



Research Article

**VACCINATION OR HERD IMMUNITY—WHICH ONE IS MORE EFFECTIVE
IN TERMS OF IMMUNOLOGICAL PROTECTION**

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ARTICLE INFO

Article History:

Received 4th March, 2020

Received in revised form 25th

April, 2020

Accepted 18th May, 2020

Published online 28th June, 2020

Key words:

Vaccination, Herd Immunity, Protection,
Population, Immunization, Vaccine.

ABSTRACT

Herd immunity is a complex issue that is inherent to a vaccine and the population receiving the vaccine. Our study summarizes 'herd immunity', importantly taking focus on conceptual developments with applications to vaccination programs. We have sketched a clear view that herd immunity is an amazing benefit of protection covering the population, but it is only applicable when the most of i.e. 93% to 95% of people in a population are vaccinated properly. We have also made it clear that despite taking the advantage of herd immunity, all the people have to be vaccinated to sure the protection of own self (like we may visit one day a place where vaccination coverage is not so high and various infectious diseases are around) and surrounding people (like an older adult relative who has a chronic disease or a baby who is too young to get vaccinated avoid getting sick).

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INTRODUCTION

If enough people in a community are immunized against a particular disease, then it is more difficult for that disease to get passed between those who are not immunized. A type of immunity that occurs when the vaccination of a portion of the population (or herd) provides protection to unprotected individuals is termed as 'herd immunity'. It does not apply to all diseases. Actually, herd immunity (high) due to immunization, indirectly protects the population as a whole from disease. So, if the proportion of immune or vaccinated person in a population is large, there is less likelihood of a susceptible individual being exposed to disease and less chance of transmission of the disease from an infected person to a susceptible member.

On the other hand, a vaccine is a biological preparation that provides active acquired immunity to a particular disease, typically containing an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of a microbe, its toxins or one of its surface proteins.

Though both terms are very relatable, but on a harsh sense of immunology, herd immunity is then the weapon of immunity when near about 95% people of a population are properly vaccinated. Also, in spite of having herd immunity like an excellent benefit of immunity, all the people within a community must be vaccinated properly at the due times without any miss.

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All the causes of such statement and their detailing are going to be discussed in this study with logical explanations.

Aims and Objectives

The main objective of our study is to draw a clear sketch that despite taking the advantage of herd immunity, all the people of a population have to be vaccinated to sure the protection of own self (like we may visit one day a place where vaccination coverage is not so high and various infectious diseases are around) and surrounding people (like an older adult relative who has a chronic disease or a baby who is too young to get vaccinated avoid getting sick). Our study aims to say that herd immunity will be functional if the total population is under vaccination coverage and the more than 95% vaccination coverage of a population provides the safe sign to be protected anywhere else people visit.

What is herd immunity?

Herd immunity is an important as well as significant concept of epidemic theory regarding population-level effect of individual-immunity to prevent transmission of pathogens.

If enough people in a community are immunized against a particular disease, then it is more difficult for that disease to get passed between those who are not immunized. A type of immunity that occurs when the vaccination of a portion of the population (or herd) provides protection to unprotected individuals is termed as 'herd immunity'. It does not apply to all diseases.

So, if the proportion of immune or vaccinated person in a population is large, there is less likelihood of a susceptible individual being exposed to disease and less chance of

transmission of the disease from an infected person to a susceptible member.

Thus, herd immunity (high) due to immunization, indirectly protects the population as a whole from disease.

Understanding of herd immunity requires consideration of infection dynamics, modes of transmission, as well as the acquisition of immunity by individuals in the population. Loss of herd immunity may also explain age-associated epidemics of disease related to loss of passively acquired maternal immunity.

Importantly, effects of individual immunity that is a powerful force affecting host health and pathogen evolution, scale up to affect pathogen transmission dynamics and the success of vaccination campaigns for entire host populations. Particular immunological characteristics may be more or less likely to result in a population level signature of herd immunity. (Metcalfe CJE et al., 2015)

What is vaccination?

Vaccines can be defined as a nontoxic or non-virulent preparation of antigenic materials, often combined with adjuvants, that is administered to living individuals to induce long term humoral as well as a cell mediated protective immunity against pathogenic infections.

So, a vaccine is a biological preparation that provides active acquired immunity to a particular disease, typically containing an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of a microbe, its toxins or one of its surface proteins. Vaccines can be prophylactic (e.g.: Polio Vaccine) or therapeutic (e.g.: Vaccines against vaginal cancer).

Vaccines stimulate the living body's immune system to recognize the agent as a threat and destroy it and create memory cells against the agent and prevent its secondary infection. Administration of vaccine is called vaccination, that is most effective method of active immunization, but is less time consuming and has less risk of complication than an antibody treatment.

Mode of Action of a Vaccine in general is to induce the immune system of a living recipient to produce an immunological memory based on T and B lymphocytes in order to produce a rapid and effective response to the exposure to targeted pathogen. (Canoui E et al., 2019)

What is significance behind the term 'herd immunity'?

As flu season gets rolling, we will keep hearing health authorities to urge to everyone of age 6 or older to get vaccinated. A significant reason doctors want as many people as possible to get a 'flu shot' is that it protects more than just one of us. It also cuts the risk for our family, co-workers and everyone else around us.

When lots of people in an area are vaccinated, fewer people get sick. Then fewer pathogens or germs are around to spread from person to person. This is the principal concept of 'herd immunity', also known as 'community immunity'.

The whole principle says that if we give a vaccine to somebody, we protect them from getting infected, but we also prevent them from transmitting the disease to other people.

Herd immunity protects people, who cannot get vaccinated as their immune system is weak and vaccines might make them sick. This includes babies, people with vaccine allergies and anyone with an immune-suppressing disease like AIDS or Cancer.

It is evident from studies that often the people, we need to protect with herd immunity, are most vulnerable to serious diseases.

Why vaccines are so important?

To have herd immunity and protect lots of people from disease, a very high percentage of people in any one area need to be vaccinated. This is called the 'threshold'.

The more contagious or infectious or communicable a disease is, the higher percentage we need. To get herd immunity against measles, for example, 93% to 95% of people in a community have to be vaccinated. In other words, about 93 to 95 out of every 100 people have to get particular vaccines to prevent the specific diseases.

For examples-- When too few people get vaccinated, diseases that disappeared from the United States few years ago can make a comeback. That's because diseases that are no longer here still spread in other countries.

Rubella was wiped out in the U.S. in 2004, but it's still common in Mexico. Measles stopped spreading in America in 2000, but outbreaks happen today in Europe, Africa, Asia and the Pacific.

Herd immunity is also important because vaccine protection can fade with time. The pertussis vaccine starts to become less effective 2 years after we get it. The meningococcal conjugate vaccine that protects against meningitis also does not work as well over time.

When people's immunity drops, it can lead to new disease outbreaks unless more people in the area keep getting vaccinated.

Herd immunity and the flu

Some vaccines are better at producing herd immunity than others. The measles, mumps and rubella (MMR) vaccine is 97% effective at preventing measles, so when lots of people in a community get this vaccine, protection rates stay high.

The flu vaccine is a little difficult, which is only about 40% to 60% effective in any given year. This is because sometimes the virus strains in the vaccine do not exactly match the virus that spreads. The flu vaccine is also good at protecting small groups of people – such as in our home, office or school. When we get vaccinated, we help an older adult relative who has a chronic disease or a baby who is too young to get vaccinated avoid getting sick.

Vaccines are especially important for people who work in hospitals and other health care centers to have protective immunity. The sick people they care for are more likely to get flu complications and they need more protection.

DISCUSSION AND CONCLUSION

Don't Rely on the Herd

We might think, 'if herd immunity protects me, why do I need to get vaccinated?' Vaccines are still the best way to protect ourselves and we may travel one day to a place where the vaccination coverage is not so high.

'Herd immunity' is an amazing benefit of immunology, only when a population have high vaccination coverage. So, to achieve direct protection, if we can get vaccinated in time following the National Vaccination Rules, it will be the best way to protect ourselves as well as our surrounding and even the total population by herd immunity from vaccine-preventable diseases.

Data Availability Statement

The databases collected for this study are available to the corresponding authors.

Author Contributions

DM wrote the first draft and completed the manuscript. SA organized, revised and DM designed the study. SA provided critical revision thoroughly. All authors read and approved the submitted version.

Funding

No supporting fund is provided.

Conflict of Interest

The authors declare that this study was completed without any interference of commercial or financial relationships.

Acknowledgements

The authors show their gratitude to each other and gratefulness to their academic institution.

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How to cite this article:

Subhechha Adhikary and Debalina Mukherjee (2020) 'Vaccination or Herd Immunity—Which one is More Effective in Terms of Immunological Protection', *International Journal of Current Advanced Research*, 09(06), pp. 22451-22453. DOI: <http://dx.doi.org/10.24327/ijcar.2020.22453.4428>
