



ORIGINAL ARTICLE

## Frequency of meningitis in children 6-18 months of age presenting with 1st episode of febrile seizure at Sahiwal Teaching Hospital Sahiwal, Punjab, Pakistan.

Sajid Mustafa<sup>1</sup>, Muhammad Faisal<sup>2</sup>, Muhammad Yasin<sup>3</sup>, Jovaria Saeed<sup>4</sup>

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**ABSTRACT... Objectives:** To determine the frequency of meningitis in children 6-18 months of age presenting with 1st episode of febrile seizure (FS). **Study Design:** Cross-sectional. **Setting:** Department of Pediatric Medicine, Sahiwal Teaching Hospital, Sahiwal. **Period:** October 2021 to April 2022. **Material & Methods:** Children with 1st simple FS of age 6 months to 18 months of either gender were included. After taking informed written consent from the child's parents, lumbar puncture was done in each patient and cerebrospinal fluid (CSF) analysis and blood sample were sent to the institutional pathology laboratory for presence or absence of meningitis. **Results:** In a total of 156 children, mean age was  $11.24 \pm 2.86$  months while 94 (60.3%) children were between 6-12 months of age. There were 100 (64.1%) male and 56 (35.9%) female children. The frequency of meningitis was found in 16 (10.3%) patients. **Conclusion:** The frequency of meningitis in children with 1st episode of febrile seizure was high (10.3%).

**Key words:** Cerebrospinal Fluid, Febrile Seizure, Meningitis.

### INTRODUCTION

The most prevalent kind of seizures in children is febrile seizures (FS). Almost 2-5% of the infants of age greater than 1 month are affected and in most of the cases age remains between 6 months and 5 years.<sup>1</sup> Globally, it is considered to be the main reason for children to be hospitalized. The seizures along with fever is termed as FS provided that, intracranial infection, disruption in metabolism, or a previous history of afebrile seizures is not evident.<sup>2</sup> These seizures are either simple (generalized, do not last for more than 15 minutes and in a period of 24 hours, occur once) or complex (focal seizures, takes more than 15 minutes in continuation or occur again within 24 hours).<sup>3</sup>

Previous studies have established the association of seizures with bacterial meningitis.<sup>3,4</sup> Seizures occur in 16.7% of the children as an initial indicator of meningitis, while among children of young age,

one third might not be presenting typical signs and symptoms of meningitis.<sup>5</sup> In order to rule out meningitis, making an appropriate decision for Lumbar puncture (LP) in such type of children, is a matter of prime concern. Being properly equipped with the statistics of meningitis and associated risk factors among FS presenting children, it is helpful to decide accordingly in these circumstances. Sufficient statistical data is available all over the world which describes the incidence of meningitis among FS presenting children.<sup>6,7</sup> Some of the researchers recommend that if the typical signs of meningitis are not evident, it is needed to do LP in children presenting complex seizures, before starting antibiotics and under 12 months of age or with a history of partial vaccination.<sup>8,9</sup>

In the perspective of fever, there are chances for seizures to have an association with bacterial meningitis; it is hard to make a decision for LP in the FS children, more specifically in infants aging

1. MBBS, DCH, MCPS, FCPS (Pediatric Medicine), Associate Professor & Head Pediatric Medicine, Sahiwal Teaching Hospital, Sahiwal.

2. FCPS (Pediatric Medicine), Assistant Professor Pediatric Medicine, Sahiwal Teaching Hospital, Sahiwal.

3. MBBS, FCPS (Pediatric Medicine), Senior Registrar Pediatric Medicine, Sahiwal Teaching Hospital, Sahiwal.

4. MBBS FCPS (Pediatric Medicine), Senior Registrar Pediatric Medicine, Sahiwal Teaching Hospital, Sahiwal.

**Correspondence Address:**

Dr. Muhammad Faisal  
Department of Pediatric Medicine  
Sahiwal Teaching Hospital, Sahiwal.  
drmfaisalmehr@yahoo.com

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less than 12 months and in which the chances of clinical symptoms of bacterial meningitis are not quite evident.<sup>4,5</sup> In the children reported with fever and seizures as first episode, meningitis was highly incident. Many studies revealed that children aging between 6-18 months presenting introductory simple FS were assessed for meningitis despite the factor that meningeal irritation was not evident in them.<sup>4-6</sup> Among children reported with introductory FS; a study mentioned the occurrence of meningitis as 25.87%.<sup>7</sup> According to another description 9.0% was the incidence rate for the same.<sup>8</sup> In addition to, the incidence of meningitis was found to be 4.5% among children presenting simple FS for the first time.<sup>9</sup>

Keeping in view the variance in occurrence of meningitis among children presenting introductory FS and the rate of mortality among unaddressed neonates, we planned this study for the local population to find out the frequency of meningitis among the children aging between 6-18 month and were in their introductory phase of FS. Our study is perhaps the first one to address the described issue as we could not find any local data which could explain the rise in FS occurrence among this specific age group of our society. Not only local data on this issue will be registered owing to the findings of the study but experts would take certain measures to identify and manage such type of patients for their better outcome. The objective of this study was to determine the frequency of meningitis in children 6-18 months of age presenting with 1st episode of FS.

## MATERIAL & METHODS

This cross-sectional study was conducted at Department of Pediatric Medicine, Sahiwal Teaching Hospital, Sahiwal, Pakistan from October 2021 to April 2022. The calculated sample size was 156 with 95% confidence level, 4.5% margin of error and considering frequency of meningitis among children with 1st simple FS as 9.0%.<sup>8</sup> Inclusion criteria were children with 1st simple FS aged between 6-18 months of either gender. Exclusion criteria were children with past history of seizure (assessed on history), underlying chronic

neurologic condition as assessed on medical record or those with biochemical abnormalities (hypoglycemia [blood sugar level <40 mg/dl], hypocalcaemia [serum calcium levels <8.5 mg/dl] and hyponatremia [serum sodium levels <125 mEq/L]). Children with chronic renal failure (assessed on history and serum creatinine >1.5 mg/dl) were also excluded. Simple FS was defined as a generalized episode of involuntary movements, lasting less than 15 minutes and having temperature >101 OF.

After permission from the institutional ethical review committee (Letter number: 49/IRB/SLMC/SWL), a total of 156 children admitted to Department of Pediatric Medicine, DHQ Hospital, Sahiwal, fulfilling the Inclusion criteria were selected. After taking informed and written consent from the patient's parents, lumbar puncture was done in each patient and cerebrospinal fluid (CSF) analysis and blood sample were sent to the institutional pathology laboratory for presence or absence of meningitis. Meningitis was diagnosed on laboratory evidence of CSF routine examination. Lumbar puncture in acute bacterial meningitis showing leukocyte 100-600/mm<sup>3</sup> with predominance polymorphonuclear PMN >70% and protein 100-200mg/dl. The all data was recorded on a specially designed proforma.

Data analyzed through "Statistical Package for Social Sciences (SPSS)", version 26.0. Data was presented as mean and standard deviation for quantitative variables while frequency and percentage were shown for categorical variables. Effect modifiers like age, gender, weight, place of living (rural/urban) and type of feeding (breast feeding/bottle feeding) were controlled through stratifications. P-value ≤0.05 was considered as significant.

## RESULTS

In a total of 156 children, the mean age was 11.24±2.86 months while 94 (60.3%) were between 6 months to 12 months of age. There were 100 (64.1%) were male and 56 (35.9%) female children (male to female ratio 1.8:1). The mean weight was 6.60±1.25 kg whereas residential status of 104 (66.7%) children was rural. Table-I

representing characteristics of studied children.

Characteristics		Number (%)
Age	6–12 months	94 (60.3%)
	13-18 months	62 (39.7%)
Gender	Male	100 (64.1%)
	Female	56 (35.9%)
Weight (kg)	≤6	83 (53.2%)
	>6	73 (46.8%)
Residence	Rural	104 (66.7%)
	Urban	52 (33.3%)
Feeding Types	Breast feeding	99 (63.5%)
	Bottle feeding	57 (36.5%)

**Table-I. Characteristics of children (n=156)**

The frequency of meningitis was found in 16 (10.3%) children. Stratification of meningitis with respect to age and gender is shown in Table-II. No significant association of meningitis with study variables were found ( $p>0.05$ ).

Study Variables		Meningitis		P-Value
		Yes (n=16)	No (n=140)	
Age groups	6–12 months	12 (75.0%)	82 (58.6%)	0.203
	13-18 months	04 (25.0%)	58 (41.4%)	
Gender	Male	7 (43.8%)	93 (66.4%)	0.073
	Female	9 (56.2%)	47 (33.6%)	
Weight (kg)	≤6	11 (68.8%)	72 (51.4%)	0.188
	>6	5 (31.2%)	68 (48.6%)	
Residence	Rural	8 (50.0%)	96 (68.6%)	0.135
	Urban	8 (50.0%)	44 (31.4%)	
Feeding Types	Breast feeding	11 (68.8%)	88 (62.9%)	0.643
	Bottle feeding	5 (31.2%)	52 (37.1%)	

**Table-II. Stratification of meningitis with study variables (N=156)**

## DISCUSSION

Among children aging between 6-60 months, subsequent to acute febrile ailment, FS are observed quite frequently where intracranial infection or inflammation is not evident.<sup>10</sup> According to the suggested guidelines by “American Academy of Pediatrics (AAP)” on the basis of clinical profile of the USA children, when there are positive meningeal signs in a certain age group, fever and seizures are in the history of

unvaccinated or partially vaccinated children aging in between 6-60 months, lumbar puncture (LP) is indicated.<sup>12</sup> However, these guidelines cannot be generalized for the population of India because of the different racial background, population based characteristics and status of immunization (only 47.3% immunized).<sup>12</sup> European data has shown the prevalence of FS associated meningitis ranging between 2-5%.<sup>11</sup> We conducted this study to evaluate the occurrence of meningitis in infants of age group in between 6-18 months presenting first incidence of FS. Among all study cases mean age came out to be  $11.24 \pm 2.86$  months. Male and female contributions were 64.10% and 39.90% respectively giving a ratio of 1.8:1. We found meningitis 10.3% prevalent in the group of infants presenting first incidence FS. The prevalence of meningitis reported by a study was almost 25.9%.<sup>7</sup> Another study presented their findings with 9.0% occurring rate.<sup>8</sup> Results of a study indicated that among a group of FS patients 62% went through LP.<sup>9</sup> The prevalence of meningitis (infected or uninfected) was (4.5%, 95% confidence interval (CI): 2.9-6.9 by Wilson-Score interval) and infected meningitis came out to be (1.65%, 95% CI: 0.8–3.3) with no evidence of signs of meningeal irritation in any patient. Comparing meningitis group with non-meningitis, the incidences frequently associated with the first group were complex FS, 1st episode FS, and compromised consciousness.<sup>9</sup>

Statistics have revealed the occurrence of infected meningitis among FS children of the developed countries as 0.8% (95% CI: 0.73-0.88), further decreased up to 0.23% (95% CI: 0.0-0.46) after being immunized.<sup>13</sup> In the same way, among children presenting 1st attack of complex FS, the incidence of bacterial meningitis was 0.9% (95% CI: 0.2-2.8).<sup>14</sup> Therefore, for children who were fully vaccinated and presented FS, they decided that lumbar puncture had no justification.<sup>15</sup> An Australian prospective study mentioned the prevalence of bacterial meningitis (BM) as 17.2%, among young children aging between 2 months and 10 years and had alone seizure and presented with meningism, or coma.<sup>16</sup> But dissimilar results were obtained through a study conducted in Ghana, as acute bacterial meningitis was found

to be 10.2% prevalent among FS children aging between 3 months and 15 years.<sup>17</sup> In Nepal, children of age 6 months- 5 years presenting 1st attack of FS were studied and the frequency of bacterial meningitis came out to be 17%.<sup>18</sup>

A retrospective study from India showed that meningitis was 2.4% prevalent in 1st attack FS children, in simple FS children 0.86%, and in complex FS children 4.81%.<sup>19</sup> Al-Eissa of Saudi Arabia mentioned 3.5% and 1.5% as the occurrence rates of meningitis and bacterial meningitis respectively for FS children of age in between 3 months and 5 years.<sup>18</sup> In 2013, Casasoprana et al<sup>20</sup> of France estimated the incidence of bacterial meningitis in children below 18 months of age presenting 1st FS and found it to be 1.9%. Meningitis was 4.7% prevalent among FS patients as mentioned by Ghotbi and Shiva.<sup>21</sup> Higher rates of incidence for meningitis in FS children have been reported in some of the studies. China's Owusu-Ofori et al evaluated frequency of BM equal to 10.2% in FS children while correspondingly 10% occurrence rate of BM among FS children of below 1 year of age was observed by Tunisian researchers Tinsa et al.<sup>22,23</sup> Higher meningitis rates in these countries might be the reason.<sup>22</sup>

In Papua New Guinea, researchers evaluated predictive factors for acute bacterial meningitis (ABM) and mentioned that stiffness in neck, kernig's and brudzinski's signs, and among children aging less than 18 months, a bulging fontanel had positive likelihood ratio of 4.3 for proven/probable ABM were common. Less common predictors were multiple seizures and deep coma (likelihood ratio 1.5-2.1).<sup>24</sup> For the local population, a study revealed that the frequency of ABM was 7.6% with 41.6% of the contributors 6-12 months old, 33.3% from 13-18 months and children aging between 19-60 months 25%.<sup>25</sup>

## CONCLUSION

The frequency of meningitis in children with 1st episode of febrile seizure was high (10.3%). Proper screening of meningitis in children with 1st episode of febrile seizure for early and proper management of this disastrous complication in

order to reduce the morbidity and mortality of these particular patients.




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### AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Sajid Mustafa	Study concept, Study design, Discussion, Data analysis, Drafting.	
2	Muhammad Faisal	Methodology, Data Analysis, Discussion, Proof reading.	
3	Muhammad Yasin	Literature Review, Discussion, Data analysis.	
4	Jovaria Saeed	Data Collection, Data interpretation, Introduction, Literature Review, Discussion.	