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MENINGOCOCCAL CARRIER RATE AMONG CENTRAL SECURITY FORCES IN ALEXANDRIA (I)

By

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INTRODUCTION

Meningococcal disease is a significant cause of mortality and morbidity allover the world (Schwartz et al.,1989). Before the era of chemotherapy, the mortality rate from meningococcal meningitis was 50 - 60% during epidemics and 30 - 40% among sporadic cases (Galazaka 1982). Among infants, mortality rate was close to 100%.

The discovery of sulfonamides lowered the mortality rate dramatically. Peltola (1983) reported that, the overall mortality rate from meningococcal meningitis varied from 2% to 10%.

The asymptomatic nasopharyngeal carriers of Neisseria meningitidis (N. meningitidis) serve as reservoirs of infection in the community and are responsible for the dissimination of infection to the susceptible hosts (Jacobson and Fraser 1976). Most persons who contact meningococcal disease have acquired the organism from a carrier and not from a case (Paul et al., 1987). Physical crowding of persons appears to be one factor influencing the prevalence of meningococcal carriage (Fraser et al., 1973). Carriage

rates may increase markedly within inclosed population such as military recruits, even in the absence of overt or frank case (Beam et al., 1971). So the aim of this study was to determine the carrier state of meningococci among the central security forces, a population particularly susceptible to meningococcal disease.

MATERIAL AND METHODS

The study was carried out on a representative sample of 400 individuals which represents 40% of the total number of El-Amria training security forces center in Alexandria during the period from February to June 1990. Only individuals who had not been previously vaccinated were included in this study. All relevant information was obtained from every individual, and recorded on a special form. This form included name, age, residence, level of education, previous history of meningitis, history of meningitis among their families, and the number of members in each barracks. Four carrier surveys were performed for all the involved members, with an interval of 1-2 weeks between each two consecutive surveys.

Collection of samples:

Throat swabs were taken with sterile polyester fiber tipped applicators. The swabs were gently wiped across the mucous membrane with a slight twirling motion and withdrawn without touching neighbouring tissues. The swabs were inoculated on Thayer-Martin agar plates immediately (Thayer and Martin 1966). Plates were returned to the laboratory within 1-2 hours of sample collection.

Laboratory procedures:

In the lab., cultures were further streaked and incubated for 24 - 48 hours at 37°C in an atmosphere of 5-10 % by candle jar. Isolated colonies were examined and tested for oxidase, then stained by Gram stain. Oxidase positive Gram negative diplococci were plated on sugar medium plates (dextrose, maltose, sucrose, and lactose), and incubated overnight at 37°C. Serogrouping was done by agglutination test on a slide using poly and mono-valent antisera (Difco)

Non typable strains were serogrouped after subculture on Mueller-Hinton agar. Antibiotic sensitivity test for defined groups was performed according to Kirby and Bauer (1966).

RESULTS

I- *Epidemiological results:*

1- Age:- The ages of the involved 400 members ranged from 19 - 22 years with a mean age of 20.5 $\pm$ 0.43 years. The highest mean of meningococcal carrier rate was among those aged 22 years (42.9%). The rate decreased to (37.8%, 36.7% and 35.0%) among those aged 20, 19, and 21 years respectively. The difference was not significant (Z = 0.78) (Table I). The overall carrier rate was 38.5%.

2- Location (Governorates):- The members of the study were from 7 governorates. The mean rate of meningococcal carriage ranged from 33.5 - 65% in urban governorates (Alexandria, Matruh, Port-Said, and Damietta), while it ranged from 26.8 - 39.0% in rural governorates (Behera, Kafr El-Sheikh and Sharkia. This difference was significant (Z = 2.98, $P<0.05$) (Table II).

Level of education:- Most members of the study (73.25%) were illiterates, and the rest (26.75%) were just read and write. The mean meningococcal carrier rates among both groups were 39.8% and 35.8% respectively. The difference was not significant.

4- Previous history of meningitis:- Table (III) shows that the highest proportion of members (95.25%) gave negative history of previous disease. Only (1.25%) gave a positive history of meningitis, while 3.5% gave ill-defined data. The mean meningococcal carrier rate was 15% among those with positive history compared to 39.2% among those with negative history of meningitis. The difference was not significant (Z = 1.86).

5- Previous history of meningitis among the families of the studied members:- All the study group gave a negative history of meningococcal disease among their families.

Bacteriological results:

Table (IV) presents the serogroup distribution of the meningococcal carriers in the 4 surveys. Out of a total of 142 samples examined - for the 400 members involved in the study- 547 (38.5%) were carriers. The highest carrier rate was that of serogroup B (13.7%), followed by serogroup Z, non typables, A and serogroup X (8.2%, 7.9%, 4.8%, 1.9% respectively). Serogroups Y, C, and D were isolated from only 1.0%, 0.7%, and 0.3% respectively.

Out of the 400 individuals followed upm 312 (78%) were found to be carriers at one or more of the examination times. Out of these 312, 139 (44.6%) were found to carry the same meningococcal serogroup during the period of follow up. More than one serogroup was encountered in 173 (55.4%) out of the 312 carriers. Of the 312 carriers, 67 (21.5%) were found to be carriers in only one of the examinations and 245 (78.5%) were carriers in more than one occasion (Table V).

Antibiotic sensitivity tests for the 547 meningococcal strains isolated showed that all serogroups were sensitive to rifampin. The highest resistance was against trimethoprim/sulfamethoxazol combination (175, 32%), and sulfadizine (122, 22.3%). Resistance to other antibiotics tested (ampicillin, chloramphenicol, tetracycline, and erythromycin) showed no considerable difference ranging from 2-4%.

DISCUSSION

The epidemic type of meningitis remains one of the annoying public health problems in all parts of the world in general, and in Egypt in particular. This problem causes much anxiety especially following reports of increasing frequency of failure of sulfadiazine and various antibiotics in the management of cases and carriers (Wright 1989 and Sarkar et al., 1987).

In view of the present relative importance of the prob of meningococcal infection among military population, it seemed useful to try to investigate some factors that may

bear a relation to meningococcal carrier rate. Of the various factors studied in relation to carriage, age was not found to have any relation to meningococcal carriage. This finding may be attributed to the small age differences between all members of the study.

As regards the level of education, the meningococcal carrier rate was higher among illiterates than among members who just read and write. This observation was also obtained in previous studied (Kamal 1974, Guirguis 1979 and Holten et al., 1978). The association between education and carriage may be secondary to differences in social and hygienic conditions.

Higher rates of meningococcal carriage were observed more in people of cities than among those inhabiting rural areas. However, El-Akkad in (1969) reported an increased incidence of cerebrospinal meningitis in towns close to the sea than those in upper Egypt. This difference may be attributed to constant humidity near sea shore.

The serogroups of N. meningitidis strains isolated from all the members examined showed that the most frequent serogroups were B, followed by serogroup Z, non-typable, serogroup A, and X. Previous studies on carriage carried out in Egypt (Kamal 1974, Guirguis 1979 and Abbas et al., 1982) showed a beginning of a shift from serogroup A to other serogroups especially serogroup B. This change in the relative frequency of different meningococcal serogroups was also reported in other parts of the world, for example in East Englia (Fraser et al., 1973), Norway (Holton et al., 1978), and in Northen Nigeria (Schwartz et al., 1989) where serogroup B and C replaced serogroup A. The trend of replacing serogroup A by other serogroups - in our study- showed that not only serogroup B was dominating, but also serogroup Z was isolated most frequently. This pattern of change suggests that serogroup Z is becoming an important meningococcal agent in Egypt. The predominance of serogroups B and C in the form of carriage reported previously is now being followed by predominance of cases.

It was known previously that sulfadiazine was the most effective therapeutic agent for the treatment of meningococcal infection. It was found that when sulfadiazine was

administered, clinical cases and carriers disappeared quickly (Millar et al., 1963 and Artenstein 1970). In the present study it was found that 32% of the isolated strains were resistant to trimethoprim/sulfamethoxazol, and 22.3% were resistant to sulfadiazine. Same results were reported in previous studies done in Egypt (Mikhail et al., 1989 and Kamal 1974).

It is to be noted that minimal resistance was exhibited to ampicillin, chloramphenicol, tetracyclin and erythromycin. The same pattern of resistance was reported before (Wahdan et al., 1973). All meningococcal serogroup isolated were sensitive to rifampin which should be directed towards treatment of cases.

SUMMARY

The study was carried out on 400 individuals selected from El-Amria training security forces center. Four throat culture surveys were performed on all the members with 1-2 weeks interval. Cultures were done on Thayer-Marten agar Isolates were examined to identify meningococcal groups. The study showed that the mean meningococcal carrier rate was 38.5%. This rate was significantly higher in urban than in rural governorates (Z: 2.98). The highest carrier rate was that of serogroup B (13.7%). All the isolated strains were sensitive to rifampin. 32% of strains were resistant to trimethoprim/sulfamethoxazol combination, while 22.3% were resistant to sulfadiazine.

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Table (I): Distribution of the 400 individuals by age and mean m eningococcal carrier rate.

Age groups in years	Number (%)	Mean carrier rate*
19	32 (8.00)	36.7 %
20	329 (82.25)	37.8 %
21	23 (5.75)	35.0 %
22	16 (4.00)	42.9 %
Total	400(100.00%)	38.5 %

* Mean carrier rate: The mean carriage of the four surveys.

Table (II): Distribution of the 400 individuals according to location and mean meningococcal carrier rate.

Governorates		Number (%)	Mean carrier rate
Behera	(R)	138 (34.50)	39.00 %
Kafr El-Sheikh	(R)	126 (31.50)	36.80 %
Sharkia	(R)	34 (8.50)	26.80 %
Alexandria	(U)	38 (20.75)	33.50 %
Matruh	(U)	9 (2.25)	50.00 %
Port-Said	(U)	8 (2.00)	74.50 %
Damietta	(U)	2 (0.50)	65.00 %
Total		400 (100.00%)	38.50 %

R: rural U: urban Z: 2.98 , $P < 0.05$

Table (III): Previous history of meningitis and mean meningococcal carrier rate.

Previous history of meningitis	Number (%)	Mean carrier rate
Negative	381 (95.25)	39.2 %
Positive	5 (1.25)	15.0 %
Unknown	14 (3.50)	27.1 %
Total	400 (100.00%)	38.5 %

Z : 1.85 , P $>$ 0.05

Table (IV): Distribution of meningococcal carriage by serogroups among the 400 individuals in the four surveys.

Serogroups	Meningococcal carriage Number (Percent)
A	68 (4.8%)
B	195 (13.7%)
C	10 (0.7%)
D	4 (0.3%)
X	27 (1.9%)
Y	14 (1.0%)
Z	116 (8.2%)
Total typables	434 (30.6%)
Non typables	113 (7.9%)
Total carriers	547 (38.5%)
Non carriers	874 (61.5%)
Total No.of samples examined	1421 (100.0%)

Table (V): Meningococcal carriage by serogroup and frequency of isolation during the period of the study.

Number of isolations	Meningococcal carriage				Total	
	One group		More than one group			
	No.	(%)	No.	(%)	No.	(%)
One isolation	48	15.4	19	6.1	67	21.5
More than one	91	29.2	154	49.3	245	78.5
Total	139	44.6	173	55.4	312	100.0 %