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Bacterial Meningitis – A Review

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Review Article

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ABSTRACT

Various pathogens are responsible for causing deadly diseases like HIV/AIDS, tuberculosis, diarrhoea, polio. The main focus of this article is to discuss about bacterial meningitis which can be deadly if left untreated. The article mainly discusses about the causative organisms, signs and symptoms, the transmission route, preventive measures and medications. This article will also focus on the open accesspeer reviewed literatures and journals, the importance of conferences, meetings which discusses and exchange ideas openly regarding the various ways to adopt to remain protected from this infectious disease. The conferences, open access journals also play a major role in the awakening of the general public who remains quite dormant and ignorant about this deadly disease bacterial meningitis.

INTRODUCTION

Meningitis mostly caused by virus, bacteria or fungus results in the acute swelling of the meninges that cover the brain and the spinal cord. Viral meningitis is quite common and is treatable. Bacterial meningitis is dangerous and fatal if left untreated. Viral and bacterial meningitis share the same symptoms like stiff neck, fever, severe headache, nausea, vomiting and are not distinguishable. However bacterial meningitis cause irreparable and permanent damages like learning disabilities, hearing loss, brain damage [1-10]. The symptoms include nausea, vomiting, photophobia (increased sensitivity to light), sensitivity to loud noise, confused state etc. This can also lead to serious body complications like sepsis which can cause tissue damage leading to organ failure and ultimately death. Babies, elderly individuals and person with compromised immune system are more likely to be at higher risk to be infected.

Humans are supposed to be the carriers (carry the germs without being affected), this is air borne and spreads through cough, sneezing, kissing etc. The main causative bacteria are *Streptococcus pneumonia*, Group B Streptococcus, *Neisseria meningitides*, *Haemophilus influenza* and *Listeria monocytogenes*. Meningococcal meningitis is caused by Neisseria meningitides. Mothers can pass group B Streptococcus and *Escherichia coli* to their babies during labor and birth. According to a report every year 4100 cases are registered in USA with 500 deaths [11-21].

The main reason behind the death due to meningitis is lack of ignorance. People cannot even know when they get affected. It is mostly characterised by irritation, poor feeding, sluggishness, bulging fontanelle or abnormal reflexes in babies while headache, rashes, vomiting, confusing are the signs in older adults.

The main focus in eradication of the deadly disease is proper diagnosis at right time, vaccination, self-consciousness and proper knowledge. However vaccines are available but are not 100% effective which demands self-consciousness and self-realization about the disease. Now a days internet has proved itself to be very useful and the most accessible way to make people learn, know, acquire about anything they want or need and also in turn makes people knowledgeable. One such accessible way is the open access journals that increase the visibility. These peer reviewed journals have impact factor that ensures excellence, essence of the work and number of citations received for the same published articles, calculated on the number of articles that undergo a double blind peer review process by the Editorial Board.

MENINGITIS: ERADICATION A MUST: INITIATIVES BY SOCIETIES

There are various societies that work together to eradicate various life threatening infectious diseases. They help in educating the masses about the prevention, cure and safety measures to get ready to face the challenges. European-Society-of-Clinical-Microbiology-&-Infectious-Disease has become one of the leading societies in clinical microbiology and infectious diseases which provides world-class facilities for the scientists to work pushing the boundaries of Immunology. Clinical Immunology Society aims in providing proper education regarding the novel research conducted, development of modern technologies and approaches in regard to promote excellence in patient care with immunologic or inflammatory diseases. It helps in exchange of innovative ideas to subdue the life-threatening disorders. OMICS collaboration with FEMS:Federation of European Microbiology which represents the federation of microbiological societies of 36 European countries. FEMS believes in adopting the habit of gathering, exchanging and distributing innovative ideas and knowledge through journals, news items, teaching support, grants, by conducting congress for microbiologists all over the world and by initiating campaigns like the European Academy of Microbiology (EAM) and the European Microbiology Forum (EMF) [22-40]. It believes in maximising the communication of the knowledge and its importance to masses, scientists, policy makers as it affects improved health and well-being, wealth generation and environmental quality and sustainability. These societies ultimately aim in providing knowledge through conferences, campaigns, journals for the betterment of the human society worldwide. The knowledge helps in eradicating the stigma and ignorance attached with the disease which propels or compels any one to diagnose the disease and get it treated at the right time with proper medication and treatment.

OPEN ACCESS JOURNALS:ACCESSIBILITY, VISIBILITY AND ITS IMPORTANCE

An open access journal increases the visibility and accessibility without any financial or legal barriers. It helps in exchanging and acquiring ideas regarding new research advances, development of modern techniques and technologies, new ideas for conducting research etc. Journal of meningitis is an open access journal that publish articles mainly focusing on the epidemiology, clinical manifestations, bacteriological profile of the causative agents, and diagnostic tests such as imaging, lumbar puncture. Journal of Infectious Diseases & Therapy is an open access journal which publish reliable source of information on the current discoveries, developments, therapies, treatments, diagnosis in the field of infectious diseases caused by bacterial, viral, fungal, parasitic infections. These microbial infections can be water, air or food borne. Journal of Infectious Diseases and Diagnosis aims in publishing articles focusing on recent adopted diagnostic techniques to cure the infectious diseases. It focuses on the publication of articles concentrating on the development of new medications and effective target proteins that could be used for medication or diagnosis. Journal of Infectious Diseases & Preventive Medicine mainly focuses on the paleopathology which provides the historical perspective of a particular disease for the contemporary understanding. It provides details about the clinical and microscopic findings of a particular disease, with date and time details of its emergence that suggests possible medication in preventing and combating the disease. This would further be helpful in the diagnosis, characterization and therapy of various marked diseases. Journal of Bacteriology & Parasitology focuses on new discoveries to our basic knowledge by which the information transforms from basic understanding to practical and clinical application including the nature of pathogen and their interaction with the host, epidemiology, ecology and mechanisms of bacteria. Bacteriology and Parasitology is a dynamic field, as they constantly change their structure, genetic makeup and host relationships. An article entitled "Polymorphisms in DNA Repair Gene XRCC1 (Arg194Trp) and (Arg399Gln) and their Role in the susceptibility of Bacterial Meningitis" explains that the host genetic characteristics such as the single nucleotide polymorphisms (SNPs) occurrence might have resulted in the disease susceptibility. DNA damages were quantified using the genomic DNA with formamidopyrimidine DNA-glycosylase (FPG)[6]. Cytokines and chemokines were quantified from cerebrospinal fluid samples of meningitis patients. It was found that there was no association of the SNP XRCC1 Arg194Trp with the disease while it indicated that the Gln XRCC1 allele of the SNP XRCC1 Arg399Gln might be protective for meningitis. However, this study has to be further extended to a larger cohort so as to confirm and

understand the mechanisms involved in the protection. Recent research is under way in the search of a novel therapeutic to cure the deadly disease and to decrease mortality rate [41-63].

WORLDWIDE CONFERENCES

Worldwide conferences are also conducted to ensure proper knowledge among the masses. 4th International Congress on Bacteriology and Infectious Diseases held at San Antonio, Texas in May, 2016 focused on the infectious diseases caused by the pathogenic bacteria and the need of proper treatment and medication. It provided a global platform to provide new insights in the field of microbiological emerging infections and the precautionary measures and treatment needed to combat the diseases. 4th International congress on Infectious Diseases that is going to be held in May, 2017 in Barcelona, Spain aims to break open the mechanism about the remergence of the pathogenic microbes, their adaptability and evolutionary property and about their interaction with hosts and environment through the discussions by the dignitaries in the open forum. 6th Annual Bacteriology and Parasitology Meeting going to be held at Singapore in September 2017 will provide an opportunity to share knowledge by the renowned scientists, physicians, surgeons, young researchers, industrial delegates and talented student communities in the field of bacteriology and immunology where networking and global partnering happens for the acceleration of future research [64-70]. It was held at Germany in September 2016, aimed at providing insights regarding influenza virus, flu, transmission, preventive measures, need for vaccination, treatment and therapies. The delegates presented the idea about three different types of influenza vaccines, trivalent vaccines (protection against H1N1 and an H3N2) and an influenza B virus) and quadrivalent vaccines (protection against two influenza A viruses and two influenza B viruses), Flu vaccines (containing the inactivated form of the virus or a nasal spray of live attenuated influenza vaccine (LAIV, Q/LAIV).

RECENT MODERN ADVANCEMENTS IN TECHNOLOGIES AND TECHNIQUES

Bacterial meningitis has become a life threatening disease across the globe. Mostly the babies and older individuals with weak immune system are at higher risk. Many notable speakers have given their views regarding the prevention and treatment and available vaccination facilities. One of the notable speakers Raju Ravikumar, professor in neuromicrobiology suggested *Streptococcus pneumoniae* as gram positive cocci as one of the agents responsible for causing acute meningitis. According to him PCR and serological testing is more reliable diagnosing tool in providing positive results than CSF culture. Serotyping and genotyping methods have been used for molecular epidemiological study. Moreover he has emphasized on the development of faster and reliable techniques and technologies for diagnosing meningitis. Many recent developments have been made in the context of diagnosing and treating meningitis. Lumbar puncture or spinal tap is one such procedure which involves the insertion of a needle in to the lower part of the spine measuring pressure and taking cerebrospinal fluid (CSF) sample from inside the spine to detect the defect affecting the spinal cord, brain or any other parts of the nervous system. Mostly in the developing countries the detection and characterization of bacterial meningitis is carried out through culture, latex agglutination, gram stain. Out of all these adopted methods gram stain is more effective in diagnosing [70-86].

PCR (Polymerase Chain reaction) is one such method to diagnose meningitis because of its high sensitivity, specificity, high throughout capabilities and enhances confirmatory results. Real-time PCR technology has been employed in most cases because it is a closed system with lower rates of contamination. Imaging such as X-rays and computerized tomography (CT) scans of the head, chest or sinuses may reveal swelling or inflammation.

Another speaker Tatiana Barichello, a notable professor discussed about the invasion mechanism of bacteria after entering inside the blood brain barrier and then the long term irreparable consequences as a result of bacterial meningitis such as hearing loss, brain damage etc. Edward Joseph Bottone worked as a Emeritus Professor in the department of Medicine/Infectious Diseases at Mount Sinai School of Medicine, New York and his research interest includes Microbiology, Bacteriology, Infectious Diseases. He is a member of various notable scientific societies and has received numerous honours and awards. He has published various research articles, books on his research interest. Malak Kotb is currently working as a professor in University of North Dakota and has interest in infectious diseases, microbiology and molecular genetics [88-94].

CONCLUSION

Bacterial meningitis imposes serious detrimental health threats if left untreated. It is mainly the inflammation of the meninges caused by the *Neisseria meningitides* bacteria. It is mainly diagnosed by CSF fluid sample (lumbar puncture), PCR, gram stain or latex agglutination. Out of all the diagnostic techniques Real time PCR is effective in producing positive results. 100% effective vaccines are still not available. Babies and older people with low immunity are largely affected. However situation demands for developed reliable techniques for diagnosing and treating the disease. The main focus is to help people educate about the symptoms which they generally ignore. Mostly the humans carry the germs inspite of being affected. Now the time has come to decrease the mortality caused due to bacterial meningitis [95-100].

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