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Neisseria meningitidis cases in third level hospital

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Palabras clave:
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ABSTRACT

Background: *Neisseria meningitidis* is a Gram-negative bacterium. Serotypes associated with it are A, B, C, and W-135. And they can appear at any age. From 2002-2010, 474 cases were reported in Mexico. The Ministry of Health is the Health Care Institution attending more cases (64%) and the Instituto Mexicano del Seguro Social attends 11.18%. **Objective:** Retrospective analysis of clinical and bacteriological aspects of cases meningitis by *N. meningitidis* treated at the Infectology Hospital, during the period 2010-2013. **Methods:** Descriptive study, in a reference center for infectious diseases. All patients with a confirmed infection due to *N. meningitidis* diagnosis were included. The information was obtained from the epidemiological study conducted. **Results:** There were a total of 11 confirmed cases of infection due to *N. meningitidis*; the diagnosis was made by coagglutination test, and serotype C predominated. **Conclusion:** The main measures for disease control are accurate diagnosis, ideally with microbiological culture, timely treatment and chemoprophylaxis. Conjugated vaccines have shown a good population impact due to its effect on decreasing the percentage of asymptomatic carriers. In order to evaluate prior exposure with greater precision, it is appropriate to study the presence of *N. meningitidis* in all close contacts.

RESUMEN

Introducción*:** Neisseria meningitidis *es una bacteria Gram negativa. Los serotipos más importantes asociados con la enfermedad son A, B, C W-135, los cuales causan diferentes enfermedades que se presentan a cualquier edad. En México se reportaron 474 casos de 2002 a 2010; la Secretaría de Salud es la institución médica que atiende más casos (64%) y el IMSS 53 casos (11.28%).* ***Objetivo*:** *Análisis retrospectivo de aspectos clínicos y bacteriológicos de casos de meningitis por* N. meningitidis *y meningococcemia en el Hospital de Infectología durante 2010-2013.* ***Métodos*:** *Estudio descriptivo, se incluyó a pacientes con diagnóstico confirmado de* N. meningitidis. ***Resultados*:** *Se presentó un total de 11 casos de infección debido a* N. meningitidis*; el diagnóstico se hizo a través de aglutinación en Látex; el serotipo C predominó. No se reportaron defunciones.* ***Conclusión: *La medida principal en la atención de pacientes con infección por* N. meningitidis *es el diagnóstico certero, la prueba de aglutinación en látex es una guía en el diagnóstico, pero no reemplaza al cultivo microbiológico; el diagnóstico establece el tratamiento oportuno y la quimioprofilaxis para el personal cercano al paciente. Para el control de* Neisseria meningitidis, *las vacunas conjugadas han demostrado buenos resultados en la población por su efecto en la disminución del porcentaje de portadores asintomáticos.*

INTRODUCTION

For the diagnosis of infectious diseases, particularly those of the central nervous system as in the case of meningitis, bacteriological diagnosis should be timely and accurate; the objective is to minimize the chances of complications, consequences and death. Treatment should be based, often with the knowledge of the epidemiological behavior of the causative agent of the infection.

Neisseria meningitidis, also known as meningococcus, is classified as a pilus, Gram-negative non-mobile aerobic bacterium, a diplococcus, able to be isolated in enriched blood agar media. It is usually encapsulated within a polysaccharide layer with antigenic properties that allow its classification into 13 different serogroups identified so far. The most important of these serotypes associated with disease are A, B, C, W-135 and Y and, to a lesser degree, X and Z, and 29-E.[1]

N. meningitidis is the causal agent of serious diseases such as pneumonias, respiratory tract infections, septic shock syndrome and, the most serious, meningitis. These diseases mainly occur in children from 6 months to 4 years of age and also frequently affect young people, although they can present at any age.[2]

Serogroups A, B, and C cause the majority of the cases worldwide, whereas serogroups B and C are prevalent in Europe and in America. Serogroups A and C are predominant in Asia and Africa. In particular, the USA, Sweden and Israel are the only countries where in the last decade an increase has been demonstrated in the incidence of serogroup Y. In Mexico, a growing number of cases associated with serogroup C *N. meningitidis* have recently been reported that appear both sporadically as well as in small outbreaks in the Federal District of Mexico City or other municipalities of the State of Mexico from 1990-2004.[3]

Symptoms are characterized by sudden onset of headache, fever, neck rigidity, nausea, vomiting, photophobia and neurological disturbances such as stupor, delirium, coma and convulsive crisis. In infants, meningitis may have a more insidious onset with atypical symptoms without neck rigidity. In these cases, bulging of the fontanel may be characteristic. The following may also be present: irritability and constant crying, vomiting, seizures, rejection of food and hypotonia.

Meningococcemia, in contrast, is less common but highly lethal even with treatment and is characterized by the finding of positive blood cultures of *N. meningitidis* associated with exaggerated systemic inflammatory response to endotoxin. The rash associated with meningococcal disease can be maculopapular, similar to a viral exanthema. There is no itching, and it is transient, it usually lasts about 2 days.[4]

The Waterhouse Friderichsen syndrome can be seen in sepsis due to meningococcus, manifested as a result of acute adrenal insufficiency due to the fulminant destruction of the adrenal glands as a result of massive intracapsular hemorrhage. Acute adrenal insufficiency that characterizes this clinical condition is incompatible with life (100% mortality).[5]

The cases reported in Mexico during the year 2008 had an incidence of 0.08; during the year 2010 it decreased to 0.04/100,000 inhabitants. During the years 2002-2010 it was reported that the health care institutions of the Ministry of Health treated > 56.81% of cases, and the Instituto Mexicano del Seguro Social (IMSS) reported 53 cases (9.49%) from a total of 130 reported cases in the country during the study period.[6]

OBJECTIVE

Retrospective analysis of clinical and bacteriological aspects of cases meningitis by *N. meningitidis* treated at the Infectology Hospital, during the period 2010-2013.

MATERIAL AND METHODS

Design

We carried out a descriptive study from January 2010 to July 2013 in the Infectious Disease Hospital CMN «La Raza» of the IMSS. The work has been approved by the ethical committee. All patients with a confirmed diagnosis of infection due to *N. meningitidis* were included.

Each confirmed case was examined, and an epidemiological study and cerebrospinal fluid (CSF) sample taking was carried out. The information was obtained from the epidemiological study carried out.

Definitions

Infection by *N. meningitidis* was confirmed in CSF through co agglutination, Gram stain or culture isolation for *N. meningitidis*.

Statistical analysis

A descriptive analysis of the confirmed cases was done. Measures of central tendency, normality and frequencies were calculated.

RESULTS *(Table I)*

During the study period (43 months), there were a total of 11 confirmed cases of infection due to *N. meningitidis*; 81.9% were meningitis and 18.1% were meningococcemia. The age with the greatest frequency was 20-59 years (54.6%) followed by the 0- to 9-year-old group (27.3%, mean 23.91%). The mean number of hospital days was 17.45. Females showed an increased frequency of the disease (72.7%). Comorbidities identified were recurrent upper respiratory tract infections (27.3%) followed by type 2 diabetes mellitus, *Listeria meningitis* and obesity (9.1%); 27.3% had a history of having visited a prison, 36.4% had a history of travel and 9.1% had contact with similar cases of the illness. With regard to the symptoms, 100% presented with fever and headache followed by meningeal signs in 81.8% and presence of vomiting, bleeding, and upper respiratory tract infection in 54.5%. With regard to the diagnosis, 90.9% were made through positive co agglutination, and a negative report with a history of having received other antibiotics before being referred to this medical department. The most frequent serotype found was C (63.6%) followed by W135 (27.3%). According to the CSF characteristics, 90.1% were purulent and 9.1% clear; 81.8% received treatment with ceftriaxone, 9.1% with cefotaxime and 9.1% with ampicillin. There were no deaths. A study of those living in the household was done and only two subjects were identified as carriers.

Table I. *Neisseria meningitidis* characteristics clinical and epidemiology.

	n	Minimum	Maximum	Average	SD	p*
Age	11	3	53	23.91	17.14	.925
Days of hospital stay	11	9	34	17.45	7.258	.838

*Shapiro-Wilk

Characteristic		n = 11	Percentage
Age groups (years)	0-9	3	27.3
	10-19	2	18.1
	20-59	6	54.6
Gender	Male	3	27.3
	Female	8	72.7
Type of infection	Meningitis	9	81.9
	Meningococcemia	2	18.2
Residence	State of Mexico	9	82
	Federal District	1	9
	Others	1	9
Outcome	Improved	11	100
	Died	0	0
History	Recurrent URTI	3	27.3
	DM	1	9.1
	Meningitis due to Listeria	1	9.1
	Obesity	1	9.1
	Others	2	18.2
	Denied	3	27.3
Epidemiological history			
Visit to prison	Yes	3	27.3
	No	8	72.7
Travel	Yes	4	36.4
	No	7	63.6
Contact with similar cases	Yes	1	9.1
	No	10	90.9
Co agglutination	Positive	10	90.9
	Negative	1	9.1
Serotype	C	7	63.6
	W135	3	27.3
	NE	1	9.1
CSF characteristics	Purulent	10	90.1
	Crystal	1	9.1
Signs and symptoms			
Fever	Yes	11	100
	No	0	0
Headache	Yes	11	100
	No	0	0
Meningeal signs	Yes	9	81.8
	No	2	18.2

Continued Table I. *Neisseria meningitidis* characteristics clinical and epidemiology.

Characteristic		n = 11	Percentage
URTI	Yes	6	54.5
	No	5	45.5
Hemorrhagic signs	Yes	6	54.5
	No	5	45.5
Vomiting	Yes	6	54.5
	No	5	45.5
Convulsive crisis	Yes	2	18.2
	No	9	81.8
Treatment	Ceftriaxone	9	81.8
	Cefotaxime	1	9.1
	Ampicillin	1	9.1

SD = standard deviation; DM = diabetes mellitus; URTI = upper respiratory tract infection.

DISCUSSION

The 11 diagnosed cases and treated in a tertiary hospital during a 5 years period were retrospectively analyzed, it is important to consider that *Neisseria meningitidis* is an organism with heterotrophic metabolism, its growth requires mineral salts, lactate, amino acids and glutamic acid as a carbon source; these circumstances make it difficult to grow after planting of the specimens studied.

Meningococcus is a human commensal bacterium. It has been the cause of endemic and epidemic diseases. Knowledge of the mechanisms of transmission, pathophysiology, host susceptibility, global epidemiology, and chemoprophylaxis results in important advances. However, the conjugated vaccine for serogroups A, C, W-135, and serogroup B has been fundamental and has allowed epidemic control of this microorganism in some regions of the world. The human upper respiratory tract is a reservoir for *N. meningitidis*, exposing asymptomatic carriers as the probable source of transmission of this agent. Thus, the importance of the asymptomatic carrier in the biology of the meningococcus and the genetic exchange has been confirmed by the distribution of the serogroups and genotypes that vary with the geographic location.[7]

Serogroups B and C of meningococcus have been the most frequent, although outbreaks of the Y and W-135 serogroups have also been reported in the medical literature according to its occurrence in the early years of the first decade of this millennium. The definition of epidemic is related to the baseline incidence rate in each region of each country.[8,9]

Data from this study, carried out in a medical referral center for infectious diseases, disclosed that the highest numbers of cases were seen (73%) without any risk factor identified, although it is known that disease may be due to inhalation of respiratory droplets containing meningococcus, characteristics similar to those reported in the literature. In 30% of subjects, recurrence of upper respiratory tract infections was identified along with exposure to carriers in prisons. Diagnosis was guided by Gram stain done using CSF and by positive co agglutination. The presence of W135 serotype was highlighted, which pointed out low frequency in epidemiological studies in this regard.

There are diagnostic methods for *N. meningitidis* directly from cerebrospinal fluid, based on the presence of latex particles, the advantage reported, not only in this study and those published in the literature, allow to detect the agent even after the administration of antibiotic treatment in addition of determining serogroup. Because it is a specialized tertiary care unit, patients had received prior treatment, circumstances that impede the microbiological isolation.[10]

There were 11 cases identified through CSF study and were treated with cephalosporins in relation to the appropriateness of once daily administration (ceftriaxone) in nine patients, one treated with cefotaxime and another with ampicillin. In all cases there was therapeutic success. Infectivity of the infection disappeared after antimicrobial therapy.

It is important to emphasize that prophylaxis for health personnel is indicated for those who have been directly

exposed to patient secretions. In infectious diseases, epidemiological study of the contacts should be carried out. In this study, only two carriers were able to be identified.

Treatment of bacterial meningitis is a challenge, given the increase in bacterial drug resistance, as well as associate therapy.[11,12]

Meningococcal meningitis is caused by different serotypes, it has a wide range of distribution and age group; although significant reduction of cases, particularly serogroup C has been attributed to vaccination carried out in some countries such as Sub-Saharan Africa known as the meningitis belt, where has been reported an *N. meningitis* serogroup A epidemiological outbreak.[13]

In infectious processes, it is required to make an epidemiological study to contacts where could be identified only two carriers.

Authors have considered that knowing the behavior of this infection along with immediate health notification and preventable vaccines,[14] allow for identification of the epidemiological behavior for timely decision making and will encourage trends in future research in this regard, as to provide information, important challenges remain in epidemiological surveillance in the generation of new and more potent vaccines.[15]

CONCLUSION

Disease caused by *N. meningitidis* is one of the principal causes of bacterial meningitis and sepsis worldwide. In this study, the greatest number of cases in adults was identified with predominance of the C serotype added to what has already been reported in the medical literature. The main measures for disease control are immunoprophylaxis and accurate and timely diagnosis, ideally with microbiological culture and, where appropriate, coagglutination supported by Gram stain. Conjugated vaccines have shown a good population impact due to its effect on decreasing the percentage of asymptomatic carriers. Initiation of antimicrobials in all cases, as well as the use of chemoprophylaxis in close contacts, constitutes measures of control. In order to evaluate prior exposure with greater precision, it is appropriate to study the presence of *N. meningitidis* in all close contacts during an 8-h period, whether or not they are members of the household, to detect the carriers and to decrease secondary cases.

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POTENTIAL CONFLICTS OF INTEREST

No conflicts.

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