

## **A study on the application rate of CSF test (cerebro spinal fluid) in diagnosing acute bacterial meningitis in infants and children under 5 years old in Tajrish shohada and Tehran mofid hospitals during 2005**

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### **ABSTRACT**

Studying CSF (cerebro spinal fluid) is a simple and fast measure for diagnosing meningitis in children. For this reason, LP [lumbar puncture] is used to treat csf. Regarding the side effects of LP, we decided to determine the positive points observed in the patients' files than total patients confined to bed in our selected population. In this study conducted by descriptive retrospective method, the records of 1705 infants and children suspected to meningitis, confined in Tajrish Shohada and Tehran Mofid Hospitals for LP test, were investigated. Data collected from these cases were statistically analyzed. Studies indicated that in 93.7% of infants and children tested by LP as well as csf tested, the results were negative, therefore due to the fact that LP is considered as a risky method for children, performing a test doesn't seem necessary in most cases. Results of this study also indicated that maximum rate of infection was among males and occurred in autumn.

**Keywords:** CSF Test; LP(lumbar puncture); Infants; Meningitis

### **INTRODUCTION**

Acute bacterial meningitis is a severe and fatal disease and is considered as a pediatric emergency case. Approximately 90% of children's bacterial meningitis occurs during their first five years of life. This disease may result in about 12% mortality and this rate may increase to 30% in infants as well. Symptoms of acute meningitis begin during a few hours to a few days and typically appear by fever, headache, convulsion and weakness, stiff neck and reduced conscious and even coma. During infancy and suckling and in kids, its symptoms are ambiguous and non specific and for this reason, in comparison with older ages, neural examination may unlikely help diagnosing and if it couldn't be treated timely, in people who survive, in 1/3 of cases it may result in several disorders mainly deafness, convulsion, mental retardation and developmental delay and may have a lifelong effect on patient [1].

Timely and accurate diagnosing and treatment of this disease may be considered as effective solution for reducing the mortality rate and its side effects [1]. Anatomical disorder with immunity defects in such age group may increase the risk of being affected by bacterial meningitis, therefore vaccinating the high risk people is one of the ways for preventing affection to meningitis csf test must be repeated only in patients who did not show any clinical response or modification after receiving 48 hours of antibiotic treatment, [3]. Meningitis may be diagnosed by its clinical symptoms and lumbar puncture as well as attaining csf (cerebro spinal fluid). Because csf is flowing in ventricles and different parts of braintherefore, meninges infection may infect csf as well. If this test is conducted accurately and timely, it may be considered as a simple and fast measure according to WHO Standards that is not only a useful method, but considered as a valuable predictive tool for kids' meningitis [4]. For csf

study, LP (lumbar puncture) is initially tested that is a risky method for infants and kids. Considering the point that LP is a risky method and in some cases comes with irreparable side effects, we decided to investigate positive cases in the files of patients than total patients confined to bed (in related population).

## MATERIALS AND METHODS

The present study is a descriptive retrospective survey and the population under study includes 1705 cases composed of infants under 30 days and children less than 5 years old suspected to meningitis referred to Tajrish Shohada and Tehran Mofid Hospitals during 2005. The patients were treated by lumbar puncture of csf and collected data were inserted in the questionnaire and then analyzed by SPSS software. Types of white blood cells, type of microbes in the direct smear of csf before and after culture and type of antibiogram were studied based on gender, season, sample color and quantity .

## RESULTS

According to tests conducted on 1705 csf samples, 335 samples from Tajrish Shohada hospital, 21 samples (6.3%) were positive and of 1370 samples from Tehran Mofid Hospital, 86 samples (6.3%) were positive. Results indicated that 93.7% of microbial culture results of csf samples were negative and 6.3% were positive. Findings also indicated that despite the difference in the number of samples of studied hospitals, the percentage of results obtained from both hospitals were the same (table 1). Positive microbial culture studies indicated that no sensitive microbe in need of specific conditions was seen. Study of white blood cells and color of csf samples and comparing them with results of negative microbial culture indicated that a small percentage of samples had negative microbial culture despite opacity and higher white blood cell. Maximum rate of infection was among infants and male kids (table 2) occurred in autumn and staphylococcus was one of the main factors resulting in bacterial meningitis in the studied population.

**Table 1.** Distribution of situation of microbial sample culture results separated by Tajrish Shohada and Tehran Mofid Hospitals

Microbial culture result		Hospital		Total Number
		Shohada	Mofid	
negative	Quant.	314	1284	1598
	%	93.7	93.7	93.7
positive	Quant.	21	86	107
	%	6.3	6.3	6.3
Total	Quant.	335	1370	1705
	%	100	100	100

**Table 2.** Distribution of gender of samples with positive microbial culture separated by Tajrish Shohada and Tehran Mofid Hospitals

Gender		Ward		Total
		Infants	Kids	
Male	Quant.	11	6	17
	%	64.7	35.3	100
Female	Quant.	1	3	4
	%	25	75	100
Total	Quant.	12	9	21
	%	57.1	42.9	100

## DISCUSSION

Results from this study indicate that the most common group affected to this disease includes infants [15] and the most prevalent season of disease is autumn. Affected people were more males (table 2) conformed to the results of other studies [15&25]. It can be said that the increased rate of disease in infants is probably due to lack of developed immunity system and insufficient production of IgM during first months of infancy [5]. Studies conducted on results of total microbial culture of CSFs on 1705 cases in both hospitals, Tajrish Shohada and Tehran Mofid (2005) indicates that only 6.3% (107 samples) of CSF results were positive and remaining, i.e. 93.7% [1598 samples) were negative (table 1). Considering very high quantity of negative results in microbial cultures of CSF, since in most case, the signs of meningitis in children under 5 year old are ambiguous [6] and due to the fact that meningitis can have irreparable effects, physicians confine any referent suspected to meningitis to bed and test them with LP. Because LP is a risky and invasive test [9] coming with some side effects under some conditions and considering the cost and time spent for such tests, the necessity of taking LP in high size and conducting CSF test is under questions. Studying the cases of patients indicate that LPs in some cases were repeated and this repetition occasionally attained to 9 times, but likewise the results of microbial culture of their CSF were negative. In some cases microbial culture results of CSFs of confined patients were negative for the first time but positive in the following tests. Occasionally microbes extracted from CSFs were different in the first time with microbes extracted from CSFs than next times. If there is any conformity between the type of microbe of CSF sample in the first time with repeated samples, the reason may be either because of not using antibiotic or ineffective antibiotic used (in case of using right antibiotics, microbial culture results in next times should be negative). In case if results and type of microbe in the first microbial cultures have no conformity to repeated samples or microbial culture results in first culture are negative but repeated samples are positive, it is necessary conducting more studies is necessary (likely polluted). Repeating LP and CSF test must

be mainly conducted in patients who didn't show any clinical response or change in their conditions 48 hours after beginning proper antibiotic treatment [29]. Although, in this study the number of repeated cases in comparison to total CSFs conducted was low (66 cases, 3.9%), they must also be under consideration. Usually white blood cells (WBC) cannot be seen in CSF, but according to researchers the presence of 0- 6 cells and in some references 10 cells can be considered normal. The presence of WBC in CSF indicates the presence of infection. If neutrophils comprise dominant WBC of CSF, we must suspect bacterial infection [1].

In Tajrish Shohada Hospital, during direct smear of CSF stained by gram, there were 19 cases with increased WBC and no specific (bacterial) infection, therefore they weren't considered among positive bacterial meningitis and probably that may be among virus meningitis or sensitive bacterial needing specific conditions [7]. Considering the results from, it can be inferred that among 19 samples comprising 5.7% of negative CSF sample in Tajrish Shohada Hospital, with WBC higher than 6 cells, 9 CSF samples (2.7%) with dominated neutrophils (neutrophils higher than 50% to 100%) were also negative although their microbial culture results were expected to be absolutely positive.

The color of CSF is clear unless some blood enters it during LP. In case of nuclear fluid, an infection is indicated. [1]. According to studies conducted in the cases of studied patients, 10 out of 103 unclear samples (9.7%) had negative microbial culture results. If unclear CSF sample has been cultured with negative result, it is necessary to study on the responsible factors and try to remove them to prevent repeating such results. In this study, using CSF test, in 90.3% of cases in unclear samples, one can absolutely diagnose meningitis [4]. Microbes such as hemophilus influenza, type b, nistria meningitides, sprectococcus group B, listeria monocytogenesis [7] which are sensitive microbes needing specific growth conditions as well as microbes like E.Coli, Clebsiella, Staphylococcus, Streptocucpnemonie, Antrobacer, are among common infections of meningitis, In studies of Venjer et al (1990) conducted in USA, the most common bacteria extracted from infants

included hemophilus influenza, type b (45%), Streptococcus pneumoniae (18%), and Nistria meningitidis (14%) respectively. According to the results of the present and recent studies, streptococcus has been reported as the second factor of meningitis conformed to case of patients investigated in this study [28]. In microbial culture study of 1705 cases of infants and kids, even one case of sensitive microbes needing to specific storage, conduction conditions and specific food was not seen in any of the hospitals. It seems unlikely that among 1705 samples of LP conducted, even one influenza type b, Nistria meningitidis and or streptococcus, Group B was not seen. Another considerable point is lack of separation and listeria monocytogenesis report from CSF of studied population, while this bacterium is one of the main factors for occurrence of bacterial meningitis in other countries except Iran. The reason is not clear, may be it is because the microbe isn't prevalent in Iran or there are no necessary techniques in separating it from patients and diagnosing it.

According to the results of this study, Staphylococcus is the main factor of most meningitis in the studied population. The Second factor is streptococcus followed by clebsiella that is to some extent different from results of recent studies [20]. This difference is likely due to small number of positive samples or possibility because of mistake in differential diagnosis in the lab and or in the type of common bacteria which needs more studies.

According to results of this study, it can be stated that gram positive bacteria particularly staphylococcus and streptococcus and gram negative bacteria, clebsiella are accounted among factors resulting in bacterial meningitis in infants and children of studied region that are sensitive to broad spectrum antibiotics like Ampiciline and

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Chloramphenicol as well as Spirofloxaizin (CP) and Ceftizoxim (CT).

Therefore, according to studies, because of very low percentage of positive CSFs and risky CSF puncture, conducting LP in patients suspected to meningitis is not recommended. Because LP may cause coagulation disorders in the patients due to possibility of sub arachnoid bleeding resulted from needles or formation of spine epidural and sub- epidural hematoma. But it is recommended to use low risk lab methods such as indications of skull MRI before LP that has been verified in about 45% of patients affected by bacterial meningitis by CSF and we can use PCT technique [29].

Meanwhile, results from studying the cases of patients in Shohada and Mofid Hospitals indicate that when conducting LP and repeating it as well as when conducting CSF test, it is necessary to pay more attention to have a suitable assessment using CSF test for diagnosing acute bacterial meningitis.

Observing accuracy in conducting LP by physician and timely sending CSF sample to the lab under suitable conditions as well as timely conducting tests on CSF sample by partner in the lab is necessary. If there is an issue related to lack of proper techniques in the lab, authorities of lab must consider it.

## CONCLUSION

Studies indicated that in most cases when infants and kids under 5 are tested by LP and CSF culture, their results were negative. Because timely diagnosis of meningitis in infants and children is very important, it is recommended to use PCR technique comparing with culture because it has 100% sensitivity. Results of this study also indicate that maximum infection was in male kids and more prevalent in autumn.

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