

# Blood and Blood Disorders

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## Blood and HIV Transmission

Blood is the main vehicle for HIV transmission. Other frequent modes of HIV transmission occur from unprotected sexual intercourse, direct needle injection with or infusion of contaminated blood or blood products, or when using unsterilized equipment previously used by a known HIV infected person. An infected mother may transmit the virus to her unborn child or through breastfeeding.

The risk of transmission from a client with HIV to a mental health practitioner is extremely low as the virus is not airborne, foodborne, or waterborne. Usual casual contacts such as holding or shaking hands, kissing, hugging, or coughing do not result in transmission. Healthcare workers are at the highest risk to contract HIV from an infected needlestick injury but this risk remains low and is estimated at <1%. Thus it is rare to develop HIV through usual care and if the practitioner performs universal precautions.

Universal precautions are designed to prevent the spread of bloodborne diseases such as HIV and hepatitis B when healthcare is administered. Developed by the Centers for Disease Control and Prevention (CDC) in 1987, universal precautions include the practices of avoiding blood and bodily fluids by using gloves, gowns or masks when applicable. The mental health practitioner can employ universal precautions by handwashing before and after client contact, and avoidance of blood and body fluids. Universal precautions are intended for *all* clients and not just those infected with HIV.

It is imperative that the mental health practitioner understand modes of HIV transmission. The client may wish to see only the mental health practitioner and not follow with a routine medical provider. Thus the practitioner needs to work with each client to reduce possible exposures. These include avoiding both contaminated

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blood such as through sharing injection equipment if using substances and unprotected sexual relations, and exercising caution with sexual relations when the client or partner is menstruating. Although approximately 6,000 women with HIV give birth per year, the risk to the unborn child of becoming infected is as low as 1–2% when antiretroviral therapy is administered during pregnancy. It is important to emphasize this reduced risk with medication adherence and routine medical care if your client is or wishes to become or pregnant.

## **Blood Disorders and the Bone Marrow Environment**

Blood disorders are often diagnosed on a routine test called a complete blood count (CBC). A CBC is obtained by healthcare providers (HCPs) to screen for a variety of diseases and health conditions or to investigate client concerns such as fatigue. The presence of blood disorders has been well documented since the beginning of the HIV/AIDS epidemic. If untreated, blood disorders can negatively affect ones' quality of life and lead to unwanted complications such as hospitalization, prolonged illness or death.

Human bone marrow is the major site of hematopoiesis, or the formation of new blood cells. The bone marrow of a healthy individual has the ability to produce hematopoietic stem cells which mature into various cell lines. Blood disorders can occur through a series of changes or alterations to the structure of each cell line. Through a complicated mechanism, HIV itself can infect healthy bone marrow cells. This in turn causes a series of blood abnormalities.

The bone marrow produces white blood cell (WBC) precursors, erythrocytes (red blood cell [RBC] precursors) and megakaryocytes (platelet precursors). In order to evaluate these cells a bone marrow biopsy must be performed. With this procedure a needle is gently inserted into the spongy bone marrow and a small sample is removed. A hematopathologist analyzes these cell lines under a microscope. Changes to one or more of the cell lines will not allow healthy cells to mature and proliferate and lead to the development of blood disorders. A normal bone marrow environment allows WBC, RBC, and platelets the ability to move into the blood stream and carry out their roles. The number of each can be measured by a routine complete blood count (CBC) blood draw.

## **Red Blood Cell Disorders: Anemia**

Anemia is defined as reduced blood cell (RBC) mass or blood hemoglobin (Hb) and is a sign of an underlying disorder. Hemoglobin is a molecule responsible for carrying oxygen with the blood. Symptoms of anemia include fatigue, shortness of breath, and pale skin or mucous membranes. Anemia is diagnosed on CBC when the blood Hb is low. The normal range varies according to the age of the individual

but is usually between 12 and 16 gm/dL. Symptoms of anemia are more pronounced when the anemia is more severe. Many studies have demonstrated that even mild anemia can negatively affect ones' quality of life.

Reasons for anemia in HIV/AIDS may be due to bleeding, increased RBC destruction (break down of RBC in the blood), or decreased RBC production within the bone marrow. Individuals with HIV/AIDS may develop anemia from causes such as iron deficiency, vitamin B-12 deficiency or hepatitis infection. Potent antiretroviral therapies can lead to anemia which ranges from mild to severe. G6PD deficiency is a genetic condition that may cause anemia as a result of RBC destruction after exposure to oxidant drugs.

Treatment of anemia is aimed at correcting the underlying cause. Supportive care for mild anemia may include oral iron or vitamin replacement (if deficiencies occur), encouraging the individual to limit strenuous activities, and maintain adequate hydration and rest. Transfusion of packed RBC in the setting of severe anemia (Hb <8 gm/dL) may be necessary depending on the severity of symptoms.

## **White Blood Cell Disorders: Leukopenia and Lymphopenia**

White blood cells (WBC) or leukocytes are produced on the myeloid cell line within the bone marrow. Integral to a functioning immune system, healthy WBC and their components are responsible for protecting the individual from infection. The total WBC count is comprised of cells with unique roles. Two very important components of the WBC include neutrophils and lymphocytes. Neutrophils are key infection fighting cells and first—responders to clear bacteria from a site of infection. Neutropenia refers to low blood neutrophil counts. Lymphocytes are necessary to protect against viral illness. The total population of T-lymphocytes is low or absent in HIV/AIDS. Although total WBC counts are commonly low in HIV/AIDS, most infections occur as a result of damaged T-lymphocytes and opportunistic infections rather than due to neutropenia.

## **Platelet Disorders**

Platelets are cells that produce a variety of blood clotting factors. When blood platelets are low (called thrombocytopenia), they place the individual at risk for spontaneous bleeding with little or no trauma. A diagnosis of thrombocytopenia is made when platelet counts fall below  $150 \times 10^9/L$ . The average lifespan of a platelet is 5–9 days.

The pathophysiology of platelet disorders is quite complex. However, similar to anemia, platelets can be low due to decreased bone marrow platelet production or increased platelet destruction. Idiopathic thrombocytopenia purpura (ITP) and

thrombotic thrombocytopenia purpura (TTP) are two platelet disorders seen in HIV/AIDS.

The diagnosis of thrombocytopenia is first made by drawing a CBC which quantifies the blood platelet count. When thrombocytopenia is diagnosed, a hematopathologist will look at a blood smear under the microscope. This can identify if there is peripheral destruction of platelets once the cells mature and migrate out of the bone marrow. If the blood smear does not show platelet destruction, a bone marrow aspiration and biopsy will be necessary. This will evaluate if the megakaryocytes, or platelet precursors, are present or absent which may explain why healthy functioning platelets are not being produced.

The emphasis of treatment for thrombocytopenia is to determine the cause of low platelets and prevent bleeding. Immune therapies such as corticosteroids or change in medication regimen can be expected if destruction is occurring. Blood platelet transfusions may be necessary if platelet counts are critically low  $<20 \times 10^9/L$  when the risk of spontaneous bleeding is high.

## Additional Considerations

It is important for the mental health practitioner to be aware of blood transmission, blood disorders and their manifestations. Casual contact does not result in HIV transmission, thus the practitioner should remain confident to provide the same care to an individual with HIV as they would to another. Prevention of HIV occurs through avoidance of blood and body fluids. Treatment with antiretroviral therapy during pregnancy can prevent the spread of HIV from an infected mother to her baby.

Blood disorders may occur throughout the course of the disease. Newer drugs are less likely to impact blood counts as in the past, but HIV/AIDS itself may cause blood disorders. If a client complains of feeling tired, experiences easy bruising or bleeding, referral to a medical care provider for further evaluation is warranted. Prompt recognition and treatment of anemia, leukopenia and thrombocytopenia can prevent unnecessary complications in these individuals.

*Related Topics:* Antiretroviral therapy, prevention strategies.

## Suggested Reading

- Aberg, J. A., Kaplan, J. E., Libman, H., Emmanuel, P., Anderson, J. R., Stone, V. E., et al. (2009). Primary care guidelines for the management of persons infected with human immunodeficiency virus: 2009 Update by the HIV Medicine Association of the Infectious Diseases Society of America. *Clinical Infectious Diseases*, 49(5), 651–681.
- Recht, M. (2009). Thrombocytopenia and anemia in infants and children. *Emergency Medicine Clinics of North America*, 27(3), 505–523.

Stasi, R., Willis, F., Shannon, M. S., & Gordon-Smith, E. C. (2009). Infectious causes of chronic immune thrombocytopenia. *Hematology/Oncology Clinics of North America*, 23(6), 1275–1297. doi:10.1016/j.hoc.2009.08.009.

### ***Suggested Resources***

Centers for Disease Control and Prevention. (2012). Retrieved January 18, 2012 from <http://www.cdc.gov/niosh/topics/bbp/universal.html>

The Merck Manual of Hematology and Oncology (2012). On-line. Retrieved January 14, 2012 from [http://www.merckmanuals.com/professional/hematology\\_and\\_oncology.html?qt=&sc=&alt=](http://www.merckmanuals.com/professional/hematology_and_oncology.html?qt=&sc=&alt=)