

## Mortality due to nervous system disease in Jerez de los Caballeros during the 19th century

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### ABSTRACT

This article investigates mortality due to nervous system disease in Jerez de los Caballeros (province of Badajoz, Spain) during the 19th century. Nervous system diseases, cited in 1794 records, were the fifth most common cause of death and accounted for 9.7% of all mortalities. We analysed the parish archive (APJC), which includes the death records for each of the town's four parishes, and also consulted the municipal historical archive (AHMJC). All information obtained was then classified according to the third nomenclature of the *Bertillon International Classification of Causes of Death*, 1899 edition. Cerebrovascular diseases (cerebral haemorrhage and congestion) comprised the largest group, with 848 cases or almost half of the total deaths due to nervous system disorders. This sizeable total made cerebral haemorrhage and congestion the fourth cause of mortality overall. The following categories, encephalitis and meningitis, accounted for a total of 416 deaths. Men were more commonly affected than women. More deaths by this cause were recorded in adults than in juveniles (59.2%), and they were especially frequent in individuals aged 65 to 74. Juvenile victims were most commonly children less than a year old. The most common conditions in young children were cerebral haemorrhage/congestion and meningitis. In adults, the most common entities were acute cerebrovascular diseases. The highest mortality rates were recorded in the summer.

### KEYWORDS

Cerebral congestion, encephalitis, cerebral haemorrhage, history of medicine, meningitis, mortality, central nervous system

### Introduction

With a view to studying the causes of death in the 19th century in Jerez de los Caballeros (province of Badajoz, Spain), we collected a total of 26 203 death records. Of these entries, 7665 did not report a cause of death; the remaining 18 538 records have been included in our study.

Attempting to explain causes of death in specific communities using historical mortality categories is a complex and difficult process, and such studies focusing exclusively on neurological causes are very rare. The *Bertillon Classification of Causes of Death* (third nomenclature), compiled by Jacques Bertillon in 1899, provides the nosological classification system used at the time. Bertillon described the rules to be observed “for the solution of

certain difficulties (most frequently caused by incomplete diagnosis...): incomplete diagnosis....doubtful diagnosis....and choice between two simultaneous diagnoses”<sup>1</sup>

The Bertillon classification, based on aetiological and especially anatomical models, arose in the context of the epidemiological transition in Europe. It served as the model for the subsequent international classifications of diseases published by the WHO. As such, the Bertillon classification is described as “the most commonly used by medical historians....There are countless advantages to using this system; for example, it is geographically universal, which allows us to make comparisons between different countries”<sup>2</sup> An epidemiologist attempting to chart the mortality profile of a population in a given period, and the reasons for decreased mortality, will work more effectively if diagnoses are based on aetiological criteria.<sup>3</sup>

In the second section of the Bertillon Classification (“Local Diseases”), we find the chapter heading “Diseases of the Nervous System and of the Organs of Sense”. Our sample contains 1794 records in this category, which represented the fifth leading cause of death in the town and accounted for 9.7% of the total mortalities.

The methodological problem of how to analyse mortality using retrospective diagnoses based on the diagnostic expressions recorded in the death certificates in parish and civil death records is tackled through semantic historiography, an approach entailing a list of difficulties that different authors have described.<sup>4-7</sup> The decision to use a specific classification or nomenclature for causes of death should enable us to draw parallels with results obtained in earlier studies.

This investigation focused on Jerez de los Caballeros, a town located in the south-west part of the province of Badajoz at 38 deg 19 min 15 sec N, 6 deg 46 min 11 sec W.<sup>8</sup> Its mean altitude is 500 metres above sea level; “its climate is warm, with variable winds, although the prevalent winds are in the south, east, and west; the population suffers from inflammatory and intermittent diseases, and from carbuncles”.<sup>9</sup> Our purpose is to explore mortality due to nervous system disease in Jerez de los Caballeros during the 19th century.

### Material and methods

We analysed the parish archive (APJC) containing the death records for each of the four parishes in the town. We also consulted the municipal historical archive (AHMJC) along with other historical and current literature.

In order to quantify the demographic force of mortality and be able to compare different populations, we must view the total deaths in each population as a percentage of the population total. To this end, we calculate the crude death rate, using the following formula:  $CDR = \text{total number of deaths per year per 1000} / \text{mean population for that year}$ .

Since the total population is used as denominator, the formula yields a crude or global rate that reflects the number of individuals per 1000 who exit the population every year due to death by natural causes, and not due to migration. Having census figures for the concrete moment in time is necessary in order to calculate CDR.

We have divided both the adult and child populations shown in the tables and figures into different age groups,

since “...all available data lead us to believe that the age of seven years was universally accepted by the Church as the true threshold between childhood and adulthood to all religious effects”.<sup>10</sup> The adult population has been grouped by age in 10-year periods: 15-24 years, 25-34 years, 35-44 years, etc. Only the first group of ‘adults’, those aged 8-14, follows a different pattern. Since very few deaths were reported for subjects aged 95 or older, all of these subjects were grouped in the category of 95 and up. Young children have been stratified as follows: < 1 year, 1-3 years, and 4-7 years; infants aged less than one year have been further classified as < 1 month, 1-3 months, 4-6 months, and 7-12 months.

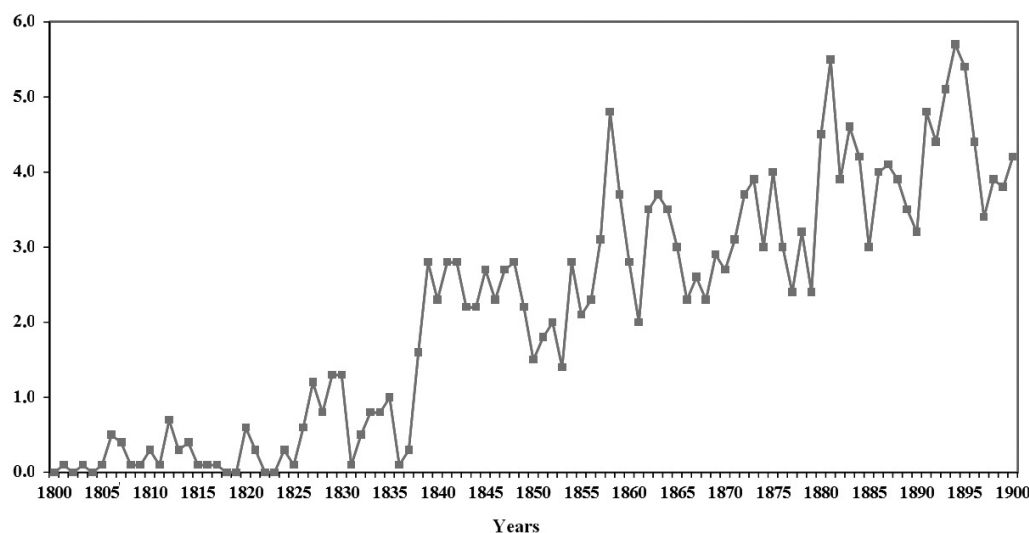
### Results

The first record, dated 18 October 1801, describes a 95-year-old woman who died of *perlesía*, defined by a 19th century Spanish medical dictionary as “a common term used as a synonym of paralysis”.<sup>12</sup> Records of diagnoses

**Table 1.** Diseases of the nervous system and of the organs of sense in Jerez de los Caballeros in the 19th century

Third Nomenclature (Bertillon, 1899)	No. of Cases	%
Encephalitis	216	12.0
Simple meningitis	200	11.1
Progressive locomotor ataxia	1	0.1
Progressive muscular atrophy	-	-
Cerebral haemorrhage and congestion	848	47.2
Softening of the brain	52	2.9
Paralysis without indicated cause	56	3.1
General paralysis	3	0.2
Other forms of insanity	12	0.7
Epilepsy	124	6.9
Non-puerperal eclampsia	15	0.8
Convulsions of infants	66	3.7
Chorea	1	0.1
A) Hysteria	2	0.1
B) Neuralgia	3	0.2
C) Other diseases of the nervous system	194	10.8
Diseases of the eyes	1	0.1
Diseases of the ears	-	-
<b>Total</b>	<b>1794</b>	<b>100.0</b>

Source: APJC. Death records. 1800-1900.



**Figure 1.** Evolution of the specific crude death rate for central nervous system diseases

were sporadic just after the turn of that century, but they became more common within the first 25 years.

Based on the Bertillon Classification, Table 1 lists the number of cases and the percentage of the total. Cerebrovascular diseases (congestion and haemorrhage) were the most common nervous system-related cause of death, accounting for nearly half of these entries with a total of 848. In fact, cerebral congestion and haemorrhage constituted the fourth most common cause of death overall. The following but much smaller category, encephalitis and meningitis, contained 416 cases, or 23.1% of all deaths caused by nervous system disease.

Figure 1, which displays the distribution stratified by age group, shows two clearly defined periods. The first period, spanning 1800 to 1837, includes a total of 93 deaths and a mean rate of barely 0.4 per thousand. Records remained scarce and sporadic until 1826, but began increasing gradually after that date. The second period, spanning 1838 to 1900, accounts for most of the mortalities at 1701 deaths. The mean death rate was 3.2 per thousand, eight times the previously cited rate. We observe higher numbers of cases as the century progressed, which reflects the increasing diagnostic capability of the local doctors. In the 19th century, all public health initiatives revolved around controlling infectious disease. Thanks to vaccination and improved sanitation, life expectancy now exceeded 50 years, and as a result, the

**Table 2.** Diseases of the nervous system and of the organs of sense, listed by age

Age (years)	No. of Cases	%
<1	363	20.2
<1 m	56	15.4
1-3 m	99	27.3
4-6 m	95	26.2
7-12 m	113	31.1
1-3	251	14.0
4-7	87	4.8
8-14	53	2.9
15-24	74	4.1
25-34	72	4.0
35-44	66	3.7
45-54	113	6.3
55-64	170	9.5
65-74	263	14.7
75-84	191	10.7
85-94	56	3.1
>94	7	0.4
<b>Not given</b>	28	1.6
No age	23	82.1
Young children	5	17.9
<b>Total</b>	<b>1794</b>	<b>100.0</b>

Source: APJC. Death records. 1800-1900.

percentage of deaths due to cerebrovascular disease began to increase.<sup>13</sup>

The year with the highest mortality due to nervous system disease was 1894, with 51 deaths and a rate of 5.7 per thousand. The last decade of the 19th century had 413 recorded deaths and a rate of 4.5 per thousand, which was greater than the mean rate for the second period. The year with the highest overall mortality in Jerez de los Caballeros was also 1894, and nervous system diseases accounted for 10.9% of all deaths that year. The 48 deaths from nervous system disorders recorded in 1895 represented 15.6% of that year's total of 307.

Slightly more cases were reported in men, with 924 deaths or 51.5%, than in women, with 870 deaths (48.5%). Deaths in this category were also more common in adults, with 1063 cases and 59.2% of the total. In turn, young children accounted for 706 deaths (39.3%). It is important to note that this age group represents ages from 0 to 7 years, and that older subjects are grouped with adults.<sup>10</sup> The 25 entries that do not provide the patient's age account for the remaining 1.4%.

Table 2 and Figure 2 show the age distribution for deceased subjects. Although adults were much more numerous, we observe that infants less than a year old

presented the highest intergroup mortality rate: 363 deaths, or 20.2% of the total deaths. Most of these cases belonged to the group aged 7 to 12 months, with 113 cases or 31.1% of deaths recorded for infants less than a year old.

The mortality rate among children aged one to three years is also high at 251 deaths and 14.0% of the total, making this the third most affected population after the group aged 65 to 74 (263 deaths, 14.7% of the total). Mortality rates remain consistently low between the ages of 4 to 44, after which a new upward trend is seen in the group aged 45 to 54. This continues until mortality rates descend again in the group aged 75 to 84. Officials recorded 737 deaths due to nervous system diseases, or 41.1% of all deaths in this category, in subjects aged 45 to 84 years.

There do not seem to be any major seasonal differences, although the month of July stands out with 212 deaths or 11.3% of the total. Generally speaking, summer is the season with the highest mortality, with 562 deaths (10.5%), and the lowest mortality is reported in the winter with 377 deaths (7.0%).

Central nervous system infections as a whole constitute the most numerous category, with 244 records and

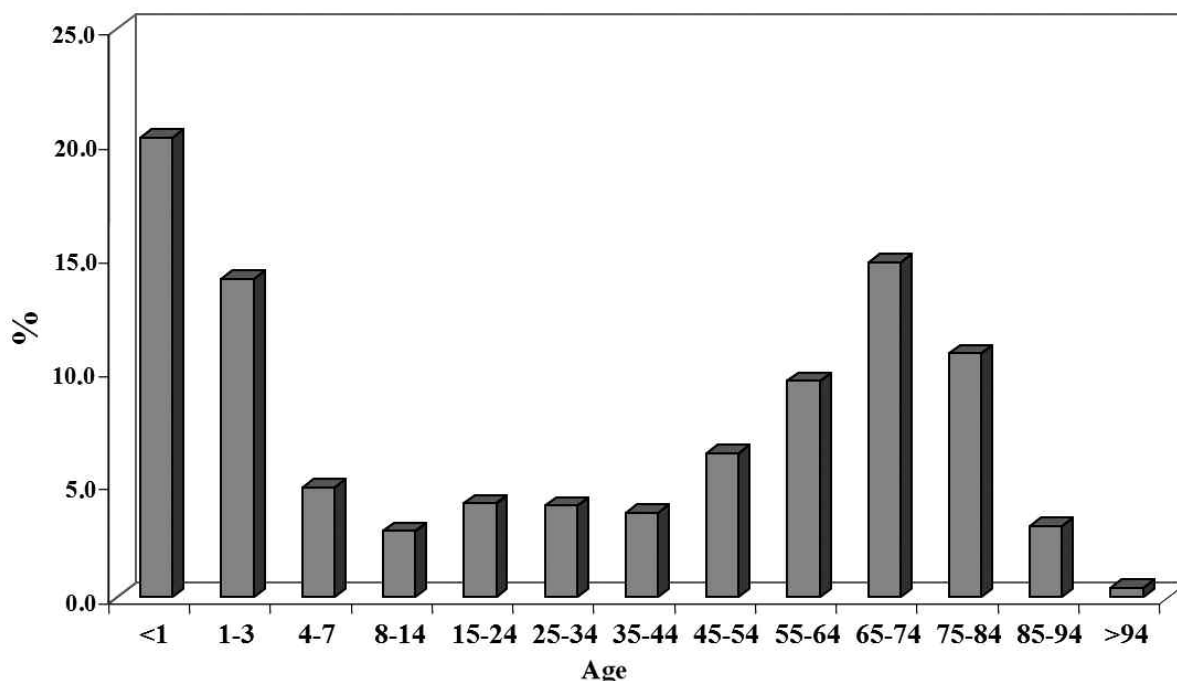


Figure 2. Age distribution of deaths due to diseases of the nervous system and of the organs of sense

more than a third of the total at 34.7%. However, we should point out that the largest category in young children is cerebral haemorrhage and congestion, with 183 cases (26.0%), even though these entities seem to be more common in elderly adults. In any case, subjects ranging in age from 55 to 84 account for 414 deaths and 48.9% of the total for this disease category.

The second most common nervous system-related cause of death among young children in Jerez de los Caballeros was meningitis, then defined as “an inflammation of the serous and vascular membranes that envelop the brain”.<sup>14</sup> This description refers to inflammation of the meninges, although the authors do not specify whether it affects one membrane or several membranes simultaneously. This cause of death was listed for 151 cases or 21.5% of the total.

Several different types of convulsions may occur; epilepsy was described as “intermittent attacks with sudden total loss of sense that follow a chronic course; these are almost always accompanied by weakness, perversion and at times even abolition of the mental faculties. This is generally incurable”.<sup>15</sup> This is the fifth largest cause of death among the young children in our study, with 78 entries accounting for 11.1% of the total.

Adding the figures for adults and children reveals that 20 deaths are missing from the total. These are the records for which no age is given, although some subjects whose age is not available were simply recorded as children or as adults and have therefore been placed in their respective categories.

Acute cerebrovascular diseases were the most common causes, with 662 deaths making up 61.8% of the total. The significance of these diseases was highlighted by M. Le Roy: “The head is the principal part of the body because it contains the brain and many organs intended to perform diverse vital and animal functions, and because it is the seat of all moral affect”.<sup>16</sup> Different diagnostic terms were used to identify these diseases, including *perlesía* or *accidente perlático*.

Apoplexy is another well-represented category at 314 cases, or 17.5% of the total. These events fundamentally occur in the brain, and different forms can be distinguished according to whether effusions of blood or serous fluid are present in the brain, or if there are no noticeable changes.<sup>17</sup>

Apoplexy or apoplectic attacks are defined as “...the state in which the patient is struck with a more or less sudden paralysis and loss of consciousness”.<sup>18</sup>

Misdiagnosis is frequent due to confusion “...with other illnesses of the brain that may mimic apoplexy.... In order of frequency, these illnesses are cerebral congestion (occlusion), softening of the brain...and lastly, meningitis”.<sup>19</sup> The most challenging examples in our study were the 256 cases of cerebral congestion, the 52 cases of softening of the brain, and the 353 cases of meningitis.

Figure 3 shows the age distribution of the main diseases described here, listed in decreasing order by number of deaths.

## Discussion

Diagnoses reported on death certificates reflect the medical and scientific knowledge emanating from different schools of medicine, variability in how diagnostic criteria were applied, changes in nomenclature and in the causes of death themselves, and changes in specific social groups. All of these factors result in “a lack of coherence and absence of continuity in the process of diagnosing causes of death”.<sup>19</sup> Although the diagnostic pronouncements on the death certificates should, in theory, have been made by a professional who had duly examined the deceased, this was not the case in real life. Records were often turned in by people with little to no medical knowledge, including family members, neighbours, or the parish priest. When reading and noting down information from these records, we must also be mindful of how we interpret it. The entries would have been made by the sacristan, curate, etc., and signed by the priest; their lack of medical knowledge could have given rise to transcription errors.

In order to perform a differential diagnosis to correctly distinguish between cerebral haemorrhage and other acute cerebral events, doctors would have had to understand “...the two defining features of cerebral haemorrhage: 1) sudden onset followed by a declining course; 2) hemiplegia or partial paralysis”.<sup>14(p345)</sup> This is useful for solving the mystery that had puzzled us earlier: the numerous examples of children whose cause of death was listed as cerebrovascular disease, but which was probably acute meningitis. The history of the medical knowledge of meningitis can be divided into three fundamental phases. The first, clinical knowledge; the second, aetiological knowledge beginning with Pasteur’s discoveries; and a third phase of therapeutic knowledge that began with the use of serum therapy and continues with chemical and antibiotic agents.<sup>20</sup> The latter would not be discovered until the 20th century.

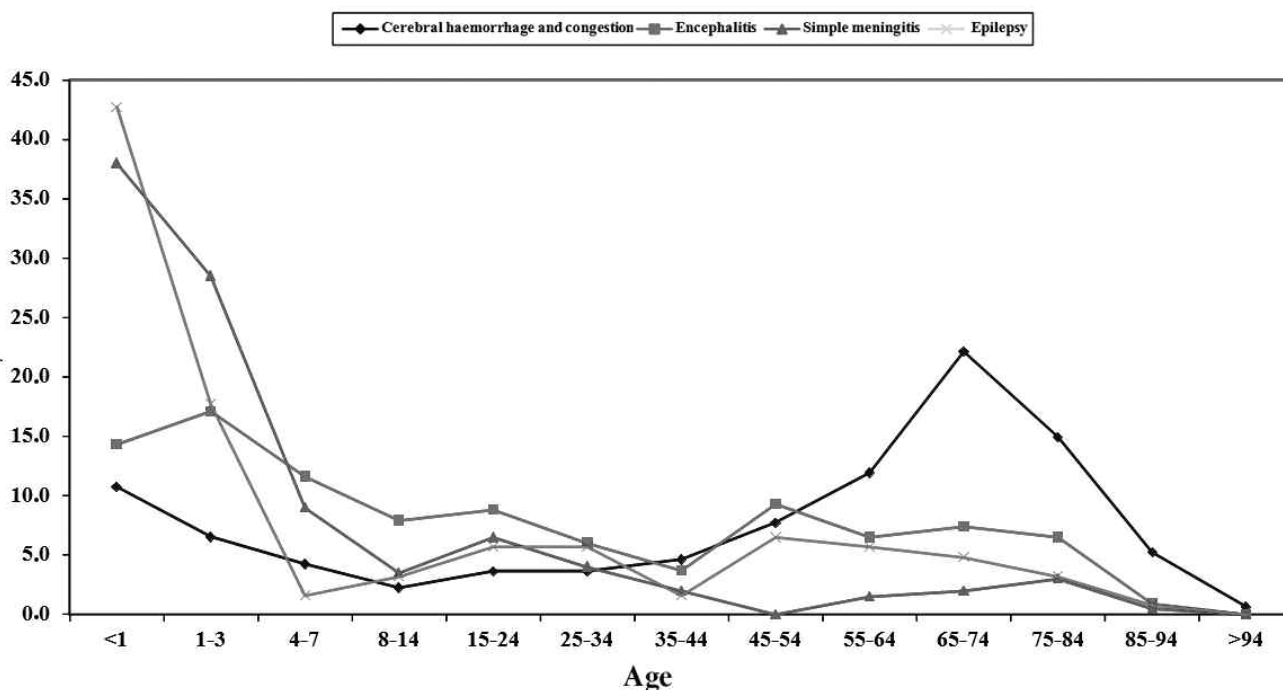


Figure 3. Age distribution of deaths due to main diseases of the nervous system and of the organs of sense

In conclusion, one of our study's limitations is the difficulty of performing a good differential diagnosis and distinguishing between such diseases as cerebral haemorrhage and softening of the brain without the assistance of neuroimaging techniques. Doctors at the time would have made mistakes when diagnosing and when treating these diseases.

As knowledge advanced and medical nomenclature evolved, the term 'cerebritis' was replaced by 'encephalitis'.<sup>21</sup> Doctors also came to debate the differences between encephalitis and apoplexy. Some held that blood would be pooled at a focal point in cases of apoplexy, in contrast with the diffuse infiltration of blood seen in brain tissue affected by encephalitis.

Other terms such as 'brain fever' began to appear in about 1846. From that time on, this diagnosis was commonly used, and the entity was often confused with meningitis or encephalitis.<sup>22</sup>

In a study carried out in Solsona (Lleida province) from the late 19th to the early 20th century, the authors

concluded that stroke was more frequent among males aged 51 to 60. They found no cases in subjects older than 85. Strokes with loss of consciousness and hemiplegia without loss of consciousness were the main clinical types that were recorded. Bleeding, leeches, and galvanic current were commonly employed treatments under certain circumstances. Mortality during the acute phase was greater than 57%. One hundred years ago, stroke was a severe disease that affected younger patients, and had a higher mortality rate, than is the case in today's population.<sup>23</sup>

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