized manner are needed for better coverage assessing immunization practices. Guidelines

Table 3. Knowledge about timing, frequency and source of administration of influenza and Tdap vaccines and reasons not to get vaccinated (N=189)

| | Influenza | | Tdap | |
|--|-----------|---------|-----------|---------|
| | Frequency | Percent | Frequency | Percent |
| <i>Timing of administration (n=189)</i> | | | | |
| Before pregnancy | 123 | 68.2 | 58 | 30.7 |
| During pregnancy | 23 | 12.2 | 14 | 7.4 |
| After pregnancy | 23 | 12.2 | 6 | 3.2 |
| Unknown | 35 | 18.5 | 111 | 58.7 |
| <i>Frequency of administration (n=189)</i> | | | | |
| Annually | 99 | 52.4 | 25 | 13.2 |
| Every 5 – 10 years | 5 | 2.6 | 21 | 11.1 |
| Each pregnancy | 1 | 0.5 | 3 | 1.6 |
| Other | 84 | 44.4 | 140 | 74 |
| <i>Vaccine offered by (n=101 influenza, n=48 Tdap)</i> | | | | |
| Healthcare setting | 80 | 79.2 | 45 | 93.8 |
| School | 10 | 9.9 | 0 | 0 |
| Other | 11 | 10.9 | 3 | 6.3 |
| <i>Reasons not to get vaccinated (n = 189)</i> | | | | |
| Effects on pregnancy | 29 | 15.3 | 18 | 9.5 |
| Not being informed | 28 | 14.8 | 68 | 35.9 |
| Risk associated with vaccination | 12 | 6.3 | 3 | 1.6 |
| Other | 6 | 3.1 | 10 | 5.3 |
| I will get vaccinated | 35 | 18.5 | 1 | 0.5 |
| Refuse to answer | 79 | 41.8 | 89 | 47 |

released by the CDC that have been created to strengthen patient perspective in undergoing vaccination can be applied in our clinical setting. An interdisciplinary team can also aid in promoting these practices as well. Currently, the federal law (The National Childhood Vaccine Injury Act of 1986) mandates that all healthcare providers who administer vaccines must give patients, their parents or legal representatives, the appropriate vaccine information statement (VIS), which can be used to educate patients before administration of each dose of certain vaccine (15). This serves as an educational strategy for patients.

Tdap vaccination results demonstrated mixed data results in all aspects regarding knowledge, attitudes, perception, and vaccination practice. However, all areas scored below those for influenza. It may imply a lack of knowledge on the topic among the population and health care providers as well as limited media coverage on the importance of Tdap vaccination. The aforementioned areas can represent a forum for further patient interventions as well as physician education to ensure immunization practices during pregnancy. It is important to spread the knowledge that most infant pertussis infection occur in the first 3 months of age and recommended administration of pertussis vaccine for infants starts at 2 months old age, leaving a 2-month window of susceptibility (9). The CDC on 2016 internet panel survey reported that 48.8% of pregnant

patients receive the Tdap vaccine (11). In Puerto Rico, there is no publicly available information regarding Tdap vaccination practices in pregnancy. If this data would be extrapolated to Puerto Rican Tdap vaccination, the pregnant patient are two times less likely to get vaccinated compared with the Hispanics in the US. In this study, participants were unaware whether vaccination is indicated, and most denied having received any information about the effects of pertussis infection. Time constraints has been reported as a limitation to proper prenatal counseling (19). Physician time management may be improved with the inclusion of ancillary personnel in the education of pregnant patients. Also, nurses and other health professionals involved in prenatal care play a major role in increasing vaccination in pregnant women by advising women to be vaccinated and by addressing their concerns about vaccine safety (19). This study suggests that urgent action is needed to cover immunization with Tdap vaccine in the tertiary care center evaluated. Improvement is also needed with influenza vaccination rates in the center evaluated.

One limitation of this study is that although the sample incorporates patients from across the island of Puerto Rico, it was collected in a single healthcare center and the results cannot be generalized. As result, the external validity of study is compromised. However, our findings suggested potential areas for intervention and could be used as a guidance for the development of other studies to evaluate vaccination trends in Puerto Rico. Another limitation is that the data was gathered in two distinct ways: self-administered and study-staff administered interview, as per patient request. Recall bias is always present when self-administered questionnaire is given as well as interviewer bias when a study-staff is performing the questions. In addition, this questionnaire was administered in flu season which could result as confounding in the results. The unknown response was prevalent in multiple questions in our instrument which can limit the interpretation of data. Despite these limitations, this study serves as a base for further studies on Puerto Rico prenatal counseling and primary prevention strategies.

In summary, evaluation of immunization status and scheduled vaccine education during pregnancy is an integral component of prenatal care. Our study addresses the gap of information observed in our population. Alternative strategies need to be created such as centering groups, health campaigns, ancillary personnel collaboration and paper or digital information which will aid in the optimization of education strategies among our patients. Further investigation is needed to understand all factors that can influence preconception and peri-partum care in all patients. Additionally, elaboration of a stratified data collection system is needed to recover information of immunization practices regarding Tdap administration among pregnant patient, since no data is available or reported in literature of the population evaluated. This study emphasizes the pivotal role that physicians play in setting preventive care measures in our patients. By endorsing this role, physicians can help improve vaccine practices in our population.

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AMR and JR conceived the study. LR recruited most patients administering them the questionnaire. AMR, DV, LR and YM contributed to the designed, conducted the analysis and performed the study. AMR, DV and LR drafted the manuscript; JR and YM revised the manuscript and statistical analysis. All the authors approved the final manuscript. This study was supported in part by the UPR School of Medicine Endowed Health Services Research Center, Grants 5S21MD000242 and 5S21MD000138, from the National Center for Minority Health and Health Disparities, National Institutes of Health (NCMHD-NIH). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of NCMHD- NIH.

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