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ORIGINAL ARTICLE

Impact of Influenza vaccination on risk groups patients diagnosed by the Institute Adolfo Lutz Regional Laboratory Center located in São José do Rio Preto, Sao Paulo

Impacto da vacinação contra Influenza em pacientes pertencentes à grupos de risco diagnosticados pelo Instituto Adolfo Lutz de São José do Rio Preto, São Paulo

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ABSTRACT

Introduction: Influenza is a viral respiratory infection, with high transmissibility and global distribution, being responsible for high rates of hospitalization and mortality. The vaccination is a effective measure and an important control strategy. Objective: to evaluate the vaccination impact on children under five, elderly people over 60 and pregnant women. **Methods:** a results survey of Influenza were done at the Instituto Adolfo Lutz Regional of São José do Rio Preto, in the period from January 2018 to December 2019. **Results:** a total of 1468 samples of respiratory secretion from patients with suspected Severe Acute Respiratory Syndrome (SARS) and 56 respiratory tract fragments of suspected SARS deaths were analyzed. The positivity rates for influenza in each group were: 10.6% in children, 25.2% in the elderly and 28.8% in pregnant women, the majority of whom were not immunized (84; 78.6 and 61%), respectively. In relation to the deaths, 14.2% were positive for the Influenza virus and 100% were not immunized. **Conclusion:** In the studied groups, vaccination played an important role in the prevention of Influenza infection. It should be noted that most patients diagnosed with SARS were not vaccinated, including all deaths, confirming the importance of vaccination in the priority groups.

RESUMO

Introdução: Influenza é uma infecção respiratória viral, de elevada transmissibilidade e distribuição global, sendo responsável por elevados índices de hospitalização e mortalidade. A vacinação é uma medida efetiva e uma importante estratégia de controle. Objetivo: avaliar o impacto da vacinação em crianças menores de cinco anos, idosos acima de 60 anos e gestantes. **Métodos:** estudo observacional retrospectivo de levantamento de dados do Gerenciador de Ambiente Laboratorial (GAL) referente aos exames de Influenza realizados no Instituto Adolfo Lutz Regional de São José do Rio Preto, de janeiro de 2018 a dezembro de 2019. **Resultados:** foram analisadas 1468 amostras de secreção respiratória de pacientes com suspeita de Síndrome Respiratória Aguda Grave (SRAG) e 56 fragmentos do trato respiratório de óbitos suspeitos SRAG. As taxas de positividade para influenza foram: 10,6% em crianças, 25,2% em idosos e 28,8% em gestantes, sendo a maioria, não imunizados (84; 78,6 e 61%), respectivamente. Dos óbitos, 14,2% foram positivos para o vírus Influenza e 100% não eram imunizados. **Conclusão:** Nos grupos estudados, encontramos possível associação entre o papel da vacinação na prevenção da infecção por Influenza. Cabe ressaltar que a maioria dos pacientes diagnosticados com SRAG não foram vacinados, incluindo todos os óbitos, ratificando a importância da vacinação nos grupos prioritários.

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Influenza; vaccination; priority groups

Introduction

Influenza viruses, distributed worldwide, affect three to five million people annually. They are responsible for high rates of morbidity, hospitalization and mortality worldwide, involving high economic and social burden, despite being a preventable disease.[1,2] Vaccination is the most effective public health step against influenza and its complications and is considered an important control strategy, to reduce the rates of hospitalizations, deaths, and to medication expenses.[3]

Brazil has one of the most extensive immunization programs in the world. Since 1999, the influenza vaccine has been provided free of charge throughout the national territory.[2] Vaccination for seasonal influenza was initially available only for elderly people over 60 years old and some risk groups. Gradually, other groups were included as priorities and, currently, children from 6 months to under 6 years old, pregnant and postpartum women up to 45 days after childbirth, teachers from public and private institutions, indigenous, people with chronic diseases and non-communicable diseases and other special clinical conditions (with medical prescription), people with permanent disabilities, security and rescue forces, armed forces, truck drivers, road collective transport workers, port workers, in addition to the population deprived of liberty, inmates (including adolescents and young people aged between 12 and 21 under socio-educational measures) and prison system staff.[4, 5]

Health professionals also included in priority groups for vaccination, are considered strategic to prevent the transmission of Influenza viruses to high-risk patients.[2,4] The World Health Organization recommends that three key populations should be prioritized for influenza vaccination, among them pregnant women, children under five and the elderly.[6]

Although vaccination against influenza is recommended and remains a priority step annually,

vaccination coverage has declined in recent years, especially in children under five and pregnant women. The low vaccination coverage that has been occurring in recent years is considered multifactorial and is mainly related to the difficulty of accessing vaccines and the lack of confidence and knowledge regarding the benefits and safety of the Influenza vaccine.[4, 6]

Therefore, the objective of this study was to evaluate the impact of vaccination on the main risk groups for Influenza: children under five years old, elderly people over 60 years old and pregnant women.

Methods

Study design

This is a retrospective observational study with a survey of the Laboratory Environment Manager (GAL) database, notification forms and laboratory test sheets referring to samples from hospitalized patients with suspected SARS, sent for the diagnosis of Influenza to the laboratory reference, Instituto Adolfo Lutz Regional Laboratory Center of São José do Rio Preto, from January 2018 to December 2019. The study was approved by the Ethics Committee of Instituto Adolfo Lutz (CAAE: no. 30692720.8.0000.0059).

Sample

The data search strategy took place in two phases, the first phase being the survey of tests (qPCR) for the diagnosis of Severe Acute Respiratory Syndrome (SARS) registered in the GAL and obtaining information related to the clinical picture and symptoms presented, obtained from the notification forms of each patient. In the second phase, the Molecular Biology (qPCR) results were obtained from the laboratory test sheets of the reference laboratory. Only the results obtained by qPCR were considered.

The results referring to individuals belonging to risk groups were included in the study: children under five years old, elderly people over 60 years old and pregnant women hospitalized with signs of severity and suspected of having SARS. All deaths with a clinical picture of severe acute respiratory disease, regardless of the symptoms presented, were considered SARS cases.

Results referring to individuals who did not belong to the risk groups of this study or whose hospitalization and/or sample collection occurred outside the study period were excluded from the study.

Statistical analysis

Data were tabulated in an Excel spreadsheet and exported to SPSS version 21, treated using descriptive statistics, with calculations of percentages, averages, and frequencies, and presented in the form of tables. In comparing the scores between the groups, the chi-square test was used, and a value of $p<0.05$ was considered statistically significant.

Results

During the study period, 1468 respiratory secretion samples from patients with suspected SARS, belonging to risk groups, were admitted to hospitals in the northwest region of the State of Sao Paulo, and 56 respiratory tract fragments from suspected SARS deaths were registered in system. The distribution among risk groups is shown in Figure 1.

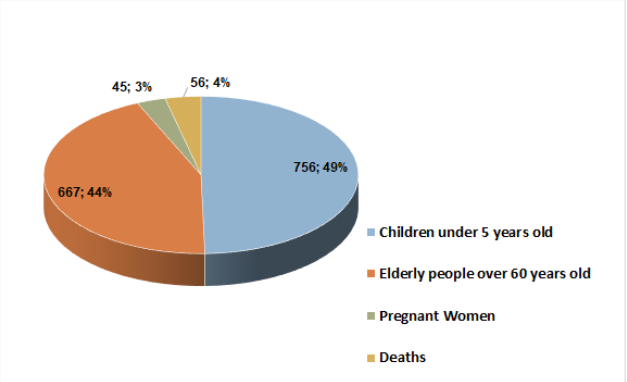

Figure 1: Distribution of samples suspected of SARS among risk groups.

Children under 5 years old

The positivity for the Influenza virus, found in respiratory secretion samples from children under five years old, was 10.6% (80/756).

The Influenza A virus predominated among the positive respiratory secretion samples, with 70 positive samples for Influenza A and 10 for Influenza B. Of the Influenza A samples, 56 were from the H1N1pdm09 (H1N1) lineage and 14 from the H3 seasonal lineage (H3) (Figure 2). Regarding vaccination, 84% of these positive children were not vaccinated (Figure 5).

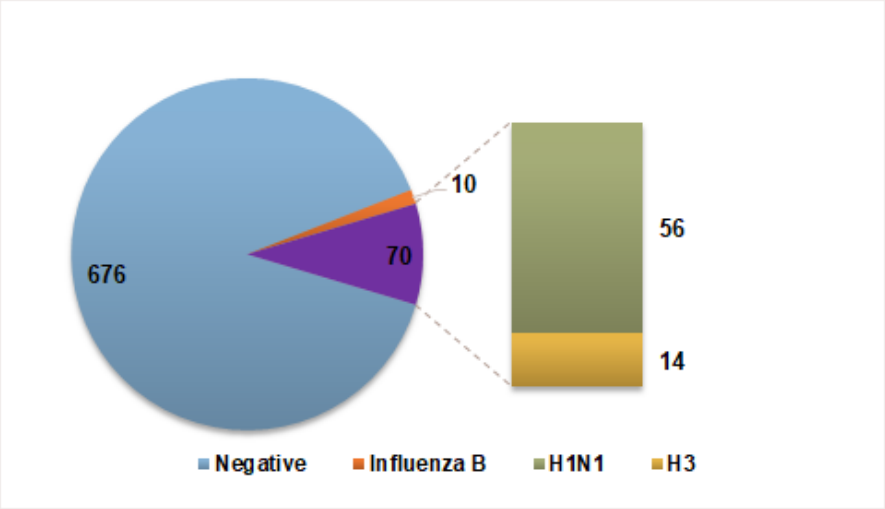

Figure 2. Distribution of Influenza viruses among children under 5 years of age.

Older people over 60 years old

The positivity for the Influenza virus, found in respiratory secretion samples from elderly people over 60 years old was 25.2% (168/667).

The Influenza A virus, as well as in children, predominated among the samples of positive respiratory secretions from the elderly, totaling 92.9% (156/168) of the cases, remaining 7.1% (12/168) were Influenza B. Influenza A samples, 70.5% (110/156) were from the H1N1pdm09 (H1N1) lineage, 26.9% (42/156) were from the seasonal lineage H3 (H3) and 2.6% (4/156) Influenza A were not subtype (Figure 3).

Regarding vaccination, approximately 78.6% (132/168) of the positive samples were from unvaccinated elderly people (Figure 5).

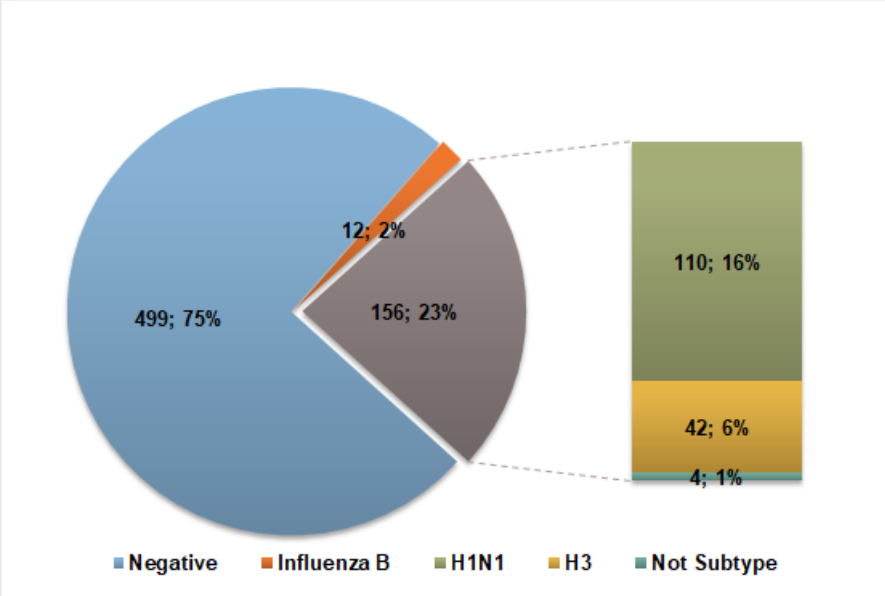

Figure 3. Distribution of Influenza viruses among elderly people over 60 years of age.

Deaths

The results of 56 fragments of the respiratory tract of the cases of death were analyzed. Eight samples were positive for the Influenza virus, of which seven were H1N1pdm09 and one was seasonal lineage H3.

Vaccination

Most patients who tested positive for SARS, in all risk groups, including all deaths, did not receive the vaccine, as can be seen in Figure 4.

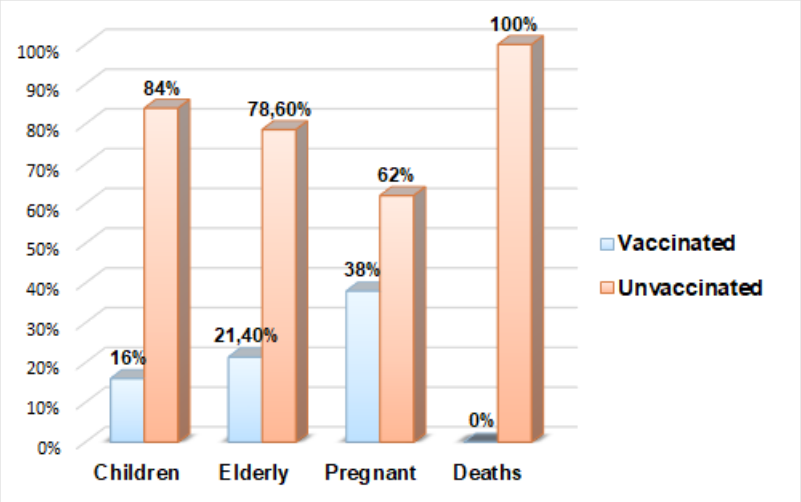

Figure 4. Percentage of vaccinated and unvaccinated individuals against influenza among positive cases.

Table 1 shows the statistical data results, in which a significant relationship can be observed between the profile of children under 5 years old, greater vaccination and a lower rate of infection with p≤0.001, the opposite relationship was observed between the elderly group, the which vaccinated less and had a higher rate of infection (p≤0.001). There was no significant relationship between profiles and virus subtypes (p=0.558).

Table 1. Statistical analysis

Profile	Total n=1524	Negative n=1255 (82,3%)	Positive n=269 (17,7%)		
			Total n=269	Vaccinated n=108 (40,1%)	Not vaccinated n=161 (59,9%)
Pregnant	45 (3,0%)	32 (2,5%)	13 (4,8%)	5 (4,5%)	8 (5,0%)
Older	667 (43,8%)	499 (39,8%)	168 (62,5%)	36 (33,3%)	132 (82,0%)
Children	756 (49,6%)	676 (53,9%)	80 (29,7%)	67 (62,2%)	13 (8,1%)
Death	56 (3,7%)	48 (3,8%)	8 (3,0%)	-------	8 (5,0%)

Qui square test; $p_{\text{positive x negative}} \leq 0{,}001$; $p_{\text{vacinnated x not vaccinated}} \leq 0{,}001$

Discussion

In this study, a survey was carried out of the results of laboratory analyses obtained in the 2018-2019 biennium, of respiratory secretion samples from the main risk groups for Influenza: children under five years old, elderly people over 60 years old and pregnant women, to evaluate the impact of vaccination on these groups. The findings showed an alarming scenario in the risk groups evaluated caused by the absence of vaccination against Influenza in terms of hospitalizations and deaths.

The pediatric population is particularly vulnerable to respiratory infections of viral etiology.[7, 8] It is estimated that annually 15 to 45% of children are infected with the influenza virus and that, by the age of six years, most of them have already been infected by the virus. influenza virus at least once.[9] In addition, each year around the world, about 870,000 children under 5 years old and 300,000 children under one year old are hospitalized due to influenza, and between 28,000 and 112,000 children under five years old die due to influenza-related causes, most of them in developing countries.[9,10]

In the present study, the predominance of Influenza A subtype H1N1pdm2009 (56/70) in samples from children under five years old corroborates with several studies that report the Influenza A virus H1N1pdm2009 as the most frequent in children of this age.[11,12]

Moreover, the H1N1pdm2009 lineage of the Influenza A virus has been described as the most frequently related to hospitalizations and severe conditions in children under 2 years old. This fact can be observed in a study conducted by Jané et al.,[12] where this same virus was responsible for more than 63% of children under 2 years old, corroborating with our data. Notoriously, 67 of the 80 unvaccinated children were infected, highlighting the essential role of the vaccine in these priority groups.

The importance of vaccination could also be observed in a study carried out in Latin American countries with children aged between 6 months and 2 years old, which showed that in children vaccinated previously or during study period, the chances of hospitalization due to SARS are associated with Influenza had a reduction of 43% when compared to unvaccinated

children in the same period.[13]

Children have an important contribution to the spread of the infection, especially among family members and the community (schools and daycare centers), due to the longer duration of release of the Influenza virus in children, due to the immaturity of their immune systems.[1,14,15] In a study conducted by Tsang et al.[1] benefits of vaccinating children and adolescents in reducing the spread of the influenza virus throughout the community and especially among members of the same family were also evidenced.

In the elderly population, respiratory infections represent the second cause of hospital admissions and the third cause of death.[16] Studies relate the unfavorable evolution of respiratory infections in the elderly to the presence of chronic diseases, deficiencies in defense mechanisms and weak antibody response to vaccination.[17-20]

In this study, around 25% of respiratory secretion samples from elderly people over 60 years of age were positive for the Influenza virus, of which 92.9% were Influenza A and the other Influenza B. Our data are in agreement with those published throughout the state of Sao Paulo, where 25% of confirmed cases for influenza were elderly people over 60 years of age and the positivity for Influenza A was around 95%.[7]

Similar to children group, one of the most relevant points of the current study was the high percentage of positive samples (about 82%) obtained from unvaccinated elderly people. Adherence to vaccination in these groups is essential because it contributes to the reduction of morbidity and mortality, in whom the condition almost always progresses to pneumonia.[16, 20] According to the study conducted in Argentina by Roses and Bonvehí,[21] the effectiveness of the vaccine to prevent influenza in the elderly over 60 is about 70%. Additionally, the use of the trivalent influenza vaccine was associated with a 32 to 45% decrease in hospitalizations for pneumonia, 31 to 65% in-hospital mortality from pneumonia, and a 43 to 50% reduction in respiratory diseases.

The positivity of the Influenza virus in the samples of pregnant women in this study was 28.9% in the present study. The Influenza A virus was detected in twelve of the thirteen samples analyzed, with a predominance of the H1N1pdm09 strain. Alarmingly, eight of the thirteen positive samples were from unvaccinated pregnant women, despite the Influenza vaccine being widely recommended for this population. In pregnant women, the flu vaccine reduces flu-like illnesses by 36%, with a 63% effectiveness in reducing influenza cases in children under 6 months.[22,23] In addition, vaccination also protects the newborn born that cannot be immunized during the first 6 months of life, through the transfer of antibodies via the placenta and later through breastfeeding.[22-25]

Currently, vaccination coverage and acceptance of vaccines during pregnancy are below the established goals.[4,23] Justifications such as fear of adverse effects combined with lack of information are among the most common causes of low vaccination coverage.[23] Additionally, we can mention several situations that jeopardize that vaccination coverage is satisfactorily achieved, such as the dissemination of erroneous information about the safety and efficacy of the influenza vaccine, lack of knowledge of the risks of influenza infection during pregnancy, false perception that influenza does not pose risks, concerns about vaccine safety for the fetus, in addition to the lack of medical assistance incentives.[23-25]

Greater adherence of pregnant women to vaccination campaigns is of paramount importance because, during pregnancy, women undergo physiological changes in their immune, cardiac and pulmonary systems, with increased oxygen consumption and decreased lung capacity, suppression of immunity, and others. Pregnancy increases women's susceptibility to infectious diseases and pathogens, so the risks of hospitalization and complications from respiratory diseases during the flu season are higher in pregnant women, who are more likely to have an unfavorable course of infection and adverse birth outcomes.[25-30]

In a review Cuningham et al.,[25] studies on the immunogenicity and benefits of influenza vaccination in pregnant women are reported. Immunization early in pregnancy is important because of ample evidence that the risk of fetal death and adverse births are higher for women who are infected with influenza during the first trimester. However, one of the most interesting findings is the evidence of immune decline at the time of delivery in women immunized in early pregnancy. Therefore, the authors suggest that women immunized in early pregnancy receive a second dose if they are still pregnant in the following flu season, emphasizing the importance of vaccination, especially for the benefits to newborns.

Finally, in seasonality, 23% of confirmed cases of Influenza evolved to death throughout the state of São Paulo. Among the deaths, about 40% were elderly over 60 years, with a percentage of 84% not vaccinated.[7] In this study, among the eight deaths positive for the Influenza virus, only two were elderly, a representative below what was observed in the entire population. state. However, it should be noted that all deaths were unvaccinated patients.

In a study conducted in Portugal to estimate the impact of seasonal trivalent influenza vaccination on hospitalizations and avoided deaths among the high-risk population, it was shown that seasonal vaccination prevented 21% of hospitalizations and 29% of deaths in the population aged 65 years old or more and 18.5%, and 19.5% in chronic conditions population.[31]

The health benefits of vaccination against Influenza in terms of hospitalizations and deaths are indisputable, greater adherence to vaccination, especially in risk groups, could avoid many of the unfavorable outcomes

mentioned above. Thus, it is necessary to involve and inform the population of the importance of immunization. However, it should be noted that for an immunization program to be successful, the population must have confidence in health services and a greater understanding of the benefits of vaccination.

Conclusion

In conclusion, the priority groups positive for Influenza, 84% of children under five years old, 78.6% of the elderly and 61.5% of pregnant women had not been vaccinated, suggesting the important role of vaccination in the prevention of Influenza infection in these groups. It should be noted that most patients diagnosed with SARS were not vaccinated, including all deaths, confirming the importance of vaccination in priority groups.

Conflict of interests

The authors declare that there is no potential conflict of interest.

Financial

There was no funding or supply of equipment and materials.

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