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Prevalence of Transfusion Transmissible Viruses Among Voluntary Blood Donors

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Abstract: Transfusion transmissible Viruses (TTVs) are potential pathogens transmitted in donated blood through a transfusion to a recipient. TTVs can cause life-threatening diseases such as liver damage and immune breakdown. This research was therefore carried out to determine the prevalence of TTVs among blood donors at Our Lady of Apostles Hospital Jos. Samples were collected and examined accordingly. It was observed that Out of the 30 samples of blood donors examined, 3 of the samples were positive with prevalence of (10.0%) while 27 of them were negative. The highest isolated TTV was Hepatitis C, with a prevalence of 3(3.3%), while HIV and Hepatitis B viruses were negative 0(0.0%), respectively. Males have the highest number of transfusion transmissible viruses with a prevalence of 2(6.7%), while females have 1(3.3%). Within 18-28, 2 were positive, 2(6.7%), while one person under 29-39 had transfusion transmissible virus at the rate of 1(3.3%). The isolation of 10.0% of TTVs from 30 blood donors stresses the need for all the laboratories to strengthen proper screening protocol of blood and other blood products against HIV Hepatitis (B and C) before transfusion.

Keywords: Transfusion Transmissible Viruses; Hepatitis B and Hepatitis C; Hepatitis E; Supply and Safety; Supply and Protecting Patient Health; Transfusion-Transmitted Infections (TTIS).

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1. Introduction

1.1. Background of The Study

Potential infectious diseases known as transfusion-transmissible viruses (TTVs) can be passed on to recipients of donated blood through the process of transfusion [20]. The following viruses are tested for in blood transfusions: cytomegalovirus (CMV), hepatitis B and C, HTLV-I and -II, HIV [5]. Introducing a new era in blood transfusion administration, focused on safeguarding human life, is necessary due to the increasing frequency of transfusion-transmissible illnesses (TTIs) like HIV, HBV, HCV, syphilis, and others. Donating blood during the incubation period has made things even more complicated for transfusion-transmitted infections (TTIs), since it increases the risk of collecting infected blood from donors before the incubation period serological indicators of infection show [29]. Because to a lack of funding, trained staff, proper infrastructure, and effective national policies and services for blood transfusions, blood safety is still an important issue in public health in Nigeria and throughout Africa. Approximately 5–10% of new HIV infections occur as a result of blood transfusions, and 12.5% of patients

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who have had blood transfusions are at risk for developing post-transfusion hepatitis [11]. Donating blood, or a portion of it, is a medical process that involves moving blood from a healthy donor to a sick recipient who needs it [21]. Millions of people rely on this procedure every year for blood transfusions caused by accidents, operations, or specific disorders. The circulatory system of the body is maintained by the fluid connective tissue known as blood, which enables the continuous contact of distant tissues. It accounts for around 7% of total body mass (about 5.6 litres in a 72 Kg man). Women have a lower proportion whereas children have a higher one (gradually decreasing until the adult level is reached).

While most people give blood out of a sense of altruism, a small number of people donate because they are poor or want financial compensation. Donating blood is still very important in Nigeria due to poverty and familial relationships [34]. The body's ability to self-repair, keep itself safe from harm, and maintain homeostasis all depend on blood, a liquid component (clotting cascade). Donating blood, or a portion of it, is a medically necessary process that involves transferring blood from a seemingly healthy person to another sick person who is in need of blood [8]. By limiting blood collection to healthy people, blood donor selection helps ensure the well-being of everyone involved. Collecting blood from donors whose transfusions pose no danger to recipients is one way to guarantee patient safety. Find out what could render a person temporarily or permanently unfit to donate. It is important to minimise the needless delay of donors who are both healthy and safe. It is important to minimise resource wastage caused by collecting unsuitable contributions by ensuring the quality of blood products obtained from whole blood and apheresis donations [23].

Transfusions of blood or blood products save lives, but unfortunately, they are also a known vector for the unintentional spread of a wide range of pathogens that can infect recipients with illnesses of varied degrees of severity. Although there are medical and surgical indications when blood transfusions can save lives, it is important to note that this procedure still poses the risk of transmitting infectious infections. In December 2006, Nigeria announced a set of instructions to build a national blood transfusion policy; this policy eventually gave rise to the National Blood Transfusion Service. Plans of action to ensure that blood donor units are available, safe, and reasonably priced make up the bulk of the national blood policy. National Blood Transfusion Service (NBTS), zonal blood service centres, state and local government areas, the military forces, private and NGOs health organisations, and so on make up its structure [18]. In spite of all these initiatives, Nigeria's political leadership remains closed-minded and unmotivated to consider new ideas for increasing the reliability and security of the country's blood supply from volunteer donors [30]. One of the most significant risks of blood transfusion is the transmission of infectious diseases that can be transmitted from donor to recipient [19].

1.2. Statement of The Problem

Transfusion-transmitted infections (TTIs) pose a significant risk to the safety of blood transfusion recipients. Despite advancements in screening technologies, the prevalence of TTIs, such as HIV, Hepatitis B, and Hepatitis C, remains a concern in many regions of Plateau State and Nigeria at large [9]. Inadequate donor screening processes, lack of awareness among potential donors, and insufficient education on safe donation practices contribute to the persistence of TTIs. This problem affects public health outcomes, increases healthcare costs, and undermines confidence in blood donation systems. Addressing these issues is critical to ensuring the safety of the blood supply and protecting patient health [24].

Transfusion-transmitted infections (TTIs) are a critical public health challenge, particularly in the context of blood transfusion services. The risk of transmitting infections through donated blood can have severe implications for patient safety, leading to complications, prolonged hospital stays, and increased healthcare costs. Transfusion Transmissible viruses, such as HIV, Hepatitis B, and Hepatitis C, can remain undetected in the early stages of infection due to varying window periods, underscoring the importance of effective donor screening and education [9]. More so, some blood donation centers may lack access to the latest testing technologies or implement insufficient screening measures, which usually leads to an increasing risk of undetected infections. There is often a lack of awareness regarding the importance of safe blood donation practices among potential donors. Misconceptions about the safety of the donation process can deter individuals from donating, leading to a reliance on a limited donor pool [25]. In some regions, socio-economic factors such as fear of discrimination and lack of access to healthcare resources may discourage individuals from participating in blood donation programs [39]. Variability in regulatory standards across regions and emerging infectious agents may pose additional risks, leading to inconsistencies in TTI screening practices and further complicating efforts to ensure blood safety [13].

1.3. Justification of The Study

Since transfusion transmissible infection is of public health concern and the mortality rate is increasing, there is a need to evaluate the rate at which these viruses are spreading. Understanding the prevalence and the types of TTIs will help create awareness of some of these transfusion-transmissible viruses, thereby educating the masses on some of the risks and dangers associated with the diseases.

Studying TTIs informs public health and strategies to reduce transmission rates and makes obtaining access to and analyzing blood donors easy. The findings can also guide resource allocation for testing and prevention efforts to ensure the safety and efficacy of blood transfusion practices. The results of this study could be used to raise awareness about the importance of blood safety and proper screening practices among healthcare clinicians/practitioners. This study may also provide information for regulatory agencies to enforce blood safety standards and guidelines. To the best of researchers' knowledge, only limited numbers of studies on transfusion transmissible viruses have been conducted in Jos. Therefore, the findings of this research will be documented for future reference.

1.4. Aim

To determine the prevalence of transfusion transmissible viruses among intending blood donors at Our Lady of Apostles Hospital in Jos, Plateau State, Nigeria.

1.5. Objectives

- To ascertain which viruses are commonly transferred from blood donors
- To determine which virus is the most prevalent among the transfusion transmissible viruses.
- To assess which age limit has the highest number of transmissible viruses?
- To compare which gender has the highest transfusion transmissible viruses.

1.6. Research Questions

- Will transfusion transmissible viruses be found in blood donors in OLA Hospital?
- Which virus will be the most prevalent in the blood?
- Which age limit will have the highest transfusion transmissible viruses?
- Can there be any difference in the rate of transfusion transmissible viruses between the genders?

1.7. Scope of The Study

The scope of this study is limited to the assessment of transfusion transmissible viruses in Our Lady of Apostle's Hospital (OLA) Jos, Nigeria, and only the different viruses found in donated blood.

2. Description of Transfusion Transmissible Viruses

Among the numerous types of viruses that can be passed on by blood transfusions are hepatitis B and C viruses as well as the human immunodeficiency virus (HIV). Viremia refers to the presence of a virus in the blood (Figure 1). Viruses can infect any part of the body once they enter the bloodstream, a condition known as viremia. The provision of consistent and safe blood has proven to be a significant public health concern, particularly in regions with a known high incidence of TTVs, notwithstanding the vital role that blood plays. There are far-reaching societal ramifications of the rising prevalence of infection, which is in part caused by the transfusion of infected blood.

There has been a paradigm shift in blood transfusion practise around the world since the identification of transfusion-transmissible viruses, with a renewed focus on patient safety and the defence of human life. As transfusion-transmissible infections can cause acute, chronic, and life-threatening illnesses, viruses including HIV, HBV, and HCV are a major cause for concern [12].

Low levels of education, marital status, various sex activities, male donors, and transfusion history are factors that contribute to the occurrence of transfusion-transmitted infections (TTVs). Therefore, looking into the prospect of finding other components is essential [14]. The nation's already overburdened social, economic, and medical systems are further compressed as a result of greater dependency levels, a decrease in productive labour, and rising demands for social and medical care. Eliminating or significantly reducing the risk of contracting transfusion-transmissible infections [6] requires the persistent and rigorous application of donor selection, screening tests, and effective inactivation protocols. You can evaluate the safety of the collected donations and the frequency of illnesses in the blood donor community by looking at statistics on transfusion-transmissible infection prevalence among donors. Additionally, it clarifies the study community's transfusion-transmissible infection epidemiology [26].

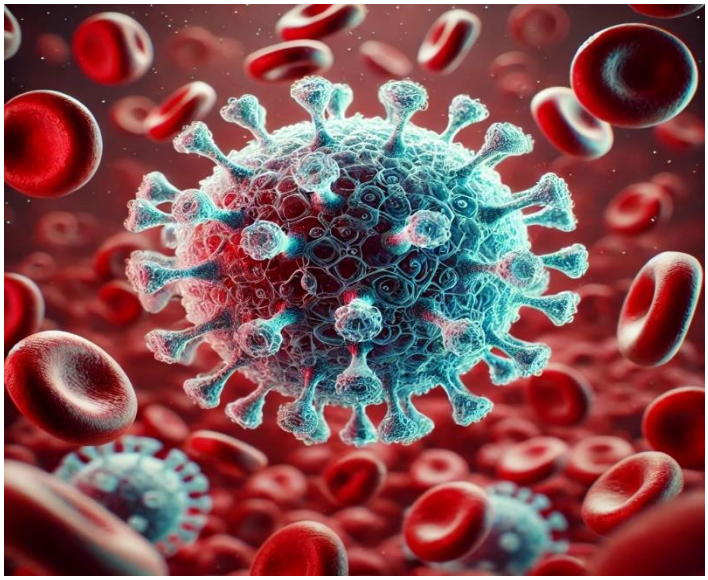

Figure 1: Virus in the Blood (Viremia)

2.1. Types of Blood Donors

2.1.1. Voluntary, Altruistic, and Regular donors

Voluntary, Altruistic, and Regular donors can be categorized as safe donors. These are considered the safest group of donors as the prevalence of blood-borne diseases and infections is lowest among these groups. Voluntary Donors donate without compensation, typically aware of eligibility and health standards [16].

Altruistic Donors: Donate to help others, often adhering to safe donation guidelines.

Regular Donors: Individuals who donate blood regularly and maintain healthy practices. Ensuring the safety of the blood supply relies heavily on voluntary and philanthropic donations.

2.1.2. Commercial Donors, High-Risk Donors, and replacement donors

This set of donors can be categorized as unsafe donors

Commercial donors: Individuals who donate blood for financial gain may lead to less scrutiny regarding health.

High-Risk Donors: Individuals who engage in behaviors that increase the risk of transmitting infections, such as unprotected sex or sharing of needles.

Replacement Donors: While not inherently unsafe, they may be less thoroughly screened and may not always adhere to safe donation practices.

2.2. Features of Virus

Viruses, which are 100–1,000 times smaller than human cells, are comparable to parasites in that they both require a host in order to replicate. Although they are capable of transformation, their remarkable reproduction rate is limited to live host cells. They lack cytoplasm and other biological components, making them acellular. They need the metabolic machinery of the host cell to multiply because they cannot carry out metabolism on their own. The viral genome, which can be either RNA or DNA, and the capsid protein make up the virus (capsid). An additional layer known as an envelope may occasionally encase the capsid, as demonstrated in (Figure 2).

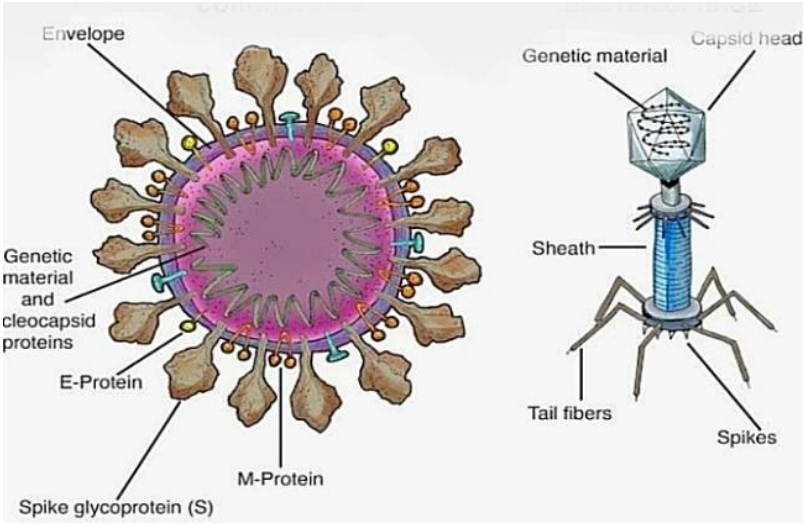

Figure 2: Features of A Virus [40]

2.3. Some Viruses That Are Usually Screened For TTVS

2.3.1. Human Immunodeficiency Virus (HIV)

The human immunodeficiency virus (HIV) is a lentivirus, which means it retains its genetic material as RNA. A loss of CD4 T cells, brought on by an HIV infection, is what ultimately leads to AIDS, or acquired immune deficiency syndrome. Cases of AIDS began to be reported in 1981, and since then, they have spread globally. The most common way for drug injectors to spread the virus is by sharing needles, but it can also spread during pregnancy and in the bloodstream [38].

In the early stages of the pandemic, it was observed that blood products acquired from infected patients might transmit the virus. There was a 90% chance of transmitting HIV through transfusion of an HIV-positive individual's product in the past, before 1985, when HIV testing was initially implemented. The rates of HIV transmission through transfusions were comparable to those of platelets, plasma, or red blood cells (RBCs) that had been kept for less than 21 days. The window period, during which an HIV-positive donor could transmit the virus through blood transfusions but has not yet shown any laboratory signs of HIV infection, has been steadily shrinking as testing methods have progressed over time, leading to an ever-decreasing risk of transmission [32]. Every donated unit undergoes two rounds of HIV screening:

Antibody testing: There have been substantial advancements since the introduction of HIV-1 antibody testing in 1985. An assay (HIV-1/HIV-2 antibody test) that could detect IgM antibodies in addition to IgG antibodies and HIV-2 antibodies because of the addition of HIV-2 specific antigens made it more sensitive, and it was used in 1992 [1]. Within contracting HIV, a person typically becomes seropositive after around three weeks (22 days) [33]. Once the antibody screening assay (either an enzyme-linked immunosorbent assay (EIA) or a chemiluminescence enzyme immunoassay) returns a positive result, the samples are either further tested using an FDA-licensed antibody confirmatory assay or, alternatively, are confirmed to be positive if they also show a concurrently positive HIV-1 RNA result. Blood donors who receive a positive result are informed that they have been infected with HIV-1 (or, in extremely unusual circumstances, HIV-2); however, in the context of screening for blood donors, where the prevalence of the virus is low, false positive confirmatory results do occasionally occur [3].

Nucleic acid testing (NAT): Standard blood donor screening began in 1999/2000 with the introduction of HIV-1 RNA testing in mini-pools (MP) ranging from 6 to 16 samples. According to [36], the window period for blood tests conducted by MP-NAT is around eleven days, while for ID-NAT it is about eight days. Because HIV RNA manifests before the p24 viral protein or anti-HIV antibody, the window time with NAT is shorter than with antibody testing.

2.3.2. Human T Cell Virus (HTLV)

Human T cell lymphotropic virus (HTLV)-I and HTLV-II are two closely related retroviruses that are tested for in a single assay in each blood unit. Adult T cell leukemia-lymphoma can be caused by HTLV-I, and HTLV-associated myelopathy (HAM) can be caused by either HTLV-I or HTLV-II, but this is very unusual [37]. In late 1988, an EIA format utilising HTLV-I viral lysate as antigen started screening donated blood for antibodies to HTLV-I. This test can occasionally (but not always)

detect antibodies to HTLV-II, a closely related retrovirus in blood donors, because of immunologic cross-reactivity. As a result, HTLV-II antigens were added to the screening assay in early 1998, making it better. An FDA-licensed confirmatory assay verifies screening test results as of 2016 [23].

2.3.3. Hepatitis Virus (B&C)

Hepatitis C virus: The hepatitis C virus (HCV) is a potential source of chronic hepatitis and its potential long-term consequences. The first HCV antibody screening was conducted in 1990, and in 1992, the EIA 2.0, an enhanced multi-antigen second-generation enzyme immunoassay, was introduced. The third iteration of the test, EIA 3.0, was licenced by the FDA in 1996. Also, since 1999, HCV MP-NAT has been conducted. Antibody results can be confirmed in two ways: by comparing them to MP-NAT screening results or by running a second immunoassay based on the manufacturer's enzyme or chemiluminescence. Compared to the 70-day window utilising HCV EIA 3.0 antibody testing, the undetected infectious window period employing HCV MP-NAT is projected to be 7.4 days [22].

Hepatitis B virus: An extremely rare cause of adult-onset chronic hepatitis is hepatitis B virus (HBV). The first HBsAg (hepatitis B surface antigen) tests were administered in the early 1970s. When the chemiluminescence enzyme immunoassay (EIA) returns a positive result, the neutralisation assay that comes with the test kit is used to confirm the result. Acute infection or a persistent carrier condition might cause HBsAg to be positive. In the context of blood donors, false positive neutralisation results do happen from time to time [31]. Future donations will not be accepted from donors who test positive for neutralisation. The infectious window period preceding the establishment of HBsAg positive has been estimated to vary from 18 to 27 days, and possibly as long as 38 days [24]. This is despite the improved sensitivity of the chemiluminescence enzyme immunoassay. The use of anti-HBc as a surrogate test for non-A and non-B hepatitis carriers was first introduced in 1987 for screening purposes. Due to its capacity to identify certain HBsAg-negative donors capable of transmitting HBV, the anti-HBc assay was licenced by the FDA in 1990 [23]. This allowed for a decrease in the risk of HBV infection.

Whether an infection clears up or persists, anti-HBc antibodies are present and active from the beginning of an HBV infection. Around 1% of donors show anti-HBc positive results; however, not all tests are very specific, and there is currently no way to confirm which donations could be infectious [4]. Donors are not required to be deferred until two separate contributions test positive for anti-HBc; nonetheless, for financial considerations, many blood banks will postpone such donors after one test. In cases when the donor has not been vaccinated against HBV, a second independent test for prior infection can be performed when the patient is referred to a doctor: the identification of antibodies to the HBV surface antigen, often known as anti-HBs [10].

2.4. Benefits of Blood Donation

It is impossible to overstate the positive effects of blood donation on both the giver and the receiver. It boosts stem cell activity, which in turn stimulates the production of new cells in donors, including platelets, white blood cells, and red blood cells [28]. One of the primary reasons of cardiac illnesses and artery blockage is elevated iron levels in the blood; however, increased blood circulation lowers these levels. Researchers have also shown that yearly blood donors had a lower risk of developing circulatory disorders and blood cancers [27]. Donating blood, on the other hand, can prevent issues like postpartum haemorrhage for the receiver and other pregnant women. It prevents the death of patients undergoing medical procedures including heart surgeries and organ transplants, as well as those suffering from blood disorders like anaemia, accident injuries, cancer, etc. [8].

2.5. Different Types of Blood Parts That Are Donated

Full/whole blood donation: Donations of whole blood, which contain all of the blood's components, are the most prevalent kind of blood donation (red blood cells, plasma, and platelets).

Platelets donation: This type of donation involves donating only the platelet component of blood.

Plasma donation: This donation is made after collecting the whole component and then separating it into this required component for transfusion to the recipient.

Red blood cells: This donation is collected and used only when the recipient requires red blood cells [2].

2.6. Eligibility for Blood Donation

That is why it is important to check the eligibility of potential blood donors every time they donate. A person must be in good health and free of communicable diseases in order to be eligible to give blood, according to regulations set out by the World Health Organization. Donors must be between the ages of 18 and 65. The ideal weight for the donor is 50 kg. Blood pressure should be between 50 and 100 beats per minute, and haemoglobin levels should be 14–17 g for men and 12–14 g for women. Both the temperature and blood pressure should be kept below 37 degrees Celsius and 120/80 mm Hg, respectively [35]. Donors under the age of 18 may need to have their procedures postponed. Patients who have tested positive for infectious disorders like AIDS, hepatitis B and C, syphilis, malaria, and others are also delayed. Patients with acute anaemia, inherited blood disorders, or chronic illnesses (such as diabetes, hypertension, or cancer) should also wait [24].

2.7. Steps Taken to Ensure Safety Before Transfusion

Being able to pass the medical exam after answering questions about one's health history and fulfilling the standard requirements for blood donation [14]. Making ensuring that every blood unit is free of infectious diseases including AIDS, Hepatitis B and C, syphilis, malaria, and others by accurately testing and analysing it. To make sure the blood is safe and effective to use, check if the transfused units are compatible with the patient's blood.

2.8. Signs and Symptoms of Transfusion Transmissible Viral Diseases

Infections in the respiratory tract spread from the nasal passages to the throat and lungs. Respiratory illnesses such as bronchitis, sinusitis, ear infections, and pneumonia can be caused by a variety of viruses. Here we include examples of common colds (often caused by rhinovirus), influenza (the flu), and symptoms similar to the flu (fatigue, headaches, and body pains). A sore throat, cough, and sneezing are signs of the upper respiratory tract. Indigestion: queasy stomach, loose stools, Skin problems: eczema, varicose veins, blisters, warts. A viral infection of the gastrointestinal tract (GI tract) can manifest in a variety of ways, including an infection of the liver. Liver disease is caused by hepatitis viruses. There is a high prevalence of long-term (chronic) infections [18]. Blood clotting and vascular fragility are both impacted by hemorrhagic fevers caused by hemorrhagic viruses like Ebola, which can lead to potentially fatal bleeding. Rashes caused by exanthematous viruses can take several forms, including raised bumps or blisters or even tiny red dots under the skin. Among other things, they can irritate the respiratory system [7].

Pathogens can infect cells in the neurological system (brain and spinal cord). Paralysis, enlargement of the brain or its covering (encephalitis or meningitis), and other potentially fatal illnesses can be caused by some viruses; such examples include the West Nile virus, polio, and rabies. In most cases, a pregnant woman can transmit a congenital viral infection to her unborn child either during pregnancy or delivery. This can lead to a range of health problems, including as impaired eyesight or hearing, delays in development, and neurological disorders, all of which are determined by the virus. Two such viruses include Zika and Rubella. Pap smears or cells from the cervix can detect HPV, a cancer-causing virus. Symptoms are rare for the HPV type that can cause cancer.

2.9. Laboratory Diagnosis

Blood, spit (saliva), phlegm, or mucus can be used to diagnose viruses that can be transmitted by blood transfusions (sputum), Sampling cells from the skin, afflicted tissues, or the nasal passages (nasal/nasopharyngeal swab), Things you excrete, CNS fluid (the fluid around the brain and spinal cord) (stool). After taking a patient's vitals and listening to their symptoms, a doctor or nurse may usually identify a viral illness without ever having to obtain a blood sample or swab the patient's nose or throat. If the viral infection is causing severe inflammation in the lungs, brain, or any other internal organ of the body, X-rays, ultrasound, MRI, or CT imaging can be used to detect viral infection. These tests check for viral DNA, RNA, antibodies, or antigens.

2.10. Prevention and Control of TTVs

To ensure that blood and blood products do not spread illnesses such as HBV and HCV, screening blood donors is crucial. It is critical to upgrade healthcare infrastructure and diagnostic capabilities in hospitals in order to discover infections at an early stage, which will allow for the management of sick patients and the prevention of future transmission [17].

2.11. Treatment

Although some TTVs cannot be treated, they can be avoided [16]. Only a small number of viral infections have specific treatments. To treat or prevent the worsening of symptoms caused by viruses, antiviral medicine may be used for viruses that

can cause serious or chronic illness. Antiviral drugs inhibit the replication of viruses (replicating). Medications like these are useful for managing long-term infections or alleviating the symptoms of some respiratory infections; however, they are virus specific and will not cure other types of viruses. Amciclovir, Acyclovir, Oseltamivir, Valacyclovir, and the home-administered oral antiviral tablet Paxlovid are among these over-the-counter (OTC) medicines. Oseltamivir phosphate, zanamivir, peramivir, and baloxavirmarboxil are the four brands of oseltamivir that are commercially available [16]. Nevertheless, convalescent plasma has been used as a post-exposure prophylactic in cases of Ebola and CAVID-19. To help some people get through till the illness is off, drinking enough of fluids and getting enough rest can be helpful.

3. Materials and Methods

3.1. Study Area

The study was conducted in Our Lady of Apostles Hospital Jos, Plateau State, Nigeria. Our Lady of Apostles (OLA) hospital of the Catholic Arch Diocese of Jos Plateau State is a public health care service organization located in Jos, the capital of Plateau State, Nigeria. It was known to be the third hospital on the plateau to receive global laboratory certification in the health industry and has commenced activity since 1943. The hospital has continued to give quality healthcare services to the Nigerian public within and outside the state [15].

3.2. Sample Size

The number of donors within the study period determined this. In order to avoid bias, all donors within the study period were included. A total of 30 donors were present during the study period; therefore, 30 were taken as the sample size for this research.

Sample size (n) = $\frac{Z^2Pq}{d^2}$ for a cross-sectional study.

Where n=Sample size, Z=Critical value at 95% confidence level, P=Prevalence, q=1-P and d=Precision, usually 5% (GMO-Research.com, 2022).

Taking the prevalence (p) of bacterial activities = 9%, the confidence interval is 95%, and the margin of error is 5%.

Sample size (n) = $0.95^2 \times 0.09(1-0.09)/0.05^2$
= 0.9025(0.082)/0.0025
= 0.07391/0.0025
= 29.6

3.3. Informed Consent

The informed consent of the donors was sought before their information and samples were collected for the research.

3.4. Preparation of Materials

All materials used during this project, such as blood bags and syringes, were already sterilized and are awaiting use. The blood bank refrigerator, which was already at the specific temperature of +2°Cand+10°C, i.e., 35-37^{0}C (except when PC/PRP is to be prepared) as described by [36], was used to keep the collected blood for present or future purposes. Anti-sera and strips were also provided.

3.5. Preparation of the Blood Donors

Donor preparation for phlebotomy follows screening. Utilize a sealed system of blood transfusions (triple configuration). Donor scales should be filled with the main pack containing the anticoagulant. To ensure that the anticoagulant comes into direct touch with the blood entering the pack, it is best to turn the pack upside down. Instead of using donor scales, a basic electronic balance can be utilised. Combine the anticoagulant with the blood when it is being collected. You can either use a machine that does both tasks at once when you're donating blood, or you can gently mix the blood by inverting the tube and do it again at least once every minute. Cut off blood supply to the donor when the scale reads zero or when the total weight of the main pack, anticoagulant, and blood reaches the target weight. Never go beyond the recommended blood-to-anticoagulant ratio. Do not use a contribution that takes more than 10 minutes to make cryoprecipitate. Follow your donor collecting protocols for labelling. Donated blood packs should be brought to room temperature before being delivered to the appropriate department no later than two hours after donation.

3.6. Sample Collection

A whole blood donation takes up to 20 minutes, as described by [37], and each individual who donated blood was examined and screened thoroughly based on the time in which they were about to donate the blood, making a total of 50 individual/persons (donors) who were examined at the time of the research.

3.7. Screening and Examination of Samples

The donors' samples were collected through phlebotomy in an EDTA bottle for screening of transfusion transmissible viruses, which include (HIV, HBV, and HCV) respectively. A retrospective analysis of blood donors was conducted and recorded from the beginning of July to the end of July 2024. Fifty blood donors and their samples were tested and examined for Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV) using enzyme-linked Imunno-static Assay (ELISA) and confirmatory tests.

3.8. Data Analysis

All data obtained from this research were analyzed statistically using the percentage prevalence method, which was used to analyze the blood donors based on Gender, Age, and type of TTIs present, and results were presented in Tables and chart.

4. Results

A total of 30 donors were examined for transfusion transmissible viruses; out of the 25 blood donors examined in OLA Hospital, three were contaminated with transfusion transmissible viruses (3 hepatitis C viruses), with a prevalence of (12.0%). At the same time, 22 were negative, as represented in the Bar Chart below (Figure 3). The highest isolated transfusion transmissible virus was Hepatitis C, with a prevalence rate 3(12.0%). None was isolated from HIV and Hepatitis B viruses, with a prevalence of 0(0.0%), respectively (Table 1).

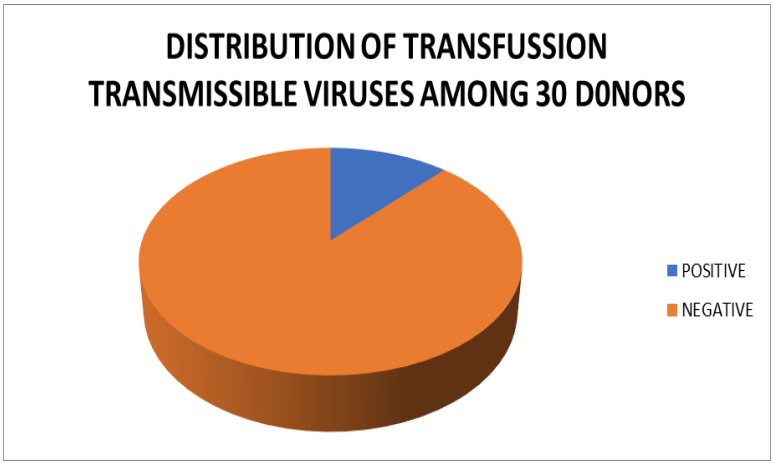

Figure 3: Distribution of Transfusion Transmissible Viruses Among the 30 Donors at Ola Hospital

Transfusion-transmissible viruses between 35 males and 15 female donors in Ola Hospital were examined, and it was discovered that the males have the highest number of transfusion-transmissible viruses with a prevalence of 2(22.2%).

Table 1: Transfusion Transmissible Viruses Isolated From Donours In Ola Hospital

TTVs	No. Examined	No. Positive	% Positive
HIV	30	0	0.0%
HEPATITIS B	30	0	0.0%
HEPATITIS C	30	3	10.0%
Total	**30**	**3**	**10.0%**

In contrast, females have transfusion transmissible viruses at the rate of 1(6.25%) (Table 2). Also, the distribution of transfusion transmissible viruses was examined within the age limit of donors at Ola Hospital.

Table 2: Prevalence of Transfusion Transmissible Viruses Between Male and Female Donors in Ola Hospital

GENDER	No. Examined	No. Positive	Positive (%)
Females	18	1	3.3%
Males	12	2	6.7
Total	**30**	**3**	**10.0**

It was discovered that out of 10 donors examined at age 18-28, 2 were positive with a prevalence of 2(20.0%), while out of 14 donors examined in 29-39, 1 had transfusion transmissible viruses at the rate of 1(7.1%). The only donor aged 40-50 examined was not positive for transfusion transmissible virus (Table 3). A Bar Chart Showing the Distribution of Transfusion Transmissible Viruses.

Table 3: Distribution of Transfusion Transmissible Viruses According to Age Limit

AGE LIMIT	No. Examined	No. Positive	Positive (%)
18-28	10	2	6.7
29-39	14	1	3.3
40-50	1	0	0.0
Total	**30**	**3**	**10.0**

5. Discussion

This study evaluated the prevalence of transfusion transmissible viruses among 30 donors in OLA Hospital, Jos Plateau state. Out of the 30 samples of blood donors examined in OLA Hospital, 3 of the samples were contaminated with transfusion transmissible virus (hepatitis C), while 27 of them had no transfusion transmissible viruses. This study documented a prevalence of (10.0%) which is not quite high compared to the work of Jeremiah and Enwin [39], who isolated a higher prevalence of 20.0%. The lower prevalence isolated from this study could be attributed to the limited time of this research work and blood donation from voluntary blood donors with less risk. More so, people are now aware of how deadly transfusion-transmissible viruses are and can protect themselves, thereby reducing the infection rate [31].

Additionally, hospitals and medical centres now have access to highly sensitive and modern serological tests that aid in the timely detection of these pathogens. Vaccines, donor screening, and improved sterilisation procedures for all blood products could help reduce the incidence of transfusion transmissible viruses. During this study, it was discovered that the highest isolated transfusion transmissible virus was the Hepatitis C virus, with a prevalence rate of 3(10.0%). In comparison, HIV and Hepatitis B were both negative, with a prevalence of 0 (0.0%), as can be seen in Table 1 above. This could be attributed to the fact that the hepatitis B vaccine is working, and many people are being immunized nowadays, unlike the hepatitis C virus. This could be attributed to different modes of transmission of these diseases. HIV cannot survive outside the living body but dies immediately outside the body, unlike the hepatitis virus, which can survive outside the body to some extent.

Meanwhile, this finding is different from the work of Tiwari et al., [6] who was able to isolate HIV and Hepatitis B and C. This could be because of the different areas of study and geographical differences. This research has documented one transfusion-transmitted virus (Hepatitis C). Viruses such as Respiratory syncytial virus (RSV), Human metapneumovirus (hMPV), Parainfluenza, Norovirus, rotavirus, astrovirus, Hantavirus pulmonary syndrome, Dengue, Human immunodeficiency virus (HIV), Human papillomavirus (HPV)/genital warts, Genital herpes (HSV), Roseola, Fifth disease, West Nile virus, Polio, Rabies. Torqueteno virus (TTV); the cytomegalovirus (CMV), Epstein-Barr virus (EBV), Adenovirus, Lassa fever virus; Rift Valley fever virus; Parvovirus B19; Ebola virus, and dengue viruses are also transfusion-transmitted viruses but were not isolated in this study. This may be because of the short study period and geographical differences, as this study was conducted in Jos.

Many different types of viruses can get into the body through the nose, mouth, eyes, anus, or genitals or a break in the skin [36]. Once these viruses enter the cells, they begin making more copies of themselves. HAV and HEV are transmitted mainly via the enteral route, whereas HBV, HCV, HDV, and HGV are transmitted mainly via the parenteral route. There are many ways by which viruses can spread, such as through sexual contact, blood-to-blood transmission (drug users sharing needles with an infected person), contact with saliva, coughing, sneezing, abscessed teeth, germs on medical equipment (surgical tools and needles), this study concentrated mainly on the ones that can be transferred through blood transfusion. Additionally, although this research primarily focused on viruses that are transmitted through blood transfusions, there are other hemorrhagic

viral diseases that can be transmitted through insect bites, such as dengue fever and yellow fever, as well as through direct contact with infected blood or other bodily fluids, such as Ebola.

Blood-borne pathogens are microorganisms such as viruses or bacteria that are carried in blood and can cause disease in people. There are many blood-borne pathogens, including malaria, syphilis, and brucellosis; still, viral infections are any illness people get from a virus (a small germ that uses the cells to reproduce). Viral infections are illnesses people acquire from tiny organisms that use someone's cells to make more copies of them. They cause many diseases, including respiratory and digestive illnesses, and can infect most body parts. Common viral illnesses include colds, flu, COVID-19, norovirus ("stomach flu"), HPV (warts), and herpes simplex virus (cold sores). Though many viral infections disappear independently, some cause life-threatening and chronic illnesses.

Viruses can affect anybody, irrespective of age, as was seen in this research. This was observed in Table 3 above; it was discovered that out of 10donours examined aged 18-28, 2 had transfusion transmissible viruses with a prevalence of 2(6.7%), while out of 14 donors examined aged 29-39, only 1 has transfusion transmissible viruses at the rate of 1(3.3%). No transfusion-transmissible viruses were found in the one donor with a blood type between 40 and 50. Due to its microscopic size, the virus can infect people of any age; in fact, it is a kind of germ or pathogen. Within their encapsulating membrane, every virus carries a tiny snippet of genetic code, be it DNA or RNA (capsid). As an analogy, think of it as an envelope with instructions; in contrast, human cells are like a whole factory with all the necessary machinery and instructions for making proteins and new cells. Viruses, on the other hand, lack cells and, by extension, the "machinery" necessary to self-replicate; so, they must infiltrate human cells in order to replicate their instructions. The process of viral replication is what causes illness in infected individuals.

Transfusion-transmissible viruses between 9 male and 16 female donors in Ola Hospital were examined, and it was discovered that the males had the highest number of transfusion-transmissible viruses with a prevalence of 2(6.7%). In contrast, females had transfusion transmissible viruses at the rate of 1(4.3%) (Table 2). This could be attributed to the varying numbers of each gender examined. The symptoms of a fever, cough, and rash can be caused by either bacteria or viruses. Having a healthcare professional check a patient out is the only way to determine the type of infection when symptoms persist for more than a few days to months. Adenoviruses and herpes viruses, among others, can cause a wide range of illnesses, including infections of the respiratory system, the digestive system, the brain, birth defects, STIs, rash-causing exanthematous infections, and so on. Although most viral infections are mild, others, like TTDs, can produce fatal complications. Because of the potential for transfusion-transmittable viruses to spread from person to person, it is crucial to take precautions against viral infections by getting the recommended immunizations, practising excellent hand hygiene, and abstaining from sexually transmitted diseases.

6. Conclusion

The prevalence of transfusion transmittable viruses among intending blood donors at OLA Hospital in Jos, Plateau State, was significant at a prevalence of (10.0%). Though not so high, it is encouraged that screening should be conducted every time on donors before denotation. The finding of this study highlighted the need for rigorous screening and testing of blood donors to ensure blood safety before transfusion. After the first screening, a second screening should be conducted around one month afterward as some of the donors may be in their window period of the infections. Those who need blood urgently should be transfused with already screened blood and replaced later with their relatives or friend's donor after it has been screened and confirmed free from any transfusion transmittable virus.

6.1. Recommendation

- The state and country should launch an anti-HIV, anti-HBV, and anti-HCV awareness campaign to inform the public about the diseases' transmission mechanisms, potential dangers, and preventative measures.
- Some transfusion-transmittable viruses that have vaccines should be made available to the general public by the Government to help reduce the infection rate.
- To prevent transmission, it is important to improve medical facilities and hospital diagnosis, which will enable the detection of transfusion-transmittable viruses and other diseases early enough to reduce their spread, possibly with advanced technologies.

6.2. Limitations of The Study

- It was limited to the study site and might not necessarily be generalizable.
- Only testable viruses, i.e., HIV, Hepatitis B, and C, were tested in the study.
- It does not tend to examine other microorganisms or infections found in blood donors but only focuses on isolating HIV, Hepatitis B, and C.

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