Study of Morbidity and Mortality Pattern of Cases of Meningitis Admitted in Tertiary Health Care Centre in India

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Research Article

Abstract: **Background:** Meningitis constitutes a dreadful illness worldwide due to its high morbidity and mortality. The etiological factors and other associated risk factors causing meningitis vary from place to place. Identification of these factors is crucial for reduction of this problem. **Objectives:** 1) To study few epidemiological factors like age, sex, residence etc. 2) To find out seasonal variations in different etiological types of meningitis. 3) To determine case fatality rate and proportional mortality rate. **Methodology:** This descriptive record based study was conducted in Dr. V. M. Govt. Medical College and General Hospital, Solapur, Maharashtra from January 2008 to December 2012. With pre-structured questionnaire, data was collected with the help of indoor case papers of meningitis cases available in medical record department. The study variables were age, sex, place of residence, etiological types of meningitis, seasonal variations, case fatality rate and proportional mortality rate. Data was analyzed with suitable statistical methods. **Results:** Total number of cases of meningitis was 984 of different ages. Out of 984 cases, 56.6% cases were male and 43.4% cases were female. 44.9% cases were resident of urban locality and 55.1% cases were resident of rural locality. In all age groups, tuberculous meningitis was most common than other types of meningitis which was statistically significant ($p<0.01$). Pediatrics age group was most commonly affected age group with meningitis ($p<0.001$). In pediatric age group, maximum number of cases (43.3%) were of viral meningitis type, which was statistically significant ($p<0.01$). Meningitis was most prevalent during September to December in all etiological types which was statistically significant ($p<0.0001$). In our study, case fatality rate of meningitis was 25.2% and proportional mortality rate was 2.5 %. **Conclusion:** Meningitis is a disease condition having great public health importance because of its high mortality. It commonly affects pediatrics age group. Commonest type of meningitis is tuberculous meningitis.

Keywords: Epidemiology, Meningitis, Morbidity, Mortality, Rate.

Introduction

Meningitis is a serious public health problem demanding early diagnosis, effective treatment, prevention and control. It is a major cause of morbidity and mortality among infant and children below the age of five years [1]. Meningitis is an infection of the membranes surrounding the brain and spinal cord. The disease mainly affects young people between ages 1–30 yrs, occurring sporadically and in small outbreaks worldwide, except in the African Meningitis Belt where large outbreaks are common. Meningitis cases typically present with stiff neck, high fever, sensitivity to light, confusion, headaches and vomiting. Even when the disease is diagnosed early and adequate treatment is started, 5% to 10% of patients die, typically within 24 to 48 hours after the onset of symptoms. Left untreated, up to 50% of cases may die. Bacterial meningitis may also result in brain damage, hearing loss or a learning disability in 10% to 20% of survivors [2]. Every year, bacterial meningitis epidemics affect more than 400 million people living in the 21 countries of the "African meningitis belt" (from Senegal to Ethiopia). In this area over 800,000 cases were reported in the last 15 years (1996–2010). Of these cases, 10% resulted in deaths, with another 10–20% developing neurological sequelae [1]. Meningococcal disease is endemic in Delhi and sporadic cases of meningococcal meningitis have been occurring in Delhi in previous years. In addition, outbreaks of meningococcal meningitis in and around Delhi, have been documented during 1966, 1985 and 2005. During 1966, 616 cases of meningitis were reported with case-fatality rate of 20.9%. The outbreak in 1985 was bigger in magnitude, both in terms of cases and the geographical area affected. 6133 cases with 799 deaths (13%) were reported. Isolated cases of meningococcal meningitis during 1985 were also reported from several other parts of India namely Haryana, Uttar Pradesh, Rajasthan, Sikkim, Gujarat, Jammu and Kashmir, West Bengal, Chandigarh, Kerala and Orissa [2]. In 2005, the cumulative total was 405 cases with 48 deaths (CFR=11.9%). The geographical distribution of reported outbreaks in India, suggests that there has been relative sparing of central and southern areas with the majority of outbreaks being reported from the large cities of northern and coastal areas including New Delhi, Mumbai and Kolkata [3]. Although these are diseases known to and well understood by medicine, especially

from the standpoint of diagnosis and treatment, it is undeniable that many aspects, especially of an epidemiological nature, require further study [4]. There have been several published studies regarding meningitis conducted in hospitals in the developed countries but there is paucity of data regarding similar surveys in the developing countries like ours [5].

Materials and Methods

This observational record based study was conducted in medical record dept. of Dr. V. M. Govt. Medical College and hospital, Solapur, Maharashtra, a tertiary health care hospital located in central area of the city Solapur, India. It provides health care services to the population of different districts of the state of Maharashtra. The records of the diagnosed meningitis cases admitted in the hospital, from January 2008 to December 2012 were studied. The diagnosis of meningitis was confirmed by evaluating the records of CSF examination, culture and/or other relevant assays done during their hospital stay. The variables included were age, sex, area of residence (rural / urban), etiological types of meningitis, case fatality rate, proportional mortality rate and seasonal variation. After obtaining ethical clearance from the institutional ethics committee, the incharge of the hospital record section was communicated and all the available records of meningitis cases were studied. Etiological types of meningitis were classified as tuberculous meningitis, pyogenic meningitis, viral meningitis, cryptococcal meningitis and other type of meningitis. Other type of meningitis contains cases which we could not classify or put in any of prior etiological types. The data collected was analyzed and tabulated using frequency distribution tables as proportions / percentages and suitable diagrams. Suitable statistical tests were applied wherever applicable [6].

Observations and Results

The records of the 984 cases of meningitis admitted in 5 yrs (from 2008 to 2012) were studied. Cases were of all ages from 1 day to > 60 years. Out of 984 cases, 56.6 % were males and 43.4 % were females, difference found was not statistically significant. (P > 0.05) and 44.9 % cases were urban residents whereas 55.1 % cases were rural residents, difference found was not statistically significant (P > 0.05).

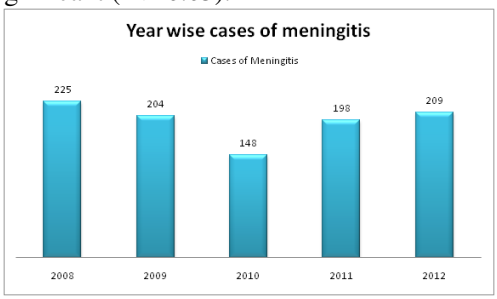

Figure 1: Yearwise distribution of cases

Fig. no.1 showed distribution of study subjects during five years. We could not found any trend of occurrence of cases. Maximum numbers of cases were in 2008 and minimum no. of cases were during 2010.

Table 1: Etiological types wise distribution of cases

Etiological types of meningitis	Total no. of cases (%)	χ^2 (P- Value)
Tuberculous Meningitis	541 (55)	$\chi^2 = 878.21$, df = 4, P< 0.01
Pyogenic Meningitis	137 (13.9)	
Viral Meningitis	223 (22.7)	
Cryptococcal Meningitis	11 (1.1)	
Others Meningitis	72 (7.3)	
Total	**984 (100)**	

Table no. 1 showed distribution of cases of meningitis as per etiological types. Maximum numbers of cases (55%) were of tuberculous meningitis type followed by viral meningitis (22.7%) and least no. of cases were of cryptococcal meningitis (1.1 %). The difference found was statistically significant (P< 0.01).

Table 2: Age wise distribution of cases of meningitis

Age group in years	Total no. of cases (%)	χ^2 (P- Value)
< 15	365 (37.1)	χ^2 =238.86, df-4, P<0.001
16-30	223 (22.7)	
31-45	192 (19.5)	
46-60	106 (10.8)	
>60	98 (9.9)	
Total	**984 (100)**	

Table no. 2 showed that maximum number of cases of meningitis was of age group less than 15 yrs (37.1%) followed by age group 16-30 yrs (22.7 %). As age increases number of cases of meningitis decreases. The difference found was statistically significant. ($x^2 = 238.86$, df = 4, $p < 0.001$).

Table 3: Type and age wise distribution of meningitis cases in pediatric age group

Age group in years	Tuberculous Meningitis (%)	Pyogenic Meningitis (%)	Viral Meningitis (%)	Other (%)	Total
< 1	20 (16.4)	20(41.7)	32(20.3)	21(56.8)	93(25.5)
1-5	50(41)	7(14.6)	55(34.8)	11(29.7)	123(33.7)
6-10	22(18)	9(18.7)	48(30.4)	3(8.1)	82(22.5)
11-15	30(24.6)	12(25)	23(14.5)	2(5.4)	67(18.3)
Total	**122**	**48**	**158**	**37**	**365**
X^2	18.46	8.17	16.23	25.66	18.46
P - value	**P=0.0004**	**P=0.04**	**P=0.001**	**P=0.0001**	**P=0.0004**

In table no.3, it was observed that the viral meningitis (43.29%) was the commonest etiological type of meningitis affecting pediatric age group ($x^2 = 111.94$, df =3, $p<0.0001$). Meningitis was most common in age group 1-5 yrs (33.7%) next age group affected was age group < 1 yrs (25.5%) ($x^2 = 18.46$, df = 3, $p = 0.0004$). Tuberculous meningitis and viral meningitis was common in 1-5 yrs of age while pyogenic meningitis and other type of meningitis cases were common in age group <1yrs. The difference found was statistically significant.

Table 4: Case fatality rate of different types of meningitis

Types of Meningitis	Total Cases	Deaths	Case Fatality Rate (C.F.R.)
Tuberculous Meningitis	541	138	25.5
Pyogenic Meningitis	137	43	31.4
Viral Meningitis	223	47	21.1
Cryptococcal Meningitis	11	4	36.4
Others Meningitis	72	16	22
Overall C.F.R.	**27.3**		

Table no.4 showed that overall case fatality rate due to meningitis was 27.3%. However, cryptococcal meningitis (36.4%) was most fatal among all etiological types of meningitis, followed by pyogenic meningitis (31.4%) and tuberculous meningitis (25.5%).

Table 5: Year wise proportional mortality rate due to meningitis

Year	Total no. of deaths due to all causes	No. of deaths due to meningitis	Proportional Mortality Rate (%)
2008	1908	58	3.03
2009	1943	39	2.00
2010	2249	40	1.77
2011	1953	60	3.07
2012	1890	51	2.69
Proportional Mortality Rate = 2.5%			

Table no.5 showed year wise proportional mortality rate of meningitis. It was maximum (3.03%) in 2008 and minimum i.e.1.77% in 2010. Average proportional mortality rate of meningitis was 2.5 %.

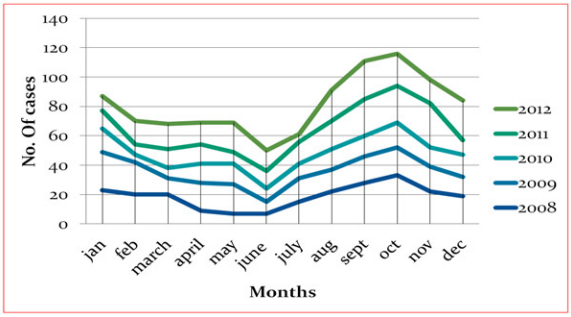

Figure 2: Month wise distribution of cases of meningitis in five years

Fig no.2 showed that number of cases increases after June and maximum no. of cases were in the month of Sept. and Oct. The difference found was statistically significant. (x^2 = 37.78, df=2, P< 0.0001)

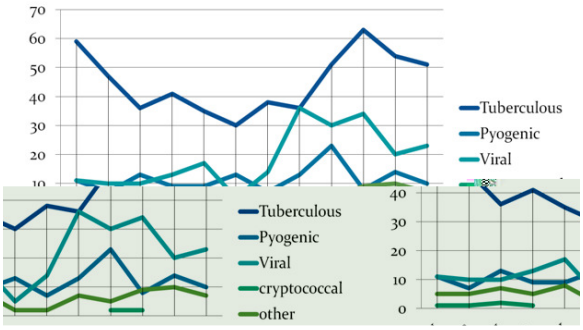

Figure 3: Month and type wise distribution of cases of meningitis

Fig. no. 3 showed that tuberculous meningitis cases were maximum in Oct. and Jan. while pyogenic meningitis was prevalent in the month of Aug and Oct. and viral meningitis was common during month of September.

Discussion

Present study revealed that meningitis was more common in males than females. This finding is consistent with study done by Modi Gaurav B et.al [7] and Swarnali Joardar *et al* [6]. Most of the patients were from rural (55.1%) area and our finding is consistent with the finding of Fatima khan *et al*[5] and Swarnali Joardar *et al* [6]. By etiological type, 55 % cases were of tuberculous meningitis, 22 % were viral meningitis and 13.9 % were pyogenic meningitis. Our finding was consistent with findings of study done by Swarnali Joardor *et al* [6]. In this study it was observed that 57.3% were of tuberculous meningitis, 34% of pyogenic type and 7.9% were of viral meningitis. Pediatric age group (<15yrs) is most commonly affected age group we observed in our study. Our finding is consistent with the study done by Modi Gaurav *et al* [7]. Among the pediatric age group 1-5yrs of age group is more frequently affected, this finding is consistent with the study conducted by Farag *et al* [1] and Fatima khan *et al* [5]. In the present study the overall case fatality rate was found to be 27.3 %. Cryptococcal meningitis is found to be most fetal as compared to pyogenic and tuberculous meningitis. The difference found is not statistically significant. But in study conducted by, S. Joardar et.al [6] at kolkata found that CFR maximum due to pyogenic meningitis (36.3 %) and minimum due to viral meningitis. This difference might be due to differences in the study population, virulence of the infecting organisms, severity of cases, the time of initiation of treatment and the quality of care given to the patient in the hospital. A study conducted in North India by Fatima Khan *et al* [5] observed that case fatality rate due to bacterial meningitis was 17.4 % . Case fatality rate was 20.9%, due to pyogenic meningitis during an epidemic in Delhi in the year 1966 [3]. In 1986 a study was conducted by Basu/ Varghese *et al*, they observed case fatality rate of meningitis was 13 % of pyogenic meningitis [3].While studying seasonal variations of meningitis, we observed in our study that no. of cases are maximum (418) during winter period (from Sept. to Dec.) and the difference found is statistically significant [x^2= 37.78, d.f. = 2, p = 0.0001]. Our this finding is consistent with finding of David Sinclare *et al* [3], Farag *et al* [1], Tuberculous meningitis shows 2 peaks in a year, cases are maximum during Oct. and during January. Viral meningitis shows two peaks one just after august and other in October. Pyogenic meningitis shows 1 peak during Sep. so peak of all these types of meningitis is during winter. S. Joardar *et al* [6] noted seasonal variation in their study that in case of tuberculous meningitis there were four peaks spread over the year; in case of pyogenic meningitis two peaks in summer and post monsoon months; and in case of viral/aseptic type peaks were not much evident. This reflects that different pattern of seasonal variation of meningitis was observed in different studies. The reasons might be the differences of environmental conditions in different study areas.

Conclusion

Most common age group affected by meningitis is age< 15yrs (37.1%). Among pediatric patients meningitis is most common in age group 1-5yrs (33.7%). Tuberculous meningitis (55%) is most common etiological type found in our study, followed by viral meningitis (22.7%). Viral meningitis (43.3%) is most common etiological type of meningitis in pediatric age group. Cases of meningitis were maximum during month of September to December [P< 0.0001]. Case fatality rate due to meningitis is 27.3%. Proportional mortality rate = 2.5(1.77-3.03)% .Males (57%) are more commonly affected than female (43%). Rural (55%) residents ware more in number than urban (45%) residents.

Limitations

Some variables like environmental history, socioeconomic status could not be studied due to non availability of records. As this is a hospital based study the information obtained do not reflect actual situation in the community so results cannot be generalized for community.

Recommendations

Public health personnel should remain aware to the presence of meningitis in community especially during the month of September to December. There is a great need to create awareness regarding symptoms of meningitis, availability of vaccines against meningitis and about importance of early hospitalization, in the community especially in the rural area to reduce case fatality rate due to meningitis .

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