

**COMPARATIVE EVALUATION OF MACROSCOPIC, MICROSCOPIC,  
SEROLOGICAL AND CULTURAL EXAMINATION OF CSF IN  
BACTERIAL MENINGITIS**

**A  
DISSERTATION  
SUBMITTED TO THE CENTRAL DEPARTMENT OF MICROBIOLOGY  
TRIBHUVAN UNIVERSITY**

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE  
DEGREE OF MASTER OF SCIENCE IN MICROBIOLOGY  
(ENVIRONMENTAL AND PUBLIC HEALTH)**

**BY  
NABARAJ DAHAL**

**CENTRAL DEPARTMENT OF MICROBIOLOGY  
TRIBHUVAN UNIVERSITY  
KIRTIPUR, KATHMANDU, NEPAL  
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## RECOMMENDATION

This is to certify that **Mr. Nabaraj Dahal** has completed this dissertation work entitled **“COMPARATIVE EVALUATION OF MACROSCOPIC, MICROSCOPIC, SEROLOGICAL AND CULTURAL EXAMINATION OF CSF IN BACTERIAL MENINGITIS”** as a partial fulfillment of Master of Science Degree in Microbiology under our supervision. To our knowledge, this work has not been submitted for any other degree.

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## ACKNOWLEDGEMENT

I am extremely grateful to my respected supervisors **Dr. Dwij Raj Bhatta, Mr. Binod Lekhak** and **Dr. Sujan Vaidya** for their constant inspiration, proper guidance and critical evaluation of this work. Without their help and guidance, this research work wouldn't have been completed.

I am also thankful to Dr. Anjana Singh, Dr. Prakash Ghimire, Dr. Shreekant Adhikari and Ms. Shaila Basnyat and staffs of Central Department of Microbiology for their support and generosity.

I heartily thank **Patan Hospital** for providing me the opportunity to use Laboratory facilities of the Hospital. I would also like to thank Mr. Ram Babu Shrestha, laboratory In-charge, Patan Hospital, for providing me the facilities in the laboratory during this work. I am particularly indebted to Mr. Krishna Govinda Prajapati and Mrs. Sabina Dangol who have given me invaluable help, support and generosity during my work. I am also thankful to Ms. Rita Bajracharya, Mr. Krishna Mukunda Khanal, Mr. Pawan Shrestha, Mr. Hem Subedi, Mr. Sundar Lal Shrestha, Mr. Dipendra Yadav, Mr. Dharendra Yadav, Mr. Chandraman Shrestha, Mr. Kiran Neupane and all the staffs of Patan Hospital for creating such a friendly environment and for their help and cooperation during the laboratory work.

It is a pleasure to acknowledge my debt to my friends Sanjiv Neupane, Kashi Ram Ghimire, Bishnu Marasini, Pankaj Baral and Girdhari Rijal whose support and cooperation from the beginning of this thesis is remarkable.

Finally, I admire my Family for their moral support and attention.

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## ABSTRACT

The Present study was conducted to find out the incidence of meningitis among the patients attending Patan Hospital, Kathmandu, Nepal from May 2007 to March 2008.

In this study, 464 Cerebrospinal fluid (CSF) samples were collected from suspected meningitis patients. The samples were analyzed for turbidity, total leucocyte count, protein level, glucose level and cultured for the isolation of microorganism. In all 464 CSF samples collected, only 20 (4.31%) showed positive culture result. Gram positive isolates were predominant. Among the isolates *Streptococcus pneumoniae* (45%) followed by *Haemophilus influenzae* type b, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Streptococcus viridans*, *Citrobacter freundii* and *Cryptococcus neoformans* were present.

Higher number of CSF samples having leucocyte count more than 100 cells/mm<sup>3</sup> were found culture positive. The association of the cell count and culture positivity was found statistically significant (P<0.05). Among the culture positive CSF samples, 60% had low glucose level (>40mg/dl) and 100% had high protein level. Most of the Gram negative isolates were found susceptible to Chloramphenicol and Cefotaxime and resistant to Amoxycillin.

Sensitivity and specificity of macroscopic, microscopic, serological and culture methods used to analyze the CSF samples for the confirmation of meningitis were assessed. The present study showed the correlation between macroscopic, microscopic, serological and cultural methods of CSF examination to confirm meningitis.

**Key words:** Meningitis, CSF (Cerebrospinal fluid), cell count, Gram Stain, Latex agglutination test for Hib, Binax test for Pneumococcal antigen

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## LIST OF ABBREVIATIONS

ABM	: Acute Bacterial Meningitis
AFB	: Acid Fast Bacilli
AIDS	: Acquired Immune Deficiency Syndrome
BBB	: Blood Brain Barrier
BCG	: Bacillus Calmette- Guerin
CDC	: Center for Disease Control and Prevention
CFR	: Case Fatality Rates
CIE	: Counter Current Immunoelectrophoresis
cm	: Centimeter
CMV	: Cytomegalovirus
CNS	: Central Nervous System
CO <sub>2</sub>	: Carbondioxide
CRP	: C-reactive Protein
CSF	: Cerebrospinal Fluid
DIC	: Disseminated Intravascular Coagulation
dl	: Deciliter
ELISA	: Enzyme Linked Immunosorbent Assay
GBS	: Group B Streptococci
GI	: Gastrointestinal Tract
Hib	: <i>Haemophilus influenzae</i> type b
HIV	: Human Immuno Deficiency Virus
HSV	: Herpes Simplex Virus
IgA	: Immunoglobulin A
IL-1	: Interleukin-1
IV	: Intravenous
JAMA	: Journal of the American Medical Association
L3	: Third Lumbar Spine
L4	: Fourth Lumbar Spine
L5	: Fifth Lumbar Spine
LAT	: Latex Agglutination Test



LDH	: Lactate Dehydrogenase
MA	: MacConkey Agar
µl	: Microliter
mg	: Milligram
ml	: Milliliter
mm	: Millimeter
mm <sup>3</sup>	: Cubic millimeter
MHA	: Mueller Hinton Agar
MHBA	: Mueller Hinton Blood Agar
MR	: Methyl Red
NA	: Nutrient Agar
No.	: Number
NPV	: Negative Predictive Value
OD	: Optical Density
PCR	: Polymerase Chain Reaction
PPV	: Positive Predictive Value
RBC	: Red Blood Cells
REMA	: Response to Epidemic Meningitis in Africa
rpm	: Revolution Per Minute
SDA	: Sabouraud Dextrose Agar
SIADH	: Syndrome of Inappropriate Antidiuretic Hormone
SIM	: Sulphide Indole Motility
TB	: Tuberculosis
TBM	: Tuberculous Meningitis
TSI	: Triple Sugar Iron
TUTH	: Tribhuvan University Teaching Hospital
UK	: United Kingdom
US	: United States
VDRL	: Veneral Disease Research Laboratory
VP	: Voges Proskauer
VZV	: Varicella Zooster Virus
WBC	: White Blood Cells
WHO	: World Health Organization
ZN	: Ziehl-Neelsen