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ISSUE: The question of Vaccination to Promote Global Health

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INTRODUCTION

Vaccination is one of the most powerful and effective actions to promote human welfare and health. Every year vaccinations prevent millions of deaths all around the world. Nevertheless there are still parts of the world that cannot reach an adequate health protection through vaccinations, mostly because relatively vulnerable countries cannot afford facilities in order to guarantee a better lifestyle for their inhabitants. Despite financial troubles, vaccinations are also a very contradictory topic to discuss on, in fact a rising number of people are still skeptical about their actual effectiveness. These are the two main causes for the leak of widespread vaccinations worldwide. Many associations and official organizations have taken lots of measures on this topic with the purpose of improving a safer environment to live in for all human beings.

KEY WORDS

Vaccine: it is a biological preparation that improves immunity to a particular disease. A vaccine typically contains an agent that resembles a disease-causing microorganism, and it is often made from weakened or killed forms of the microbe. The agent stimulates the body's immune system to recognize the agent as foreign, destroy it and "remember" it, so that the immune system can more easily recognize and destroy any of these microorganisms when it will later encounter them.

Herd immunity: it is a form of indirect protection from infectious disease that occurs when a large percentage of a population has become immune to an infection, thereby providing a measure of protection for individuals who are not immune.

Anti-vaxxer: a person who is opposed to vaccination, typically a parent who does not wish to vaccinate their child as they think that vaccinations are a "human rights violation". These people are hesitant and unwilling to vaccinate also because of various fears like the side effects of the administrated substances, the vaccine's ingredients or even the arise of new illnesses caused by them.

Passive immunity: it is the transfer of active humoral immunity in the form of ready-made antibodies. It is used when there is a high risk of infection and insufficient time for the body to develop its own immune response, or to reduce the symptoms of ongoing diseases. Passive immunization can be provided when people cannot synthesize antibodies, and when they have been exposed to a disease that they do not have immunity against.

EXPLANATION OF THE TOPIC

Diseases and severe injuries caused by bacteria and viruses exterminated entire groups of people in the past and they have been one of the main causes of death for several centuries.

The practice of immunization dates back hundreds of years. Buddhist monks drank snake venom to confer immunity to snake bite and variolation (smearing of a skin tear with cowpox to confer

immunity to smallpox) was practiced in 17th century in China. In Western society the situation started to change thanks to Edward Jenner, who is considered the founder of vaccinology. His technique developed in 1796, after he inoculated a 13 year-old-boy with vaccinia virus (cowpox), and demonstrated immunity to smallpox. In 1798, the first smallpox vaccine was developed. Over the 18th and 19th centuries, systematic implementation of mass smallpox immunization culminated in its global eradication in 1979. After him there were many other men that followed Jenner's path and found vaccines for other diseases: for example Louis Pasteur's experiments spearheaded the development of live attenuated cholera vaccine and inactivated anthrax vaccine in humans (1897 and 1904, respectively). Jonas Salk and Albert Sabin, who respectively found two different ways to vaccine against polio in 1963. Mass polio immunization has now eradicated the disease from many regions around the world. Maurice Hilleman, who in 1971 created the first MMR vaccine (trivalent) and Emil von Behring, who in 1880 found vaccines against dangerous diseases such as diphtheria and tetanus.

Despite the evidence of health gains from immunization programs there has always been resistance to vaccines in some groups. The late 1970s and 1980s marked a period of increasing crises and decreased profitability for vaccine manufacture, which led to a decline in the number of companies producing vaccines. Nowadays in modern society the vociferous anti-vaccination lobby continues, sustained also by media efforts that continue a campaign of promotion against them, also sustained by the USA Movement of anti-vaxxers, convincing a lot of people that vaccinations are dangerous for somebody's health, especially for children.

In fact, vaccine controversies have occurred since almost 80 years before the terms vaccine and vaccination were introduced, and still continue to this day. Despite proofs of vaccines being safe and effective, various scares regarding their safety still occur, resulting in outbreaks and deaths from vaccine-preventable diseases. Another source of controversy is whether mandatory vaccination policies violate civil liberties or religious principles.

A modern and notable example involved: Andrew Wakefield's claimed that MMR vaccines cause autism, which in 2011 was described as "perhaps, the most damaging medical hoax of the last 100 years". In 1998 he authored a fraudulent research paper claiming that there was a link between the administration of the polyvalent measles, mumps and rubella (MMR) vaccine and the appearance of autism and bowel disease.

After the publication of the paper, other researchers were unable to reproduce Wakefield's findings or confirm his hypothesis of an association between the MMR vaccine and autism, or autism and gastrointestinal disease. A 2004 investigation by Sunday Times reporter Brian Deer identified undisclosed financial conflicts of interest on Wakefield's part, and most of his co-authors then withdrew their support for the study's interpretations.

Immunization programs depend on public confidence to be effective and news like this obviously concern the population, resulting in parents not vaccinating their children and at the same time putting at risk herd immunity. Opposition to vaccination has posed a challenge to herd immunity, allowing preventable diseases to persist in or return to communities that have inadequate vaccination rates.

In spite of everything there are some individuals that either cannot develop immunity after vaccination or for medical reasons cannot be vaccinated such as the young, the old, the sick and also pregnant women, whose immune systems cannot withstand the dose of weakened virus in a vaccine. Newborn infants are too young to receive many vaccines, either for safety reasons or because passive immunity renders the vaccine ineffective.

VACCINE RESEARCH AND COSTS

As it might be predictable vaccine research and vaccine manufacturing have high costs: development and pricing of vaccines and accounting can be complex. The major cost categories are facilities and maintenance, raw materials and production, personnel and quality assurance. The cost of raw materials, components, labor, analytics, and documentation of the process and assay results comprise the direct costs of vaccine manufacturing. Indirect costs include the creation and management of the quality systems, production planning, warehousing and distribution, inventory management and overhead functions such as regulatory, sales, marketing and management. The ability to hire, train, and develop production and quality personnel to maintain the process and quality systems is a challenge even for highly experienced manufacturers. Technical competence is essential as is knowledge of the latest technologies and global regulatory requirements. Globally, there is a scarcity of personnel with the requisite skills and expertise needed by the vaccine industry. Countries such as India, Brazil and China, with large populations and sound technical and scientific education systems, have succeeded in creating a new and growing cohort of technicians and skilled workers suited for the highly-detailed work of vaccine manufacturing. New market entrants in other geographies may underestimate the difficulty of developing this type of knowledge base with a comprehensive training system.

Labor costs vary significantly by country, depending on the capabilities and education of the local workforce, the typical personnel roster for an average facility in low-resource countries will often include local and expatriate employees to secure the relevant technical skills required for vaccine production and release. Like other technology-driven and highly-regulated industries, vaccine manufacturing is capital-intensive, and long-term product costs are driven primarily by development and production-related economics. Costs of development and maintenance of the production process, construction and operation of manufacturing facilities and compliance with local and international regulations are all incremental to traditional manufacturing costs.

Big progresses have been made on the research for new vaccines but there are still a lot of illnesses that are not treatable through such method. To protect more children, scientists and doctors are working hard every day to develop new vaccines.

Vaccines against the “big three” – AIDS, malaria and tuberculosis (TB) – are on their way. TB is caused by bacteria that infect the lungs. It spreads when bacteria travel through the air from one person coughing, sneezing, or speaking, and are inhaled by another individual. Respiratory infections like influenza and pneumonia are particularly dangerous for children and the elderly, resulting in at least 4.25 million deaths a year. The current flu vaccine is recommended annually and protects against the three most prevalent strains circulating in each given year. Doctors and researchers are also working to develop new vaccines to prevent and treat diseases that affect adults. There have been great strides in creating vaccines to prevent cancer, diabetes, autoimmune diseases and Alzheimer’s. There are already some vaccines that prevent certain types of cancer. The vaccine against human papillomavirus (HPV), for example, can prevent six different kinds of cancer. Another vaccine for hepatitis B prevents liver cancer as well. An early Ebola vaccine has been shown to give solid protection against the disease. In a large trial of almost 6,000 people, Merck agency showed its vaccine was 100% effective . It's meant to be a temporary fix to stop emerging outbreaks from getting to the level of the epidemic that occurred between 2014 and 2016, which means it's not in use just yet. Should another outbreak arise, public health organizations could determine whether they want to use it.

Researchers are also working on a longer-lasting option. A early-stage trial of 75 healthy volunteers found that the vaccine gave an immune response for a full year in 100% of the patients. Many new vaccines will be made possible with the development of a new type of vaccine called DNA vaccines. This type of vaccine actually injects the DNA needed to make a specific portion of the

pathogen into the vaccine recipient. The potential immunity that could be gained from a DNA vaccine would be effective and last for a long time. In addition, DNA vaccines would have very few side effects because the vaccine only uses the necessary component of the bacteria or virus to make a small amount of antigen. Before a vaccine can be considered for PQ (Prequalification of vaccines- an initial evaluation of the vaccine) the NRA (National Regulatory Authority- national regulatory agencies responsible for ensuring that products released for public distribution are evaluated properly and meet international standards of quality and safety) that is sponsoring the vaccine to WHO PQ must be certified as “functional”. WHO actively engages with countries to develop regulatory capacity. The NRA also regulates clinical trials and certifies GMP (Good Manufacturing Practices). Given the complexity of many vaccines and manufacturing processes, it can take years, if not decades, to build capacity to effectively regulate the vaccine industry at a local level in accordance with international standards.

MAIN VACCINES WORLDWIDE

Here there are some of the main vaccines and some of the most important data to understand better the worldwide situation.

-Haemophilus influenzae type b (Hib) causes meningitis and pneumonia. Hib vaccine had been introduced in 191 countries by the end of 2017. Global coverage with 3 doses of Hib vaccine is estimated at 72%. There is great variation between regions. In the WHO Region of the Americas, coverage is estimated at 91%, while it is only 28% in the WHO Western Pacific Region. The WHO South-East Asia Region raised coverage from 80% in 2016 to 86% in 2017.

-Hepatitis B is a viral infection that attacks the liver. Hepatitis B vaccine for infants had been introduced nationwide in 187 countries by the end of 2017. Global coverage with 3 doses of hepatitis B vaccine is estimated at 84% and is as high as 93% in the Western Pacific. In addition, 105 countries introduced one dose of hepatitis B vaccine to newborns within the first 24 hours of life, and the global coverage is 43%.

-Human papillomavirus (HPV) is the most common viral infection of the reproductive tract, and can cause cervical cancer, other types of cancer, and genital warts in both men and women. HPV vaccine was introduced in 80 countries by the end of 2017, excluding four countries with introduction in some parts of the country.

-Measles is a highly contagious disease caused by a virus, which usually results in a high fever and rash, and can lead to blindness, encephalitis or death. By the end of 2017, 85% of children had received one dose of measles vaccine by their second birthday, and 167 countries had included a second dose as part of routine immunization and 67% of children received two doses of measles vaccine according to national immunization schedules.

-Meningitis A is an infection that can cause severe brain damage and is often deadly. By the end of 2017 – 7 years after its introduction – more than 280 million people in African countries affected by the disease had been vaccinated with MenAfriVac, a revolutionary vaccine developed by WHO and PATH (an international, nonprofit global health organization based in Seattle). In 2012, MenAfriVac became the first vaccine to gain approval for travel outside the cold chain – for as long as four days without refrigeration and at temperatures of up to 40°C. Ghana and Sudan were the first two countries to include the MenAfriVac in their routine immunization schedule in 2016, followed by Burkina Faso, Central African Republic, Chad, Mali and Niger in 2017.

-Mumps is a highly contagious virus that causes painful swelling at the side of the face under the ears (the parotid glands), fever, headache and muscle aches. It can lead to viral meningitis. Mumps vaccine had been introduced nationwide in 122 countries by the end of 2017.

-Pneumococcal diseases include pneumonia, meningitis and febrile bacteraemia, as well as otitis media, sinusitis and bronchitis. Pneumococcal vaccine had been introduced in 135 countries by the end of 2017, including five in some parts of the country, and global coverage was estimated at 44%.

-Polio is a highly infectious viral disease that can cause irreversible paralysis. In 2017, 85% of infants around the world received three doses of polio vaccine. Targeted for global eradication, polio has been stopped in all countries except for Afghanistan, Pakistan and Nigeria. Polio-free countries have been infected by imported virus, and all countries – especially those experiencing conflict and instability – remain at risk until polio is fully eradicated.

-Rotaviruses are the most common cause of severe diarrhoeal disease in young children throughout the world. Rotavirus vaccine was introduced in 91 countries by the end of 2017, including six in some parts of the country, and global coverage was estimated at 28%.

-Rubella is a viral disease which is usually mild in children, but infection during early pregnancy may cause fetal death or congenital rubella syndrome, which can lead to defects of the brain, heart, eyes, and ears. Rubella vaccine was introduced nationwide in 162 countries by the end of 2017, and global coverage was estimated at 52%.

-Tetanus is caused by a bacterium which grows in the absence of oxygen, for example in dirty wounds or in the umbilical cord if it is not kept clean. The spores of *C. tetani* are present in the environment irrespective of geographical location. It produces a toxin which can cause serious complications or death. The vaccine to prevent maternal and neonatal tetanus had been introduced in 106 countries by the end of 2017. An estimated 85% of newborns were protected through immunization. Maternal and neonatal tetanus persist as public health problems in 14 countries, mainly in Africa and Asia.

-Yellow fever is an acute viral haemorrhagic disease transmitted by infected mosquitoes. As of 2017, yellow fever vaccine had been introduced in routine infant immunization programmes in 36 of the 42 countries and territories at risk for yellow fever in Africa and the Americas. In these 42 countries and territories, coverage is estimated at 43%.

- Whooping cough is caused by the bacterium *Bordetella pertussis*. Pertussis is known for uncontrollable, violent coughing which often makes it hard to breathe. After cough fits, someone with pertussis often needs to take deep breaths, which result in a “whooping” sound. The 2012 widespread outbreaks of pertussis involved an estimated 48,277 cases, the highest incidence since 1955. The latest case has been detected in Brescia, Italy where two babies of respectively a few weeks and a month old died because their mother did not vaccinate against this disease.

NATIONS AND ORGANIZATIONS INVOLVED

One of the main organizations involved in the topic is the Global Alliance for Vaccines and Immunization (GAVI), which is part of the WHO. It is an international coalition of partners, which includes national governments and international organizations such as the United Nations Children's Fund (UNICEF), the World Health Organization (WHO) and the World Bank. It was officially launched in Davos, Switzerland in January 2000. It is a new alliance created to continue and build upon the work of the earlier Children's Vaccine Initiative, which had been launched in 1990. In GAVI, the pharmaceutical industry's participation as a full partner is an innovation and all the partners have lots of experience in the field of immunization. A fund, which is known as the Global Fund for Children's Vaccines was also established: it is a financially independent mechanism

designed by the GAVI partners to raise new resources for immunization and direct them to developing countries' health systems.

Some countries are more involved in the issue than others, whether this is seen from the positive or the negative point of view.

For example, in the African continent, Nigeria is the country with the lowest vaccination rates in the world. Less than ten percent of the population in Nigeria will receive a measles vaccine over the course of the years. Because of this, the infant mortality rate is higher in Nigeria than in most modern countries. The main reason for the low vaccine is a lack of vaccine policy in the country, and therefore the vaccines are more difficult to access.

The Federal Democratic Republic of Ethiopia is the second most populous country in sub Saharan Africa and its immunization rates were at the lowest conditions before the EPI (Expanded Program on Immunization) started to work on this specific country. Now the situation improved and a new approach to routine immunization in the rural Afar region in north-eastern Ethiopia nearly quadrupled the numbers of children vaccinated against measles, diphtheria, pertussis, tetanus, polio and other diseases in 2010 (from as low as 22% to nearly 80% coverage in the target area).

Madagascar: the country has no compulsory policy regarding vaccinations because the people cannot afford them. As a result, vaccines are not commonplace, and are expensive and inconvenient when they come by in both rural and more civilized areas.

In the Asiatic continent Japan can be one of the most noticeable cases. In fact this country is well known for having banned the MMR (measles, mumps, Rubella) vaccine in 1989. This is because after allowing the vaccine, many public monetary and health concerns came up, and the government thought it was best to shut it down. Several times the issue has come back up and each time the ban has remained effective. The vaccine is simply not offered there, regardless of whether people want to get it.

Regarding Oceania in Australia the government does not enforce compulsory vaccination laws, nor they have those laws in the first place. Despite the lack of legislation the country follows the trend of other countries, in fact the institutions encourage citizens to get vaccinations and the immunization rates are very high and positive.

In North America can be found two different sides of the situation. In fact Canada's vaccination rates are impressive. About 85 percent of children in Canada are completely vaccinated, and less than 2 percent of parents are strongly opposed to vaccination. Nevertheless, there is no mandatory vaccination policy for all of Canada. Instead, the vaccination policies differ from province to province. Right now, there are just three provinces that have mandatory vaccination policies, but they only apply to children about to enroll in school.

On the contrary the United States do not actually require parents to vaccinate their children. The system allows parents to make that decision for themselves and their child. Recently there have been outbreaks of measles and whooping cough but most states require vaccine proof for the enrolment of children public school. The fight of "anti-vaxxer" movement is also something that affects the decision of many people around the country, resulting in a lower rate of immunization in the USA. Britain also does not have a compulsory vaccination policy and also does not require vaccines to get into schools.

For what concerns South America a noticeable case is Venezuela. In fact nearly 30 years after declaring polio eradicated in Venezuela, the first case of the disease has been reported in the country. The country has also accounted for 85 per cent of cases of measles reported across Latin America and the Caribbean over the past year, according to the Pan-American Health Organization.

Of the 11 countries that reported cases, Venezuela had the overwhelming majority of cases, but also 35 deaths since mi-2017, according to the international organization. Cases of measles have been reported in 17 out of 23 of the country's states and in the capital Caracas.

The situation in Europe changes from state to state: in 2017 Germany tightened their vaccination laws because of a measles outbreak. Now, German parents must submit proof of vaccination counseling for their kids to their kindergartens. If they do not, the schools are forced to notify the German health authority and their children could be expelled.

On the contrary Slovenia has one of the most aggressive vaccination policies. To get out of these vaccinations, individuals can submit medical exemptions, but reasons of religion or conscience are not accepted. If an individual fails to receive their mandatory vaccinations, they are penalized with a fine and the strategy is clearly working. The nation has immunization rates of up to 95 percent for mandatory vaccines.

The debate surrounding vaccines and autism is still raging in Italy. Italian parents must prove their child has received 12 specific vaccinations before their child can attend a government-funded nursery or preschool and in fact the country has now completely vaccinated 95 percent of children against 6 deadly diseases. But still, because of different controversies ,immunization coverage in Italy has decreased alarmingly.

It could be considered obvious that vaccine preventable diseases are less, if not at all present in countries where legislation involves the need and the obligation of vaccination. In individual studies, vaccine refusal or lack of vaccine legislation in different countries worldwide, has been associated with outbreaks of invasive Haemophilus influenzae type b disease, varicella, pneumococcal disease, measles, and pertussis. The topic of the relation between a country with strict legislation and a country with malleable or no legislation on the matter cannot be discussed by dividing countries in continents or in developed/developing/less developed ones. To clarify better this concept the case of France could be taken into consideration. France is a developed country and has one of the world's largest economies. It is a founding member of the Group of Seven (G-7), an international organization established in 1985 to ease economic cooperation among the world's largest industrial nations. France has the European Union's second-largest economy by purchasing power parity, but still on the matter of immunization the latest data amount to a 1000 diagnosis of measles just in 2018. For example Canada has a strong legislation on the matter and in fact there was just one case, that involved just one person, who was diagnosed with an illness deriving from a vaccine preventable disease. Some countries where vaccination is voluntary had early pushback against vaccination, as in the UK and the Netherlands. In 1853 a law was passed in England and Wales requiring universal vaccination against smallpox, but opposition from anti-vaccinationists led to laws being passed to allow for conscientious objection. For countries in Africa and South America where yellow fever is endemic or where the mosquito vector is present a certificate of proof of vaccination is required. Only then will the country issue a visa upon entry to that country to prevent importation of this disease (particularly if travelers come from, or have visited yellow fever endemic areas). In past centuries (17th to 19th), yellow fever was transported to North America and Europe, causing large outbreaks that disrupted economies and development, and in some cases decimated populations. Throughout the 18th and 19th century, yellow fever was among the most feared diseases in the ports of the Old and New World.

ACTIONS TAKEN

Even though every country has its own policy on the matter of vaccination, the World Health Organization created two important plans to strengthen immunization, already acting on a worldwide level. The first one is the Global Vaccine Action Plan (GVAP), which is supported by 194 Member States of the assembly and it was endorsed in May 2012. It is a program that works on

raising immunization in the period of time that goes from 2011 to 2020 (Decade of Vaccines), in order to prevent deaths caused by preventable diseases all over the world. Many organizations such as mainly WHO, GAVI Alliance, UNICEF, Bill & Melinda Gates Foundation and the United States National Institute of Allergies and Infectious Diseases along with all partners support and ensure the effectiveness of the plan both at country and regional levels. Some of the most important goals of GVAP are: to achieve a world free of poliomyelitis, to meet vaccination coverage targets in every region, country and community, to reduce child mortality, to develop and introduce new and improved vaccines and technologies.

Other big achievements have to be addressed to the Expanded Program on Immunization (EPI), which was initiated in May 1974 with the objective to vaccinate children throughout the world. In each of the United Nations' member states, the national governments create and implement their policies for vaccination programs following the guidelines set by the EPI. It started in Ethiopia in 1980 with the intention of increasing the immunization coverage by 10% annually and reach 100% coverage in 1990. Before the activation of EPI, child vaccination coverage for tuberculosis, diphtheria, pertussis, tetanus, polio and measles was estimated to be fewer than 5 percent. Now, as a result of this program, not only has coverage increased to 79 percent, but it has been expanded to include vaccinations for hepatitis B, Haemophilus influenzae type B, rubella, tetanus, and yellow fever. The impact of increased vaccination is clear from the decreasing incidence of many diseases. Some of the most important goals of EPI are: to ensure full immunization of children under one year of age in every district, to globally eradicate poliomyelitis, to extend all new vaccine and preventative health interventions to children in all districts in the world.

CHAIR'S SUGGESTIONS

The question of vaccination is a very delicate and current problem, that is now facing a crisis due to the different points of view all around the world: starting from those who think vaccinations should be mandatory in every state, those who think vaccinations are a violation of human rights, those who do not want to be vaccinated because of religious matters and those who cannot be vaccinated because of medical reasons. But still, it is important to remember that this is a global issue that every country has to face in order to promote global health, because no country has to believe that this topic has an end in itself: in fact diseases affect one another, no matter gender, age or origin. That is why a resolution based on this matter should take into consideration all the opinions and all the already existing laws of the Member States. Cooperation in finding solutions for this issue is one of the main perspectives to keep in mind, therefore all the delegates should be well informed on it, and we hope that this report helped you out on the understanding of the topic itself.

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