

## Original Article

# Importance of Scoring Systems in Prognosticating Meningococemia

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### ABSTRACT

**Background:** Meningococcal diseases occur with a worldwide distribution as endemic or in epidemics with an overall mortality rate of 8% to 10%, mainly in patients with signs and symptoms of meningococemia. Several investigators have devised scoring systems using clinical and laboratory parameters available at the time of presentation to prognosticate the outcome of the infection. This study was designed to determine the distribution of demographic, clinical and laboratory parameters among our patients and the relative frequency of individual Stiehm and Damrosch components.

**Methods:** This was a prospective descriptive study, performed on patients with definite diagnosis of meningococcal infection admitted to Al-Zahra University hospital (adult and pediatric wards), Isfahan, Iran, between 1997 and 2002. The cases were 140 patients [99(70.7%) males and 41(29.3%)females] from 1 to 50 years old (25.5±1.32). Data were collected by filling checklists. SPSS software was applied to analyze the data using chi-square test.

**Results:** In this study, the relative frequency of individual Stiehm and Damrosch components were as follows: hypotension (10.7%), peripheral white blood cell count  $\leq 10,000/\text{mm}^3$  (39.3%), leukopenia (11.5%), ESR $<10$  mm/hr (19.3%), coma (6.4%), early widespread petechiae (18%), absence of meningitis (13.6%). Overall mortality rate was (10.7%).

**Conclusion:** Meningococci are still killers, they affect men more than women. Teenagers are at more risk than other age groups. Mortality in our study was a little higher than what is suggested (10.7%). we recommend using scoring systems for early separation of poor prognostic patients to provide them with more special care.

**Keywords:** Meningococemia, Scoring systems, Meningococcal infection

Meningococemia is a medical emergency, early recognition is essential so that appropriate antibiotic therapy and supportive care can be promptly instituted<sup>1</sup>. This syndrome remains a therapeutic challenge because of the high mortality rate associated with its fulminating expression, "the Waterhouse - Friderichsen" syndrome. The case fatality rate in fulminant meningococcal septicemia has not significantly changed over the past decades and is still the same as before<sup>2</sup>. To meet the need for a rapid clinically based assessment, several prognostic scoring systems have been devised, the most popular of which are Stiehm and Damrosch and Glasgow meningococcal septicemia prognostic score (GMSPS)<sup>3</sup>. These are based on routine clinical and laboratory parameters. Some authors indicate that high serum levels of TNF- $\alpha$ , IL-1, IL-6 and interferon  $\gamma$  have been associated with poor prognosis<sup>2,4</sup>. This article emphasizes on

scoring systems to differentiate patients with poor prognosis from stable ones.

### Materials and Methods

This survey was conducted on patients who were admitted to adult and pediatric infectious wards at Al-Zahra hospital, Isfahan, Iran, during a five year period (1997-2002). The subjects were 140 patients; 99(70.7) male and 41(29.3) female. The age distribution of patients was as follows: 4(2.9) less than one year, 29 (20.7), 1-10 years, 75(53.6), 11-20 years, 16(11.4), 21-30 years, 9(6.4), 31-50 years, 7(5), over 50 years old. Iranian patients formed 65.7%, while the remaining 34.3% were Afghan refugees (Table.1). We evaluated all the patients based on Stiehm and Damrosch (Table.2) and Glasgow meningococcal septicemia prognostic score (Table.3). Data are present as n (%).

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## Results

From 140 patients, 20 were infants and children, 57 students, 39 workers and 24 had different other jobs. The season prevalence declined in the order of winter 49(35.1), spring 37(26.4), summer 30(21.4) and fall 24(17.2). Patients came from Isfahan city 84(60) mostly from the quarter of Zeinabieh 29(20.7), along with other towns of Isfahan province 50(35.7). The rest were from nearby provinces 14(4.3). The definite clinical diagnosis ranged from pure meningitis 40(28.6), meningitis with meningococemia 62(44.3), pure meningococemia (Shock, DIC, and multiple-organ failure) 33(23.5) meningococcal meningitis 5(3.6), hypotension 15(10.7), coma 9(6.4) and Skin lesions 92(65.7). The clinical and lab findings consisted of positive Gram stain from skin lesions for diplococci 7(18.4), Fever 131(93.6), leukocytosis 99(70.7), leukopenia 16(11.5), predominant polymorphonuclear WBCs 134(95.7), thrombocytopenia 27(19.3), abnormal prothrombin time 46(32.85), and estimated sedimentation rate lower than 10mm/hour 25(18.5). Cerebrospinal analysis showed white blood cell 121(86.4) and polymorphonuclear WBCs 111 (91.7), red blood cell 121 (86.4) and protein elevation 96(68.5). Normal cerebrospinal fluid was found in 19(13.6). Fifteen(10.7) had complement component C<sup>5</sup>-C<sup>9</sup> deficiency. The overall mortality rate was 15(10.7).

## Discussion

Meningococcal infection is a communicable disease, which is spread via pharyngeal secretion through respiratory route. Acute meningococemia generally follows an upper respiratory infection, whereby rapid clinical deterioration may occur<sup>1</sup>. De-

spite advanced intensive care management, 50% to 60% of patients with fulminant disease die, usually from cardiac or respiratory failure<sup>5</sup>. We presumed a score over 8 out of 15(GMSPS) and three or more factors out of Stiehm and Damrosch systems as fatal outcome. In our survey, the patients who died were among those with high grades with both scoring systems. TNF- $\alpha$ , IL-6 are innate host characteristics whose increase contribute to the outcome of meningococemia patients<sup>4</sup>. We did not measure the level of these cytokines because of unavailability. TNF- $\alpha$  response was higher in patients who had experienced a moderately severe disease course compared to patients with a mild course<sup>6</sup>. TNF- $\alpha$  may be added to laboratory data in both scoring systems. We recommend that every physician who treats patients with meningococemia must consider these prognostic alarms. In Thomson's study, all 14 patients who died after arrival had scores equal to or greater than 8 either on admission(n=8) or afterwards (n=6). Of 109 survivors, five scored greater than or equal to eight<sup>7</sup>. These systems can help us in easier diagnosis of poor prognosis patients and starting prompt administration of suitable antibiotics, critical care and special therapeutic measures like plasmapheresis, leucapheresis or blood exchange<sup>8</sup>. Even if this helps decreasing the mortality rate, however the best way is preventing infection in high risk groups like pilgrims traveling to Saudi Arabia to attend the annual Hajj congress, college students who live in dormitories and military personnel<sup>9,10</sup>.

**Table 1.** Frequency of race and age

Variable	n (%)
<b>Race</b>	
Iranian	92(65.7)
Afghan refugees	48(34.3)
Total	140(100)
<b>Age</b>	
Under one year	4(2.9)
1-10	29( 20.7)
11-20	75(53.6)
21-30	16(11.4)
31-50	9(6.4)
Over 50	7( 5)
Total	140(100)

**Table 2.** Stiehm and Damrosch criteria<sup>3</sup>

- 1- Petechiae present for less than 12 hours before admission
- 2- Hypotension (systolic blood pressure < 70mm Hg)
- 3- Absence of meningitis (<20 WBCs in CSF)
- 4- Peripheral white blood cell count <10,000/mm<sup>3</sup>
- 5- ESR < 10 mm/hour

- When three or more factors were present, mortality was 90%
- When two or less factors were present, mortality was 9%

**Table 3.** (GMSPS) Glasgow Meningococcal Septicemia Prognostic Score<sup>7</sup>

Criteria	Score
Hypotension*	3
Skin/rectal temperature differences >3°C	3
Base deficit (capillary sample) <8mmol/l	1
Coma score** <8 at any time or deterioration of 3 ≥ in an hour	3
Lack of meningitis	2
Parental opinion that child's condition has become worse over the past hour	2
Widespread ecchymoses or extending lesions on review	1

\*Systolic BP <75mm if below 4 years of age, <85 if older

\*\* Modified pediatric coma scale. (Simpson and Reilly<sup>11</sup>)

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