A Review on Ebola Virus

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Abstract- *Human Ebola virus disease can be caused by four viruses: Sudan virus, Tai Forest virus, Bundibugyo virus, and Ebola virus (EBOV, species Zaire ebolavirus). Ebola virus Disease is a life-threatening disease. Due to a lack of timely identification and treatment, Ebola virus (EBOV) epidemics have been reported to be the most severe mortally recurring sickness. EBOV sickness is a severe hemorrhagic viral fever caused by the EBOV virus that is transmitted by direct contact with infected bodily fluids and virus-contaminated or animal-affected things. At the stage of fatal EBOV infection, most people die before developing an antibody response. Currently, prognosis is dependent on a mix of case identification and laboratory tests, most commonly real-time PCR or reverse transcription to diagnose viral RNA or quick immunoassay-based detection methods to detect EBOV antigens. Furthermore, just a few nanotech-based methods for diagnosing the Ebola virus have recently been discovered. Fluorescence molecules can be recognised with the naked eye or fluorometers thanks to optical monitoring.*

Electrochemical identification methods (such as amperometry, potentiometry, or impedimetry) could also be used to create a vulnerable system using disposable lab on chips. Furthermore, employing a hand-held potentiostat, the electrochemical devices can be easily shrunk, obviating the requirement for sophisticated diagnostic instruments. Advances in technology have been accompanied by increased efforts to improve the ability for decentralised diagnostic identification near the point of care. With early detection and treatment optimization, infectious disease epidemics can be contained more readily. Artificial intelligence (AI) and the internet of medical things (IoMT) are currently being used to aid POCT. As a result, IoMT provides health specialists and medical care centres with wireless-based operation and interconnection of POCT devices. IoMT-enabled POCT systems help bridge the gap between bioinformatics creation and data analysis.

Keywords- Etiology; Diagnosis; Pathogenesis and Transmission; Clinical Management and Treatment; Vaccines; Laboratory Diagnosis;Signs and Symptoms.

I. INTRODUCTION

A virus that causes severe bleeding,organ failure and can lead to death. Humans may spread the virus to other humans through contact with bodily fluids such as blood.Human Ebola virus disease can be caused by four viruses: Sudan virus, Tai Forest virus,Bundibugyo virus, and Ebola virus (EBOV, species Zaire ebolavirus). The 2014 outbreak of EBOV in West Africa was the worst ever, with more than 28,000 cases and more than 11,000 deaths in Liberia, Guinea, Sierra Leone, Nigeria, and Mali. Investigational studies undertaken during the latter stages of the response, however, have led to progress in the development and use of biologic and chemical compounds to treat EBOV and Ebola virus disease (EVD). Recommendations to study vaccines and therapeutics and evaluate their benefit in the context of Ebola responses have been issued by a panel of the National Academies of Sciences, Engineering, and Medicine and by the World Health Organization (WHO) in the form of an EVD Blueprint.(A Arenola,*et al.*,2015).

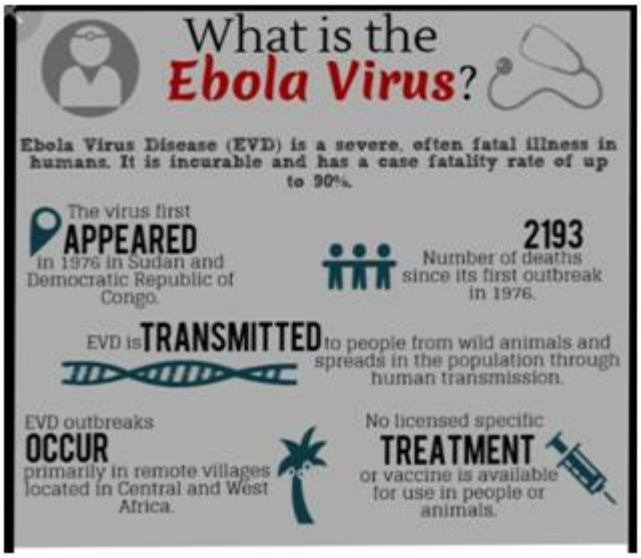


Figure-1Ebola Virus

On August 1, 2018, the Democratic Republic of Congo (DRC) announced the 10th outbreak of EVD in the country. This announcement came days after the 9th EVD outbreak, in Equateur province, was officially declared over. The virus sequence, identified from one of the first con-firmed cases and completed at the Instituted National de Recherche Biomédicale (INRB) in the DRC, identified EBOV as the cause of the outbreak. Ebola is an uncommon but fatal virus that causes fever, body pains, diarrhoea, and, in some cases, internal and external bleeding

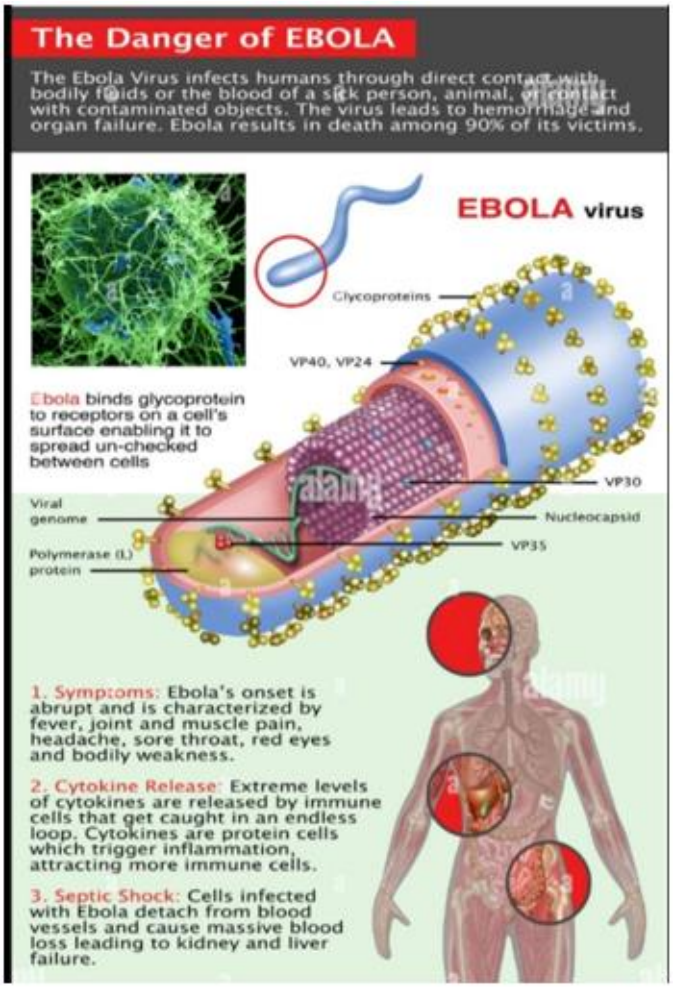


Figure-2 Danger of Ebola.

This new and ongoing outbreak was first reported in North Kivu province and has quickly spread to neighboring Ituri province. Both provinces border Uganda and are among the most populated in the DRC — a number of cities in the two provinces have populations of 300,000 or more. Exacerbating matters, this mineral-rich region has been plagued by insecurity for years, as multiple identified and unidentified rebel groups fight for control over the area. These conflicts have led to mass population displacement: more than 1 million people in North Kivu alone have been forced to leave their homes to escape the threat of abduction, rape, and killing.3 Further complicating the situation, neither province had experienced a previous EVD outbreaks.

Ebola, often known as Ebola hemorrhagic fever (EHF), is a fatal disease that mostly affects humans and nonhuman primates. A virus causes Ebola virus disease (EVD).

Infection caused by a virus belonging to the Filoviridae family and genus Ebolavirus.[1] EVDs have complicated diagnostics and it has posed a global public health threat since its discovery. WhileA possible case of yellow fever is being investigated by Dr. Peter Piot in the United Kingdom.The disease was first found in 1976 in the African country of Zaire (now Zimbabwe).Democratic Republic of Congo).In West Africa, the term "Ebola" was coined.The Ebola virus was first discovered along the Congo's Ebola River.(H Hasan.,*et.al.2019).*

On August 8, 2014, the World Health Organization (WHO) proclaimed the Ebola virus disease (EVD) epidemic in West Africa a Public Health Emergency of International Concern. Concern (PHEIC)1 is a term used to denote a group of people who are concerned about something. emphasising the significance of international collaboration Controlling the outbreak will necessitate a great deal of concentration and teamwork. There have been 2622 reported fatalities in Guinea. LiberiaLiberia and Sierra Leone are two West African countries. The EVD case that was brought into the nation illegally There was only a tiny pandemic in Nigeriaas well as similar imports from the US and SpainThis appears to be the case.

As a result, infection of healthcare professionals occurs, emphasising the significance of proper isolation procedures, personnel training, and the proper use of personal protective equipment. apparatus (PPE).Due to continuing investigations, the number of cases may change. reclassification study into the past, and the Laboratory results are readily available. Another, unrelated, In the Democratic Republic of the Congo, an EVD outbreak has been detected. Currently, there are 62 verified cases in the Democratic Republic of Congo.as well as suspected cases. Viruses from the Ebolavirus and Filoviridae families cause Ebola. Ebola is classified as a zoonosis, which means that the virus is found in animals and spreads to people. It's unclear how this transmission occurs at the start of a human pandemic. Ebola hemorrhagic fever (EHF) is an acute viral illness characterised by a high fatality rate in patients who develop a fever and a subsequent bleeding diathesis. Primates, both human and nonhuman. a percentage ranging from 50% to 100% This is a lethal weapon because of its nature. Filovirus is a biological pathogen of biological class 4.The virus's natural reservoir is unclear. As a result, As a result, nothing is known about how the Ebola virus works. It's not clear how it's transferred or how it replicates in its host. Although The major source of infection is unknown, and the epidemic has yet to be identified. There is a well-defined demiologic mode of transmission. A Several tests have been shown to be specific and useful for The Ebola virus has been identified. There are no FDA-approved supplements. EHF is being treated with an antiviral medication. The duration of incubation varies between 2 and 24 hours. up to 21 days. (R Rajak,*et.al,.2015).*

Etiology-

The Ebola virus is what causes EVD. Its starting point or origin are unknown. According to scientists, it is transmitted by animals and most likely originates from bats, which also spread the Ebola virus to people and other animals. There is no evidence that the virus can be spread by insects, including mosquitos. The typical case fatality rate for EVD in people is about 50%

A uncommon yet fatal virus called Ebola causes fever, bodily pains, diarrhoea, and occasionally internal and external bleeding. The immune system and organs are harmed when the virus travels throughout the body. In the end, it results in a decrease in blood-clotting cell levels. The result is significant, uncontrollable bleeding.

Diagnosis

Multiple techniques have been established for laboratory diagnostic methods of filovirus detection, including assays for the detection of viral genome, viral antigen, and host immune responses, even in field operations. In the West African EBOV epidemic, on-site, high-end sequencing technology was implemented to improve outbreak response. In addition, simple bedside tests to detect viral antigen have become available. The most widely used technique to diagnose acute infections is a quantitative real-time polymerase-chain-reaction assay (qRT-PCR), preferably targeting two distinct genome locations to minimize false negative results due to evolving genome mutations. The qRT-PCR assay is expected to be positive in symptomatic patients, with increasing viremia in fatal cases. Since the assay may be negative early in the disease course, however, follow-up testing is warranted in patients with initially negative tests who have continuing symptoms. In the past, negative results on at least two sequential tests have been required for discharge from the treatment center. Despite improved laboratory diagnosis, individual EVD or MVD cases may still be difficult to diagnose, since clinical assessment is critical. In ill-prepared primary health care settings, diagnosis is further hampered by lack of technical capabilities. Technology transfer and training are still in their infancy in many African countries, but awareness of filoviruses has grown, and with simple, more reliable technologies, there is a prospect for improvement.

Depending on the stage of the disease, EVD patients frequently have changed laboratory values. The World Health Organization (WHO) (2014) suggested collecting samples of Ebola testing can be done on whole blood or an oral swab at designated Ebola treatment centres. Centers for treatment Chain of reverse transcriptase polymerase enzymelinked immunosorbent (ELISA) and reverse transcription polymerase chain reaction (RTPCR) The most commonly used laboratory tests are enzyme-linked immunosorbent assays (ELISA). confirmation of the EVD. RTPCR can detect viral infections. RNA was found in infected patients' blood samples almost immediately. has a high rate of recurrence following the onset of signs and symptoms. It has a high sensitivity (up to 100 percent) and produces results in 1–2 days. occurrences of epidemics The immunoglobulins G and E are detected by ELISA. M has a limited sensitivity in samples from infected people (91 percent) as well as. (M Goeijenbier *,et.al,.2014).*

Pathogenesis and Transmission :

The development of disease after infection is a complicated interplay between the virus, the host, and the environment. Various case fatality rates (CFR) have been observed between the two groups. The four Ebolaviruses that are human-pathogenic In EBOV, the In 50-90 percent of EVD cases, CFR is present.27 For the purpose of CFR is expected to be around 50% in the present outbreak,28 Despite the fact that there is some evidence of better results, Although there are variances in the CFR for different EBOV species, Because they rely on reporting, these data are difficult to analyse. It may not be the best option. The human body is infected with 29 Ebola viruses.mucosal surfaces, abrasions, and traumas to the body either through the skin or through direct parental transfer. Infection caused by Although not impossible, undamaged skin is thought to be unlikely. The virus has been identified and isolated.

Several laboratory-acquired infections have been recorded in recent decades, most of which occurred as a result of needle mishaps or direct contact with infectious materials. The disease appears to be affected by the method of transmission. CFRCFR was involved in the early EBOV outbreak in 1976.After injection, there was a 100% success rate versus an 80% success rate. In cases of contact exposure. This has been proven ina non-human primate model that shows quicker disease progression in animals infected via injection vs. those infected by mouth It was subjected to an aerosol challenge32 Because of the high CFR, in EVD and the utilisation of EBOV as a biodefense agent The pathophysiology of EVD has been relatively well understood. 33 The majority of studies have been rodent, guinea pig,primate, and in vitro studies models. Because the virus requires most relevant data representing human disease come from non-human primate studies from non-human primate studies. Post-mortem exam in

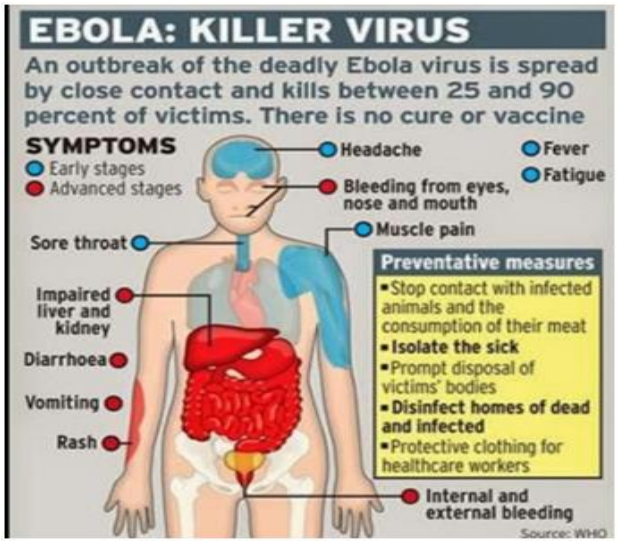


Figure 3. killer virus Ebola

ations of patients and diseased animals Immune cells (macrophages, lymphocytes) were infected in the animals. epithelial and endothelial cells), monocytes and dendritic cells, fibroblasts, hepatocytes, and tissue from the adrenal gland The rate of replication in infected cells is quite high, leading inviraemia with a quick and high peak In addition, cell The demise of infected cells is thought to play a role. aa critical role in the signs and symptoms of Patients with EVD, for example, have a reduced ability to communicate. Due to necrosis, the immune system is unable to respond to the infection. aa reduction in the number of infected lymphocytes or a decrease in the production of Hepatocyte loss causes a lack of clotting factor.(M Goeijenbier,*et.al,.2014).*

Ebola viruses enter the human body via mucosal membranes, cutaneous lacerations/tears, close contact with infected patients/corpora, or parental transmission. EBOV has a proclivity for infecting immune system cells (dendritic cells) endothelium and epithelial cells, monocytes, and macrophages), It replicates actively in cells, hepatocytes, and fibroblasts. genegene regulation and apoptosis, and they show a considerable difference. The virus enters the regional lymph nodes, causing significant viremia. resulting resulting in lymphadenopathy and hematogenous spread to the rest of the body An aggressive inflammatory response is promoted by the liver and spleen. Chemical mediators of inflammation (cytokines and chemokines) are released. Chemokines create an immunological response that is out of whack. producing a disruption in the vascular system's harmony and, as a result, leading Multiple organ failure and disseminated intravascular coagulation dysfunction.(H Hasan,*.et.al.2019).*

Clinical Management and Treatment:-

The first stage is to identify patients who have symptoms that match the WHO and Centers for Disease Control and Prevention's case definitions.(CDC), Atlanta, Georgia, USA, has developed a specific programme for patients in Ebola virus infections have occurred in the following geographic areas: patients who have been previously reported and/or patients from other countries that have experienced comparable problems and have travelled within the last 21 days to these countries These Patients must be segregated as soon as possible, and the patient must be kept safe. Contacts have been identified, and containment and containment measures have been implemented. Preventative steps have been implemented. Blood samples must be collected. be received as soon as possible and presented to the nearest a clinical laboratory that is licenced to perform diagnostic tests Ebolavirus testing is being done. At the moment, the therapy of The administration of' supportive care' and EVD are both included in EVD. strategies for therapy.

The management of haemodynamics and haemostasis is most beneficial to EVD patients. Fluid replacement is most effective when done early in the disease. Therapy improves the chances of survival dramatically. Ribavirin is the only effective antiviral currently available. Is effective against some VHF viruses, such as Lassa fever. Ebolaviruses are resistant to it. Various medicines containing have been demonstrated to be effective against Ebolaviruses. The World Health Organization (WHO) stated that, given the gravity of the situation, because of the present outbreak's severity, it is ethical to utilise medicines in development for the treatment and prevention of lists the most promising experimental results. substances having antimicrobial activity.

EVD is based on nonhuman monkey research in which ZMapp was able to reverse advanced EVD when given up to five days after infection. Unfortunately, ZMapp is in short supply right now. moment . Non-antibody based antiviral medicines include Only favipiravir, a nucleoside analogue, has been tested. aa great deal in people The medication was recently approved.in Japan for the treatment of persons infected with novel and emerging pathogensinfluenza viruses that have resurfaced Apart from anti-terrorist activities, This medicine has also been linked to influenza virus infection. EBOV-infected when therapy began six days earlier after the infection These findings are intriguing, but more research is needed. Beproven in a nonhuman primate model BCX-4430 is additionally a is a nucleoside analogue that exhibits wide anti-RNA viral action and has been shown to be effective against the Marburg virus in a non-human primate model.In a mouse model of the Ebola virus.Finally , TKM-Ebola and TKM-Ebola.The drug AVI-6002 is being developed for the treatment of EVD and gene

silenci are the mechanisms through which they work.(Y *Yobsan.et.al,.2018).*

Ebola virus vaccines:

vaccinations for ebola. The World Health Organization (WHO) convened an expert meeting in October 2014 to evaluate, test, and ultimately approve two possible Ebola vaccines:The United States National Institute of Allergy and Infectious Diseases and GlaxoSmithKline collaborated to create the

- cAd3-ZEBOV-The United States National Institute of Allergy and Infectious Diseases and GlaxoSmithKline collaborated to create the cAd3-ZEBOV vaccine (NIH). It employs an adenovirus vector generated from chimpanzees with the Ebola virus gene added.
- rVSV-ZEBOV-The Public Health Agency of Canada in Winnipeg and a business called NewLink Genetics, which is based in Ames, Iowa, produced rVSV-ZEBOV. A gene from an Ebola virus has been substituted into a virus that is weaker than that found in animals and is used in the vaccine.

The WHO-funded and-organized vaccine trial, which used the Ebola ca Suffit vaccine, released its early findings on July 31, 2015, according to Lancet Trusted Source. efficacy in the experiment, which involved 4,000 participants and was conducted in Guinea. In February 2017, Lancet Trusted Source published the whole trial results. The next step is to make these vaccines as quickly and widely accessible as possible in order to safeguard frontline healthcare workers and influence the course of the epidemic.

Laboratory Diagnosis:-

In acute, early fatal instances of EHF, the virologic and immunologic effects are different than in less severe patients that recover. It should not be necessary to certify the Ebola virus. EHFEHF was first diagnosed. Given the early lack of specificity, Symptoms apart, a strong index of suspicion is required. In order to make this diagnosis, you'll need the following information. The exhibition ofa sudden illness with high fevers (>101 °F) lasting shorter than three weeks' There were no predisposing variables for hemorrhagic disease during the length of the study. hemorrhagic symptoms and at least 2 manifestations(for instance, epistaxis, bloody stools, or hemoptysis) ally provides sufficient evidence to at least consider that laboratory confirmation (Borio and others) is available others (year 2002). Nonetheless, a definitive diagnosis of EHF is required. requires proof of viral infection in the lab. (C Casillas.*et.al,.2003).*

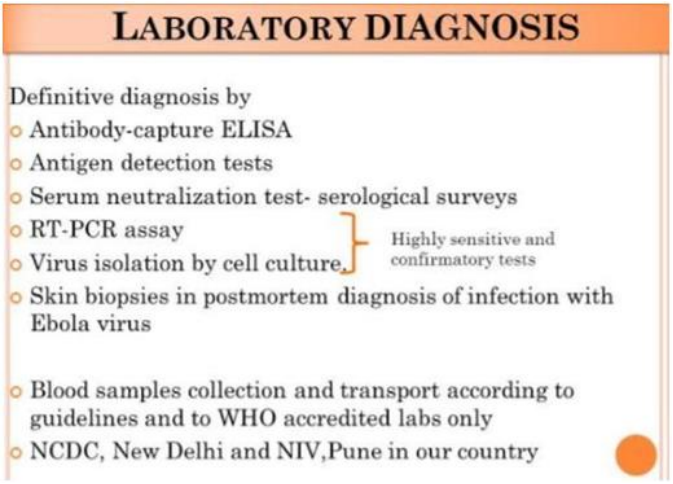
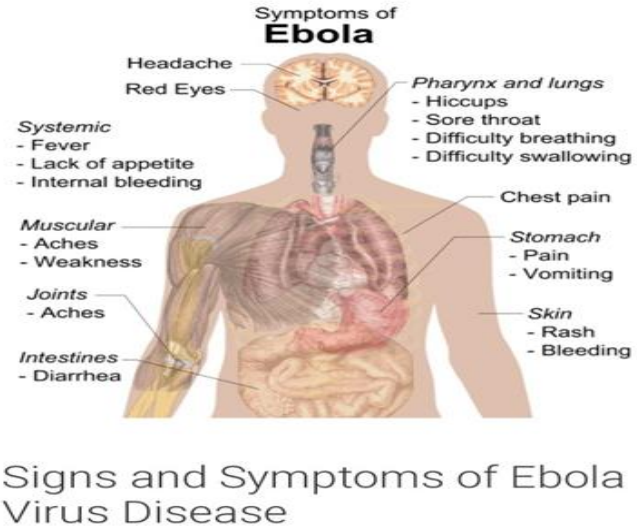


Figure -4 Laboratory Diagnosis

Signs and Symptoms:

Ebola symptoms can emerge anywhere between 2 and 21 days after exposure, with an average of 8 to 10 days. Ebola Zaire kills victims swiftly, usually between 7 to 14 days of onset of symptoms. For up to three weeks, a person can have the infection but show no symptoms. Even if a person survives, the infection can remain in their system for weeks. According to the WHO, the virus can be found in sperm up to 7 weeks after recovery. Humans are not infectious until they show signs of illness. Fever, headache, joint and muscular pain, a sore throat, and extreme muscle weakness are common symptoms of Ebola infection.



Signs and Symptoms of Ebola Virus Disease

- Signs and Symptoms of Ebola Virus Disease are as follows
- Muscle and Joint aches
- Headache
- Sore throat and Shortness of breath
- Chest pain and cough

- Red eyes
- Weakness
- Swelling
- Severe weight loss
- Chills
- Confusion
- Fatigue
- Nausea and Vomiting
- Diarrhea (may be bloody)
- Internal and External bleeding
- Bleeding, usually from the eyes
- Stomach Pain
- Hiccups
- Raised Rash
- Kidneys and Liver Failure

Prevention:

In EVD, the most important goal is to keep the vulnerable population from becoming infected and to keep transmission to a minimum. These preventive techniques necessitate a lot of hard work and dedication. government initiatives, public health facilities personals, as well as medical units .The most important part of preventing EVD transmission is to avoid it. direct physical touch with sick people and their bodies fluids. Health-care providers are particularly susceptible and face a variety of challenges. EVDEVD faces a new professional danger . As a result, extreme caution is required. The The universal infection control procedures must be followed. essential in all hospitals, laboratories, and other health-care facilities services in the field of care. The Centers for Disease Control and Prevention (CDC) in the United States has lobbied for the necessary change As a requirement, workers must wear a variety of personal protective equipment. .

Fig 6 :preventation

The potential of Ebola virus infection in humans spreading quickly is real. By avoiding direct contact with bush meat and bats, the risk of Ebola virus infection in humans can be reduced. Traditional burial practices, particularly in Africa, are dangerous. The continent played a crucial role in EVD transmission. As a result, it is critical to practise safe and secure funeral customs. to stop the disease from spreading The World Health Organization advises that safe sex practises be implemented. For a period of 12 months from the beginning of symptoms or until they are no longer symptomatic Semen that has tested negative twice should be followed . Employees who work in the dental field are more vulnerable to EVD. since they come into contact with blood and saliva on a regular basis during the procedure.
(B Beeching.*et al,.2014).*

II. CONCLUSION

Ebolavirus is the life-threatening viral disease. Multiple epidemic outbreaks in the last 25 years have elevated EVD to a severe global public health threat. Recent breakthroughs have been made in the form of effective methods. Ebola virus vaccines and anti-Ebola virus medications are currently being developed. Rapid growth, on the other hand, geographical dispersion, vague clinical presentation, and a paucity of data The potential hurdles include the development of a vaccination and the development of a specialised diagnostic test. In order to address this dreaded public health threat.

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