Analyzing COVID-19 Vaccine Adverse Reactions: A Comprehensive Study

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***Abstract*—This proposal addresses the issue of adverse reactions to COVID-19 vaccines. While existing studies focus on reporting reactions and patient symptoms. We aim to find insights on why some individuals experience these reactions while others do not by using data mining techniques. To achieve this, we plan to employ data preprocessing, modeling, frequent pattern mining, association rule mining, data analysis, and integration of environmental data. The primary dataset used for this research will be the Vaccine Adverse Event Reporting System (VAERS).**

***Keywords*—Adverse reactions, COVID-19 vaccines, Data mining techniques, Data preprocessing, Modeling, Frequent pattern mining, Association rule mining, Data analysis, clinicians, Medical history, Allergens, Medications, Informed choices, Data integration**

I. Introduction

Adverse reactions to COVID-19 vaccines have raised concerns, requiring the need to find factors affecting these reactions. We aim to find relations of vaccines and symptoms with medical history, allergies, or any other factors that would promote the likelihood of these side effects of the vaccine. By doing so, we will be able to provide knowledge to make informed vaccination choices.

A. Key contributions

Research investigating adverse reactions to the COVID-19 vaccine primarily focuses on reporting the vaccine type and the symptom profile of the patient. There is a lack of information on why some patients develop adverse reactions while others do not. There have also been several modifications made over time regarding how a patient risk analysis is performed prior to recommending vaccination, indicating that research on this topic is still very premature. Our goal is to provide further insights as to which characteristics pose an increased risk of experiencing an adverse reaction to COVID-19 vaccines.

We will focus on the following key elements for now:

- Identify medications that are more closely related to certain adverse reactions.
- Explore if patients with previously known allergens pose a greater risk of developing adverse reactions.
- By considering the person's previous medical history as a potential contributor to certain adverse reactions.
- By considering the number of vaccine doses that have been taken, the vaccination route and type of facility where the vaccine was given.

We hope to provide value by contributing research that will allow patients to make more informed choices. Additionally, exploration on this topic could serve as a tool for clinicians when performing a risk-benefit analysis on patients who are potential candidates for the vaccine.

II. Related Works (Optional)

In the following article, the factors most strongly associated with adverse effects were full vaccination dose, brand of vaccine, younger age, female sex, and having had COVID-19 before vaccination.

- https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2787361

There are also no known interactions between COVID-19 vaccines and prescribed or over the counter medications.

- https://www.manitobavaccine.ca/answers/are-there-medications-that-could-interact-with-the-covid-19-vaccine/

III. Proposed Solution

In this project we plan to perform the following tasks:

- Data Preprocessing
- Data Mining Technologies:
    1. Frequent pattern mining
    2. Association rule mining
- Data Analysis
- Data Integration: There is the possibility of integrating environmental data since we have column identifying states of the country.
- Identify the best solution with high accuracy by comparing different models
- Documenting the whole project in IEEE format

IV. Datasets Used

Vaccine Adverse Event Reporting System (VAERS)

- https://vaers.hhs.gov/data/datasets.html

References

[1] https://vaers.hhs.gov/data/datasets.html

[2] https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2787361

[3] https://www.manitobavaccine.ca/answers/are-there-medications-that-could-interact-with-the-covid-19-vaccine/