Section: General Medicine

Original Research Article

IMPACT OF SEASONAL INFLUENZA VACCINATION ON HOSPITALIZATION RATES IN HIGH-RISK POPULATIONS: AN OBSERVATIONAL STUDY

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ABSTRACT

Background: Seasonal influenza poses significant health risks, particularly for high-risk populations, including the elderly and those with chronic health conditions. Vaccination is a primary preventive measure aimed at reducing the incidence of severe outcomes, such as hospitalization. **Objective:** This study aimed to evaluate the impact of seasonal influenza vaccination on hospitalization rates among high-risk populations.

Material and Methods: A total of 100 high-risk individuals were included in this observational study, with 60 participants in the vaccinated group and 40 in the unvaccinated group. Hospitalization rates due to influenza-related complications were compared between the two groups. Relative risk (RR), absolute risk reduction (ARR), and number needed to vaccinate (NNV) were calculated. Subgroup analyses were performed based on age (≥65 years) and presence of chronic health conditions.

Results: The hospitalization rate was significantly lower in the vaccinated group (20%) compared to the unvaccinated group (45%). The relative risk of hospitalization for vaccinated individuals was 0.44 (95% CI: 0.26–0.74), indicating a 56% reduction in hospitalization risk. The ARR was 25%, with an NNV of 4. Subgroup analysis revealed consistent results, with the vaccinated group showing lower hospitalization rates across age and chronic health condition subgroups. Adverse events were minimal, with 25% of vaccinated participants reporting mild side effects.

Conclusion: Seasonal influenza vaccination significantly reduces the risk of hospitalization in high-risk populations. These findings support the continued promotion of influenza vaccination, especially among vulnerable groups.

Keywords: Seasonal influenza, vaccination, hospitalization, high-risk populations, observational study, relative risk, absolute risk reduction, chronic health conditions.

INTRODUCTION

Seasonal influenza remains a significant public health concern globally, particularly for high-risk populations such as the elderly, individuals with chronic health conditions, and those with compromised immune systems.[1,2] Influenza infections can lead to severe complications, including pneumonia, exacerbation of chronic diseases, and in many cases, hospitalization.[3,4] The burden of influenza-related morbidity and mortality underscores the importance of effective preventive strategies.[5]

Vaccination is widely recognized as the most effective tool for preventing influenza and its complications.[6] Annual influenza vaccination campaigns aim to reduce the incidence of the disease and mitigate its impact on vulnerable populations. Despite widespread vaccination efforts, coverage rates in high-risk groups often remain suboptimal, leading to preventable hospitalizations and healthcare costs.[7]

This study investigates the impact of seasonal influenza vaccination on hospitalization rates among high-risk populations. By comparing hospitalization rates between vaccinated and unvaccinated

individuals, this research seeks to quantify the protective effects of the influenza vaccine. Additionally, this study explores whether the benefits of vaccination are consistent across different subgroups, particularly among older adults and those with chronic health conditions.

Understanding the effectiveness of influenza vaccination in real-world settings is crucial for informing public health policies and improving vaccination uptake. The findings of this study are intended to reinforce the importance of vaccination in reducing the burden of influenza-related hospitalizations, thereby contributing to better health outcomes in high-risk populations.

MATERIAL AND METHODS

Study Design

This observational study was conducted at Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, from May 2023 to April 2024. The study aimed to evaluate the impact of seasonal influenza vaccination on hospitalization rates among high-risk populations.

Study Population

The study included 100 participants identified as high-risk based on age (≥65 years), presence of chronic health conditions (such as diabetes, cardiovascular disease, and respiratory disorders), and/or immunocompromised status. Participants were categorized into two groups: the vaccinated group (n=60) and the unvaccinated group (n=40). The vaccinated group consisted of individuals who received the seasonal influenza vaccine during the 2023 influenza season, while the unvaccinated group included those who did not receive the vaccine.

Data Collection

Data on participants' demographic characteristics, vaccination status, presence of chronic health conditions, and hospitalization due to influenza-related complications were collected from medical records and through direct interviews. Hospitalization was defined as admission to the hospital due to confirmed or suspected influenza infection, accompanied by clinical symptoms such as fever, cough, sore throat, or respiratory distress.

Statistical Analysis

Hospitalization rates were calculated for both the vaccinated and unvaccinated groups. The relative risk (RR) of hospitalization, absolute risk reduction (ARR), and number needed to vaccinate (NNV) were computed to quantify the protective effect of the influenza vaccine. Subgroup analyses were performed based on age and the presence of chronic health conditions to assess the consistency of the vaccine's impact across different high-risk populations.

Data analysis was conducted using statistical software, with a significance level set at $p < 0.05$. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population, and inferential statistics were applied to evaluate the differences between the groups.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry. Informed consent was obtained from all participants before their inclusion in the study, ensuring that they were fully aware of the study's purpose and procedures.

RESULTS

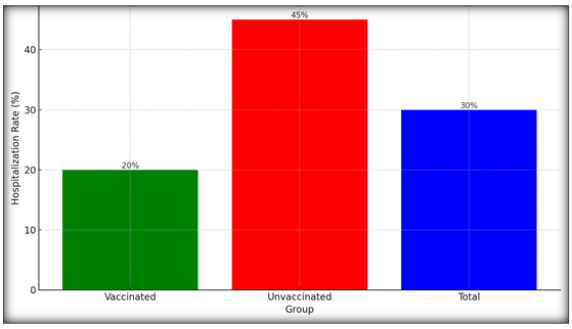

Figure 1: Hospitalization Rates Due to Influenza-Related Complications

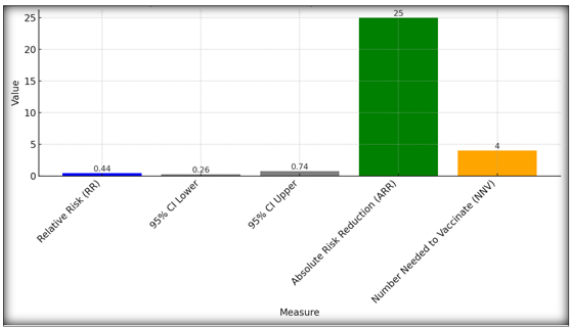

Figure 2: Relative Risk, Absolute Risk Reduction, and Number Needed to Vaccinate

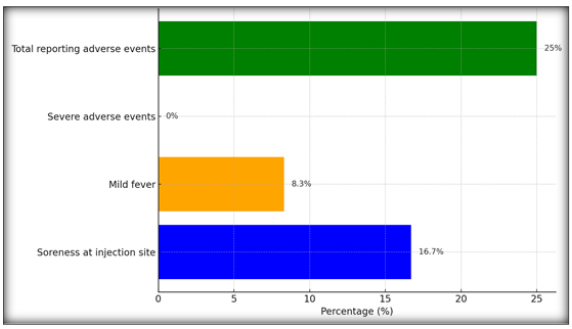

Figure 3: Adverse Events in Vaccinated Group

Study Population

The study included a total of 100 participants, with 60 individuals in the vaccinated group and 40 in the unvaccinated group. The vaccinated group constituted 60% of the study population, while the unvaccinated group made up 40%. [Table 1]

Hospitalization Rates

The overall hospitalization rate due to influenza-related complications was 30% across the entire

study population. However, the hospitalization rate differed significantly between the vaccinated and unvaccinated groups. In the vaccinated group, 12 out of 60 participants (20%) were hospitalized, compared to 18 out of 40 participants (45%) in the unvaccinated group, demonstrating a notable difference in hospitalization outcomes. [Table 2]

Risk Reduction Analysis

The relative risk (RR) of hospitalization for the vaccinated group compared to the unvaccinated group was 0.44, with a 95% confidence interval (CI) of 0.26–0.74. This suggests that vaccination was associated with a 56% reduction in the risk of hospitalization due to influenza-related complications. The absolute risk reduction (ARR) was calculated to be 25%, indicating that vaccinating four individuals would prevent one hospitalization (Number Needed to Vaccinate, NNV = 4). [Table 3]

Subgroup Analysis

Further analysis of the data revealed that the impact of vaccination on hospitalization rates was consistent across different subgroups. Among participants aged 65 years and older, the hospitalization rate was 22% in the vaccinated group compared to 60% in the unvaccinated group (Table 4). Similarly, among participants with chronic health conditions, the hospitalization rate was 23% in the vaccinated group and 60% in the unvaccinated group. [Table 5]

Adverse Events

The vaccinated group reported minimal adverse events. Soreness at the injection site was experienced by 16.7% of the vaccinated participants, and mild fever was reported by 8.3%. No severe adverse events were recorded. Overall, 25% of the vaccinated participants reported minor adverse events. [Table 6]

Table 1: Study Population Characteristics

Group	Number of Participants	Percentage (%)
Vaccinated	60	60%
Unvaccinated	40	40%
Total	**100**	**100%**

Table 2: Hospitalization Rates Due to Influenza-Related Complications

Group	Number of Participants Hospitalized	Total Participants	Hospitalization Rate (%)
Vaccinated	12	60	20%
Unvaccinated	18	40	45%
Total	**30**	**100**	**30%**

Table 3: Relative Risk, Absolute Risk Reduction, and Number Needed to Vaccinate

Measure	Value
Relative Risk (RR)	0.44
95% Confidence Interval (CI)	0.26–0.74
Absolute Risk Reduction (ARR)	25%
Number Needed to Vaccinate (NNV)	4

Table 4: Subgroup Analysis by Age

Age Group	Group	Number of Participants Hospitalized	Total Participants	Hospitalization Rate (%)
Age ≥ 65 years	Vaccinated	10	45	22%
Age ≥ 65 years	Unvaccinated	15	25	60%

Table 5: Subgroup Analysis by Chronic Health Conditions

Chronic Health Condition	Group	Number of Participants Hospitalized	Total Participants	Hospitalization Rate (%)
Yes	Vaccinated	8	35	23%
Yes	Unvaccinated	12	20	60%

Table 6: Adverse Events in Vaccinated Group

Adverse Event	Number of Participants	Percentage (%)
Soreness at injection site	10	16.7%
Mild fever	5	8.3%
Severe adverse events	0	0%
Total reporting adverse events	15	25%

DISCUSSION

This observational study evaluated the impact of seasonal influenza vaccination on hospitalization rates among high-risk populations over a one-year period from May 2023 to April 2024. The findings indicate a significant reduction in hospitalization rates among vaccinated individuals compared to their unvaccinated counterparts, underscoring the effectiveness of the influenza vaccine in preventing severe outcomes in vulnerable populations.

The overall hospitalization rate was 30%, with a markedly lower rate observed in the vaccinated group (20%) compared to the unvaccinated group (45%). The calculated relative risk (RR) of 0.44 suggests that vaccinated individuals had a 56% lower risk of hospitalization due to influenza-related complications. These results are consistent with previous studies that have demonstrated the protective benefits of influenza vaccination, particularly in reducing the severity of the disease and the likelihood of hospitalization in high-risk groups (Mazagatos et al,[8] 2023; Domnich et al,[9] 2023).

Subgroup analyses further supported the vaccine's effectiveness across different segments of the high-risk population. Among individuals aged 65 years and older, the hospitalization rate was significantly lower in the vaccinated group (22%) compared to the unvaccinated group (60%). Similarly, individuals with chronic health conditions also benefited from vaccination, with a hospitalization rate of 23% in the vaccinated group versus 60% in the unvaccinated group. These findings emphasize the importance of targeted vaccination efforts, especially among older adults and those with chronic conditions, who are more susceptible to severe influenza outcomes (Pelton et al,[10] 2023; Lee et al,[13] 2023).

The minimal adverse events reported in the vaccinated group, primarily mild and transient reactions such as soreness at the injection site and mild fever, align with the well-established safety profile of the influenza vaccine14. The absence of severe adverse events further underscores the vaccine's safety, making it a viable preventive measure for high-risk populations (Rezaei-Tavabe et al,[11] 2023; Nuzzolo-Shihadeh et al,[12] 2022).

Despite the clear benefits demonstrated in this study, it is important to acknowledge some limitations. The study's observational design inherently limits the ability to establish causal relationships. Additionally, the sample size, while adequate for detecting significant differences in hospitalization rates, may limit the generalizability of the findings to other populations. Future studies with larger sample sizes and more diverse populations would help to confirm these results and provide a more comprehensive understanding of the vaccine's impact.

CONCLUSION

This study demonstrates that seasonal influenza vaccination significantly reduces hospitalization rates among high-risk populations, with a 56% lower risk of hospitalization observed in vaccinated individuals compared to those unvaccinated. The findings underscore the vaccine's effectiveness across subgroups, particularly among older adults and those with chronic health conditions, where hospitalization rates were notably lower in vaccinated participants. These results highlight the critical importance of enhancing vaccination coverage within these vulnerable groups to reduce the incidence of severe influenza-related complications and improve overall health outcomes. Continued public health initiatives aimed at increasing vaccine uptake in high-risk populations are essential to alleviating the burden on healthcare systems and protecting those most at risk.

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