***Short Review Article***

# MECHANISM OF COMMON SYSTEMIC IMMUNODEFICIENCY DISORDERS AND ITS LITERATURE COMPARISON

**Running Title: A Short review on the mechanism of common systemic Immunodeficiency disorders**


## Abstract

Systemic immunodeficiency disorders are heterogenous groups ofImmunodeficiency disorders could experience an assortment of clinical signs, including intermittent, extreme, or irregular diseases, autoimmunity, and lymphoproliferative/malignancies. Immunodeficiency involves an enormous amount of sicknesses, influencing the advancement of the immune system, its function, or both. There is a increase in percentage of immunodeficiency disorders among population. However, numerous patients are diagnosed late; numerous cases experience the ill effects of difficulties by chronic infections, end-organ damage, or even demise before the diagnosis is made. Ideal determination and suitable treatment remain key to the successful management of patients. The objective of this review is to overview the various systemic immunodeficiency disorders and their mechanism of occurrence of immunodeficiency.


**Keywords:** Immunodeficiency, systemic, HIV, Diabetes Mellitus, Anemia


## 1.1Introduction

An immune disorder characterized with the aid of recurrent infections and low antibody levels, mainly in immunoglobulins like IgG, IgM, and IgA [(1)]. Immunodeficiency results from the absence of components of the immune system, including lymphocytes, phagocytes, and complement framework. These immunodeficiencies can be either primary, like Bruton illness, or secondary, as the one brought about by HIV infection [(2)(3)]. Deletions in genes that encode cell surface proteins and cytokine receptors, such as CD19, CD20, CD21, and CD80, can be mostly a cause[(4)]. Treatment choices are limited, and commonly involves lifelong immunoglobulin replacement therapy [(5,6)]. The most common systemic immunodeficiency disorders are HIV, anemia, diabetes mellitus, chemotherapy-induced immunodeficiency disorders. [(7-10)]

## 1.2Etiology

Immunodeficiency disorders can result from Prolonged (constant) and in addition to serious disorders like diabetes or cancer, drugs. Rarely, radiation treatment. Immunodeficiency disorders may result from practically any prolonged serious disorder. For instance, diabetes can bring about an immunodeficiency issue since white platelets don't work well when the glucose level is high [(11)]. Human immunodeficiency infection (HIV) contamination brings the most well-known serious procured autoimmunodeficiency disorder. Many kinds of diseases can cause an immunodeficiency problem. For instance, any malignancy that influences the bone marrow (like leukemia and lymphoma) can keep the bone marrow from creating ordinary white platelets (B cells and T cells), which are essential for the immune system [(12)].

## 1.3 Mechanism of immunodeficiency disorders

1.31 Mechanism of HIV

HIV virion enters macrophages and CD4+ lymphocytes by the adsorption of glycoproteins on its surface to receptors on the target cell followed by a combination of the viral envelope with the objective cell layer and the arrival of the HIV capsid into the cell [(24)(25)]. HIV can likewise scatter by direct transmission starting with one cell then onto the next by a cycle of cell-to-cell spread, for which two pathways have been depicted. Right off the bat, a contaminated lymphocyte can communicate infection straightforwardly to an Immune system microorganism utilizing a virological synapse [(26)(27)]. Also, an antigen-presenting cell (APC), like a macrophage or dendritic cell, can send HIV to lymphocytes by a cycle that either includes productive immunodeficiency disorders (on account of macrophages) or catch and move of virions in trans (on account of dendritic cells)

1.32 Mechanism of Diabetes Mellitus

Diabetes mellitus is certifiably not a solitary issue, it addresses a progression of metabolic conditions related to hyperglycemia and brought about by absconds in insulin emission and additionally insulin activity. Openness to constant hyperglycemia may result in microvascular entanglements in the retina, kidney, or periphery [(28–30)]. The blood conveys glucose to furnish the body with energy to play out the entirety of an individual's day-by-day exercises. The liver converts the food an individualeats into glucose. The glucose is then delivered into the circulatory system. In a solid individual, the blood glucose level is managed by a few chemicals, principally insulin. Insulin is delivered by the pancreas, a little organ between the stomach and liver [(31)]. The pancreas additionally makes other significant catalysts delivered straightforwardly into the gut that helps digest food. Insulin permits glucose to move out of the blood into cells all through the body where it is utilized for fuel [(32)]. Individuals enduring diabetes either donotcreate sufficient insulin (type 1 diabetes) or cannot utilize insulin appropriately (type 2 diabetes) [(33,34)], or both (which happens with a few types of diabetes). In diabetes, glucose in the blood can't move proficiently into cells, so blood glucose levels stay high. This not just starves all the cells that require the glucose for fuel, yet additionally hurts certain organs and tissues presented to the high glucose levels [(35)].

1.33 Mechanism of Anemia

Around 33% of the 5.5 billion individuals on the planet are anemic. hemoglobin under 11 g/dL for kids aged under 4 and pregnant ladies, hemoglobin under 12 g/dL for children 5 to 12 years and nonpregnant ladies, and hemoglobin under 13 g/dL for men are known to be anemic[(36)]. The type of mechanism in which anemia is caused is due to the Dysregulation of the inflammatory response, Blunting of hypoxia/erythropoietin sensing mechanism, Sarcopenia, Quantitative/qualitative alterations in stem cell physiology, Decrease in sex steroids, Frequent co-morbid medical conditions, and polypharmacy [(37)].

1.34 Mechanism of chemotherapy-induced immunodeficiency

The utilization in the clinical medication of chemotherapeutic specialists with immunosuppressive action is aimed at mitigating immunologically interceded sickness, lymphoproliferative illnesses, and anticipation of uniting dismissals following organ transplantation[(38)].

Immunodefiency disorders due to typical defective immune system leading to dysregulated impaired immunity. They are present in both children and adults, and although signs and symptoms are highly variable, most disorders involve increased susceptibility to infection, with many leading to significant disease-associated morbidity and mortality. Other important signs include excessive inflammatory responses and autoimmunity. The nature of these conditions requires referral to an immunologist for proper diagnosis and care. Severe diseases, such as HIV, necessitate long-term immune therapy[39,40]. (e.g., Bone marrow therapy, gene therapy) as soon as possible, which has led to the application of newborn screening to this population. B-cell or antibody-deficiency disorders are the most common types. The mainstay of treatment for patients with these disorders is immunoglobulin replacement therapy, and there are now several Ig products approved around the world for patients with immunodeficiency[41-43].

**Conclusion:**

This review highlighted the pathogenic mechanism of immunodeficiency in various systemic immunodeficiency disorders like HIV, Anemia, Diabetes Mellitus, Chemotherapy related immunodeficiencies. This review emphasizes that all the common systemic immunodeficiency disorders must be taken into a consideration in treatment in clinical practice.

Table 1: Comparison of literature in relation to common systematic immunodeficiency disorders

| LITERATURE COMPARISON | RELATION TO COMMON SYSTEMIC IMMUNODEFICIENCY DISORDERS | DEPENDENT VARIABLE |
|---|---|---|
| . *Abbott, J K et al.,* | +++ | gene deletion |
| *Chan et al.,* | ++ | viral envelope, HIV capsid |
| *CunninghamRundles, C.et al.,* | +++ | immune disorder |
| *Ezekowitz, J.A.et al.,* | + | dysregulation of inflammatory response |
| *Freed, E.O.et al.,* | ++ | contaminated lymphocyte, immune system microorganism |
| *Gillespie, K.M. et al.,* | + | insulin, pancreas |
| *Jolly, C.et al.,* | nil | direct transmission, cell to cell spread |

| | | |
|---|---|---|
| Lehman, H.K. et al., | + | B cells, T cells |
| Mogensen, T.H et al., | +++ | platelets, glucose level |
| *Narendran, P. et al.,* | ++ | gut,glucose |
| Notarangelo, et al., | ++ | secondary immunodeficiency |
| Ohmoto A et al., | +++ | immunosuppressive action |
| Pac M et al., | + | primary immunodeficiency |
| *Rasmussen, L.et al.,* | ++ | hemoglobin |
| Resnick, E.S. et al., | +++ | immunoglobulin replacement therapy |
| Stumvoll,M. Et al., | + | insufficient insulin |
| Thivolet, C.et al., | ++ | metabolic conditions, insulin emission |
| Wellen, K.et al., | + | high blood glucose level |
| Wyatt, R. et al., | +++ | target cell |

+ aggregable, ++ strongly agreeable, +++ very strongly aggreable



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**Conflict of interest**
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