

The Effects of Autoimmune Disease on the Women in the United States

Yifei Wang*

The Village School, Houston, United States

*Corresponding author: yifei_wang@s.thevillageschool.com

Abstract. Autoimmune illnesses occur when the immune system of the host mistakenly attacks itself. The immune system attacks numerous organs or a single organ in certain disorders, resulting in a systemic reaction. In accordance with the National Institutes of Health, an autoimmune disease impacts up to 23.5 million Americans (almost 7% of the population), and the number of cases keeps increasing. In the U. S., autoimmune disorders are one of the main causes of mortality for youthful and middle-aged females. Approximately 8% of the US population is impacted by autoimmune diseases, with women accounting for 78% of those affected. In this review paper, the cause of the autoimmune diseases, the reason why autoimmune diseases are so prevalent among females, and some existing treatments for these diseases will be introduced. By introducing the basic information on autoimmune diseases and evaluating existing treatments, more people would have a better understanding about these diseases and focus on developing more effective treatments.

Keywords: Autoimmune Disease, Treatment, Drugs.

1. Introduction

Autoimmune diseases occur when the immune system of the host attacks itself. Multiple organs or a single organ are targeted by the immune system in many disorders, leading to a systemic reaction [1]. There are more than 80 distinct autoimmune diseases, including type 1 diabetes, rheumatoid arthritis (RA), psoriasis/psoriatic arthritis, and multiple sclerosis. Different autoimmune disorders have similar early symptoms, including achy muscles, fatigue, skin rashes, swelling, and hair loss. Individual diseases may also have distinctive symptoms. For instance, extreme thirst, weight loss, and exhaustion are among the symptoms of type 1 diabetes. The causes for the malfunction of the immune system have not been found yet. Some suggest that environmental factors such as infections and exposures to chemicals may cause autoimmune diseases. According to a 2017 study, silica, mercury, pesticides, pristane, trichloroethene (TCE), and smoking have all been related to an increased risk of autoimmune disease [2]. The diet habits in Western countries are also suspected as a risk factor for getting autoimmune diseases. Inflammation is thought to be linked to high-sugar, high-fat, and heavily processed diets, which can lead to autoimmune illnesses. However, this has yet to be proven. It has been established that some persons are more likely than others to develop an autoimmune disease. Many researches have proved that women are more likely to have autoimmune diseases [3]. Autoimmune diseases impact about 8% of the population of the United States, with women accounting for 78% of those affected [4]. Researchers have found that the high prevalence of autoimmune disease among women may due to sex chromosomes and hormonal changes [1]. Two of the most popular treatment for autoimmune disease are called nonsteroidal anti-inflammatory drugs (NSAIDs) and immune-suppressing drugs. In this paper, not only the reason for the higher risk for women getting immune diseases will be introduced, but also how the two treatments above work will be explained.

2. Reason

After cancer and heart disease, autoimmune illnesses are the third most frequent disorder group in the United States, affecting around 5%–8% of the population, approximately 14–22 million people. The high frequency of autoimmune disorders in women is a common thread. Women account for 6.7

million, or 78.8%, of those with autoimmune diseases, according to conservative estimates [4]. Recent researches address that sex chromosomes, role of pregnancy, and changes in hormones may be some possible causes.

Humans have 23 pairs of chromosomes. Men and women have the same number pairs of autosomes, 22 pairs. However, they are differed by the sex chromosomes they have. XX chromosomes are found in women, while XY chromosomes are found in men. The X and Y chromosomes differ greatly in size because the Y chromosome is physically smaller than the X chromosome. Because of this, the Y chromosome has less genes than the X chromosome. Moreover, the X chromosome has a higher concentration of immune-related and immune regulatory genes, which stimulates immune responses in the body. Since there are so many genes on the X chromosome, there is a much higher chance of mutations. Since females have two X chromosomes but males only have one, females are more likely to have autoimmune diseases.

Pregnancy also helps explain the high prevalence of autoimmune disease among women. Hormonal and physical changes occur throughout pregnancy, and hormonal changes can linger for up to a year following birth. The emergence of autoimmune disorders is accelerated by these alterations. Pregnancy brings about a number of physiological changes, including an increase in basal metabolic rate, lipid levels, and weight gain. Hormone levels like estriol, progesterone, and prolactin will all vary as a result of pregnancy [1]. Because the fetus, which contains foreign antigens, reliant on the mother to act as its host, immunological changes occur, suppressing the maternal immune system [5]. It is assumed that this is done to prevent the fetus from being rejected; however, it causes a weakened immune system, which might lead to the onset of autoimmune illnesses.

Furthermore, due to changes in the levels of hormone, females going through adolescence have a higher risk of developing autoimmune illnesses. In Taiwan, researchers observed a significant difference between the likelihood of males and females having an autoimmune disease like SLE. The case number of juvenile SLE has increased dramatically among Taiwanese girls when contrasted to boys of the same age, based on this epidemiological study [6]. According to this study, hormonal changes that occur during adolescence may be a contributing cause for the higher prevalence of autoimmune diseases among women.

Although the exact reasons for people getting immune disease have not been found yet, there are some existing treatments for this type of disease. Although autoimmune disorders could not be cured by those treatments, they are helped manage the overactive immune system and lessen inflammation. The following are two types of medication used to treat these conditions: nonsteroidal anti-inflammatory drugs (NSAIDs) and immune-suppressing drugs.

3. NSAIDs

NSAIDs are among the most widely used medicines due to their effectiveness in lowering pain and inflammation, validating their inclusion in the WHO's Model List of Essential Medicines [7]. NSAIDs help to reduce pain and lower fever by blocking the actions of prostaglandins. Prostaglandins are inflammatory compounds that sensitize nerve terminals and enhance pain. These chemicals are also involved in body temperature control. Moreover, NSAIDs can help with a variety of aches and pains, such as backaches, headaches, muscle aches, arthritis and other inflammatory conditions-related inflammation and stiffness, menstruation aches and pains, and sprains or other injuries. High-dose aspirin, ibuprofen (Advil, Motrin, Midol), and naproxen (Aleve, Naprosyn) are some types of nonspecific NSAIDs available among the United States [8].

3.1. Problems

Overall, NSAIDs are effective in lowering the symptoms brought by autoimmune diseases. However, it is important to know the side effects before taking these drugs. Multiple NSAIDs are deemed safe for OTC use; however, they can cause serious side effects like hypertension (almost 5% annually of regular users), gastrointestinal (GI) bleeding (1–2% each year of regular users),

myocardial infarction (almost 1% yearly), heart failure (almost 1% on a yearly basis), and renal damage; arrhythmias and sudden cardiac death have also been observed in infrequent situations [9]. This problem could bring severe public health and economic impacts due to the large population exposure to NSAIDs.

Other side effects brought by taking NSAIDs are various stomach problems such as upset stomach, gas, diarrhea, heartburn, nausea and vomiting, and constipation. The reason for these minor gastrointestinal problems is that COX-1 is blocked by NSAIDs, which protect the lining of the stomach [8]. NSAIDs block the enzyme cyclooxygenase (COX) from generating prostaglandins. The two kinds of COX produced by the body are COX-1 and COX-2. COX-1 protects the lining of the stomach, whereas COX-2 causes inflammation. The vast majority of NSAIDs are nonspecific, inhibiting both COX-1 and COX-2.

3.2. Solutions

From medical perspective, COX-2 were created to alleviate the gastrointestinal side effects of classical NSAIDs, which were blamed on the inhibition of COX-1-derived PGE₂ and prostacyclin (PGI₂). This idea is supported by evidence from two randomized controlled trials (RCTs) of two structurally unique selective COX-2 inhibitors. Five RCTs of three physically unique inhibitors, on the other hand, they have been shown to raise the probability of heart attack and stroke. The clinical data is scientifically reliable, since evidence suggests that inhibiting COX-2-derived PGI₂ in vivo separates a protective limit on thrombogenesis, hypertension, and atherogenesis. The idea of merely "balancing" COX-2-derived PGI₂ and COX-1-derived platelet thromboxane is, however, erroneous [10].

On the other hand, from non-medical perspective, it is helpful to reduce the possibility of developing stomach problems by taking NSAIDs with food, an antacid, or milk. Furthermore, it is really important for patients to know when to seek medical attention and go to see the doctor. If patients are experiencing symptoms like ringing in the ears, blurry vision, rash, hives, itching, fluid retention, blood in the urine or stool, vomit with blood, grievous stomach pain, chest pain, prompt heart rate, and jaundice, please immediately stop taking NSAIDs and go to see the doctor [8].

Long-term, short-term, or as-needed use of NSAIDs is possible. Despite the paucity of data comparing the possibility of short-term or PRN NSAID use vs. chronic NSAID use, the risks of upper GI hemorrhage and myocardial infarction are assumed to be similar between new and chronic NSAID users. As a result, these guidelines can be examined and implemented regardless of the length of treatment. Furthermore, because some short-acting NSAIDs (ex. low-dose ibuprofen) are certified as OTC in some countries, doctors should be aware that the same guidelines are applicable to these drugs as well [11].

4. Immune-suppressing Drugs

Immunosuppressant medicines are those that weaken or suppress the immune system of the body. Antirejection medicines, for example, are utilized in the creation of a transplanted organ, including a liver, heart, or kidney, and have a higher chance of being accepted by the body. Immunosuppressive medicines are used to treat autoimmune diseases. In autoimmune illnesses, the body's own tissue is attacked by the immune system. Immunosuppressive drugs suppress the immune system, lowering the body's reaction to the autoimmune illness, and they are commonly used to treat autoimmune illnesses like psoriasis, lupus, and rheumatoid arthritis [12].

4.1. Problems

All immunosuppressant drugs; on the other hand, carry a remarkable risk of infection. When people take an immunosuppressant drug, their immune system deteriorates, making them more prone to illness. In other words, they enhance the likelihood of infection. It also means that any acquired disorders will be even harder to cure. What's more, people with particular health conditions, such as

an allergy to the medicine, kidney or liver disease, or a history of shingles or chickenpox, may experience severe side effects with immunosuppressive medicines. Also, patients who are pregnant or breastfeeding need to take extra precautions before taking this drug. Some of these medications have the potential to cause birth abnormalities, while others have lower risks during pregnancy and breastfeeding [12].

4.2. Solutions

Research must be conducted before an immunosuppressant drug is recommended to determine if there are any contraindications, discover hidden infections, as well as select the most appropriate dose. Monitoring routinely is essential during treatment to find side effects. The interval between beginning therapy and the onset of the immunosuppressive effect, and the maximum suggested treatment period and cumulative dose for each medicine, must be known to the clinician. If people are to limit variance and avoid potentially serious side effects when using immunosuppressive drugs, they should be familiar with the criteria for their usage and the monitoring required in each patient [13].

More specifically, it is important to update vaccines prior to starting immune suppression and to ensure that patients receive the influenza vaccination every year. Moreover, whenever patients go to hospital for examination, prior to starting, it is required to check for infections or immunity to certain pathogens such as tuberculosis, viral hepatitis, and HIV [14]. Most importantly, before using immunosuppressant medicines, patients must be informed about the risk of infection and the necessity for quick medical intervention. For example, they should be taught that if they are experiencing symptoms such as fever, pain in trouble or pain while urinating, the side of their lower back, or unusual tiredness or weakness, they should immediately go to see their doctors. Last but not least, always notify the doctor about all medications taken before starting an immunosuppressant drug. Prescription and OTC drugs, and vitamins and supplements, are all included. It is also necessary for the doctor to know the health conditions of the patients. Thus, the doctor can then tell patients whether their immunosuppressant medicine has any potential drug interactions [12].

5. Conclusion

The higher prevalence of autoimmune diseases among women is due to sex chromosomes, the role of pregnancy, and changes in hormones. Currently, there are some effective treatments for autoimmune diseases such as NSAIDs and immune-suppressing drugs. However, both these two drugs have severe side effects. Suggestions to reduce the risks of having side effects include following the doctor's instructions, communicating with the doctor frequently, and going to the doctor immediately if experiencing any problems. Hardly could autoimmune diseases be fully eliminated; however, increasing people's attention to this disorder is necessary for reducing the number of cases. For example, if people know about autoimmune diseases, they could seek medical attention promptly after noticing your symptoms. This could be really effective in reducing the fatality of autoimmune diseases and making sure patients could be cured during the early stage.

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