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Original article

Pregnancy-related listeriosis in Spain

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ABSTRACT

Background: Pregnant women are at high risk of acquiring listeriosis, resulting in severe fetal and neonatal outcomes.
Methods: All hospitalizations with a listeriosis diagnosis in pregnant women (obstetric listeriosis) and/or newborns (neonatal listeriosis) in Spain from 2000 to 2021 were examined using the National Registry of Hospital Discharges, employing ICD-9 and −10 coding lists.
Results: A total of 540 and 450 hospital admissions for obstetric listeriosis and neonatal listeriosis were identified, respectively, with 146 adverse fetal-neonatal outcomes (miscarriage, fetal loss, stillbirth, and neonatal death). The incidence of obstetric listeriosis, neonatal listeriosis, and adverse fetal-neonatal outcomes (5.7, 4.7, and 1.5 per 100,000 deliveries, respectively) rose significantly from 2000 to 2021.

No maternal deaths were recorded among women hospitalized with obstetric listeriosis. However, 9.8 % experienced miscarriage, related to bacteremia (OR=2.46), 6.3 % fetal loss and 5.9 % stillbirths, associated with chorioamnionitis (OR=3.42), which was identified in 77.7 % of 254 deliveries. Overall, 51.1 % of newborns developed sepsis, 58.9 % prematurity, 26.9 % ARDS, and 9.8 % died. ARDS (OR=2.76) and prematurity (OR=5.07) were associated with perinatal death in newborns with listeriosis.

Pregnancy-related listeriosis was associated with increased risks of miscarriage (OR=1.75), intrauterine death (OR=17), preterm labor (OR=8.78), fetal distress (OR=2.10), cesarean section (OR=1.68), and stillbirth (OR=23.57).
Conclusions: Admissions for obstetric listeriosis and neonatal listeriosis in Spain have risen significantly from 2000 to 2021. Pregnancy-related listeriosis has a deleterious impact on fetal and neonatal outcomes, including miscarriages, fetal loss, stillbirth, and neonatal death. Surveillance, prevention, and prompt management of pregnant women with listeriosis and newborns with neonatal infection are warranted.

Introduction

Listeriosis is a zoonotic infectious disease caused by *Listeria monocytogenes* [1]. *Listeria* is a Gram-positive bacillus, and food-borne pathogen, and an important cause of major epidemic outbreaks resulting from contaminated food worldwide [2]. Listeriosis can present with a wide spectrum of clinical manifestations, ranging from self-limited febrile gastroenteritis to a serious and invasive infection, which can be complicated by bacteremia, sepsis, meningitis, and endocarditis [1,3,4].

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Despite its relatively low prevalence, listeriosis is an important global health concern due to its increasing incidence, the frequent need for hospital admission, and the high mortality rate in high-risk populations, such as the elderly and immunosuppressed individuals [1,2,5]. In Spain, national surveillance programs began in 2013, and listeriosis was declared a mandatory notifiable disease in 2015 [6].

During pregnancy, listeriosis is especially important. Due to the physiological suppression of cell-mediated immunity during gestation, and the increased susceptibility to intracellular pathogens such as *L. monocytogenes*, pregnant women have a 16- to 18- fold greater risk of acquiring listeriosis than the general population [7–9]. Despite a generally favorable maternal prognosis, vertical transmission of *L. monocytogenes* to the fetus can lead to severe fetal and neonatal outcomes, including miscarriage, preterm labor, fetal loss, stillbirth, sepsis, neonatal meningitis, congenital pneumonia, prematurity, permanent neurological sequelae, and other serious disabilities [7–12].

Altogether, maternal-neonatal listeriosis accounts for 10–20 % of listeriosis cases in Europe and North America [10,12]. However, there is still a paucity of data regarding pregnancy-related listeriosis epidemiology and its impact on fetal and maternal outcomes [2,13,14]. Moreover, limited information is available regarding its incidence and impact in Spanish reports since 2015 [15,16]. In France, the MONALISA Study Group has recently provided relevant data regarding obstetric and neonatal outcomes, which should be investigated in other countries and populations [3,10].

Herein, we describe the main clinical and epidemiological features of patients hospitalized with pregnancy-related listeriosis in Spain over the last two decades, and evaluate the impact of listeriosis on maternal and fetal outcomes compared with the general population.

Methods

An analysis of data from the Spanish National Hospital Discharge Database (SNHDD) was performed. The SNHDD is a public access registry of the Spanish Government, which includes up to 20 hospital discharge diagnoses in addition to epidemiological and demographic data. The ninth version of the International Classification of Diseases (ICD-9) coding list was used from 1997 to 2015, and the tenth version (ICD-10) has been applied since 2016. Spain is a southwestern European country with a population of 47 million. Healthcare access is guaranteed to the entire population through the National Health Service, including individuals in irregular situations or undocummented immigrants.

Several groups have performed epidemiological studies using this database for other illnesses, highlighting its importance for estimating the current burden and time trends of different clinical conditions at the national level [17–20]. Epidemiological information on annual deliveries in the country was obtained from the National Statistics Institute (INE) (www.ines.es).

Study population

ICD-9 and ICD-10 coding lists were used to extract data and classify the type of listeriosis (supplementary table 1). All hospital admissions of patients with listeriosis from 2000 to 2021 were identified using the ICD-9 code 027.0 and the ICD-10 code A32, as described in a previous epidemiological report [21]. According to the Spanish National Epidemiological Surveillance Network, maternal and neonatal listeriosis are considered and declared separately [22]. In the present study, patients who presented any other pregnancy-related (ICD-9 codes 630–679 and ICD-10 codes O00-O9A) were considered to have conditions secondary to obstetric listeriosis. Admissions recorded with ICD-9 codes 760–779 and ICD-10 codes P00-P96 were considered neonatal listeriosis. Therefore, patients admitted with either neonatal or obstetric listeriosis were defined as the study population.

Variables, outcomes, and definitions

ICD coding lists were used to retrieve the different clinical forms of listeriosis, such as bacteremia, meningoencephalitis, sepsis, endocarditis, or arteritis, as well as relevant comorbidities including those defining immunosuppression (i.e., liver disease, diabetes mellitus, neoplasms, HIV, etc.), tobacco consumption, or obesity (supplementary table 1).

Obstetric, fetal and neonatal diagnoses were identified according to the ICD coding list and its definitions (supplementary table 1). Miscarriages were defined as fetal loss, either expelled or incomplete, following pregnancy confirmation by positive fetal cardiac screening, before 22 gestational weeks. Intrauterine death was defined as fetal loss, either expelled or incomplete, after 22 gestational weeks but before or without birth labor. Miscarriages, intrauterine death, stillbirth, and neonatal-perinatal deaths were considered major outcomes, grouped as adverse fetal-neonatal outcomes. Other obstetric and perinatal findings, such as multiple gestation, intrauterine growth retardation (fetus with estimated fetal weight below 10th centile for gestational age-IUGR), chorioamnionitis, preterm labor (before 37 weeks), fetal distress, cesarean section, live or deceased newborn, congenital pneumonia, prematurity (newborn at 28–37 weeks), extreme prematurity (newborn with gestational age 28 weeks or less), low birth weight for gestational age (newborn under 2500 g-LBWGA), acute respiratory distress syndrome (ARDS) and neonatal jaundice were also retrieved from the database.

Statistical analysis

First, epidemiological trends in obstetric listeriosis, neonatal listeriosis and adverse fetal-neonatal outcomes were analyzed during the study period, using the entire Spanish population (47 million in 2021, when the study ended) as reference. Rates were espressed per 100,000 annual deliveries. Poisson regression and the linear-by-linear trend test were used to evaluate yearly changes in the number of hospital admissions, along with the rates of obstetric and neonatal listeriosis and adverse fetal-neonatal outcomes.

Second, we described the characteristics of the study population, the extent of *Listeria* involvement, and the specific features and outcomes associated with pregnancy and the perinatal period. Categorical variables were reported as frequencies and percentages, while continuous variables were presented as mean and standard deviations. Between-group differences were determined via the Chi-square or Student's *t*-test, as appropriate.

Binary logistic regression analyses were performed to identify factors associated with major fetal outcomes, considering age, multiple gestation, immunosuppression, and listeriosis involvement for miscarriages, and chorioamnionitis for both intrauterine death and stillbirth. Additionally, age, sex, immunosuppression, listeriosis involvement, and perinatal features were included as variables in the model for neonatal death as the major outcome.

Third, a one-by-one binary logistic regression analysis assessed the impact of listeriosis on each fetal and newborn outcome, including miscarriages, IUGR, intrauterine death, preterm labor, fetal distress, cesarean section and stillbirth. Age, multiple gestation, maternal tobacco consumption, and maternal obesity were included in the models. Perinatal outcomes could not be analyzed, since the database lacks key maternal and gestational details needed for proper statistical adjustment.

All statistical analyses were performed using SPSS version 26.0 (IBM, Madrid, Spain). Only values below 0.05 were considered statistically significant.

Ethics

The study was approved by the local research ethics committee (UNIR CEI ref. PI035/2024) and complies with the Declaration of

Table 1
Main features of the population with pregnancy-related listeriosis.

	Obstetric listeriosis	Neonatal listeriosis
Patients (N, %)	540 (6.6)	450 (5.5)
Female (n, %)	540 (100)	217 (48.2)
Age (years, mean, SD)	32.9 (5.5)	0
Immunosuppressed (n, %)	3 (0.6)	3 (0.7)
Listeria involvement		
Bacteremia (n, %)	42 (7.8)	12 (2.7)
Sepsis (n, %)	38 (7)	230 (51.1)
Meningoencephalitis (n, %)	6 (1.1)	134 (29.8)
Endocarditis (n, %)	0	0
Arteritis (n%)	33 (6.2)	0
Outcomes		
Length of admission (days) (mean, SD)	7.9 (5)	23.4 (20.3)
Death (n,%)	0	44 (9.8)

SD: Standard deviation.

Helsinki. Data were provided by the Ministery of Health after all potential patient identifiers had been removed, and all data were anonymized. According to Spanish law, informed consent was not required for the study (LOPDGDD 3/2018).

Results

Between January 1st, 2000, and December 31st, 2021, 8152 hospital admissions with a diagnosis of *L. monocytogenes* were recorded nationwide, as described elsewhere [21]. Among these, 540 (6.6 %) corresponded to obstetric listeriosis and 450 (5.5 %) to neonatal listeriosis (Table 1). Together, they resulted in 146 adverse fetal-neonatal outcomes, including miscarriages, intrauterine death, stillbirths, and perinatal deaths (Fig. 1).

During the 22-year study period, the incidence of obstetric and neonatal listeriosis admissions was 5.7 and 4.7 per 100,000 deliveries, respectively. The incidence of adverse fetal-neonatal outcomes in listeriosis-related hospitalizations was 1.5 per 100,000 deliveries. All three rates rose significantly from 2000–2021, with notable peaks in 2013–2014, and 2019 ($p < 0.005$) (Fig. 2).

Obstetric listeriosis

Table 1 summarizes the main features of patients admitted with pregnancy-related listeriosis. The mean age of pregnant women was 32.9 years, and only 3 were immunosuppresed. Importantly, no deaths were reported among these patients, whereas 17.8 % of those hospitalized with non-obstetric listeriosis died ($p < 0.001$).

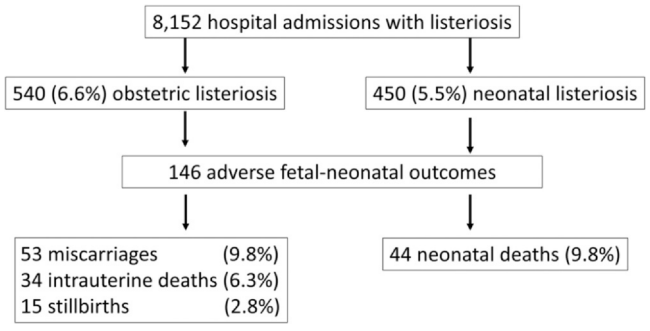

Fig. 1. Obstetric and neonatal listeriosis outcomes in Spain since 2000–2021. *Footnote: The figure shows the obstetric and neonatal listeriosis cases and outcomes in Spain since 2000–2021.*

Regarding clinical involvement, women with obstetric listeriosis had bacteriemia in 7.8 % of cases, sepsis in 7 %, and meningoencephalitis in 1.1 %. No cases of endocarditis were diagnosed.

Clinical obstetric features and outcomes in women admitted with obstetric listeriosis are detailed in Table 2. Multiple gestation was identified in 23 (4.3 %) pregnancies. During admission, 53 (9.8 %) experienced miscarriage, 34 (6.3 %) intrauterine death, and 8 (1.5 %) were diagnosed with IUGR. Overall, 254 deliveries took place, of which 202 (77.7 %) involved chorioamnionitis, 153 (60.2 %) preterm labor, 100 (39.4 %) fetal distress, and 140 (55.1 %) required cesarean section. As a result, 240 (94.4 %) were live births, while 15 (5.9 %) were stillbirths.

In summary, adverse fetal and neonatal outcomes, including miscarriage, fetal loss, and stillbirth occurred in 102 pregnancies overall (18.9 %). After adjustment, miscarriages were related to bacteremia (OR=2.46, 95 % CI: 1.07–5.64), and marginally with meningoencephalitis (OR=5.22, 95 % CI: 0.93–29.33). Chorioamnionitis (OR=3.42, 95 % CI: 1.74–6.72) was the only condition independently associated with intrauterine death and stillbirth.

Neonatal listeriosis

Overall, 48.2 % of newborns with neonatal listeriosis were female (Table 1). Immunosuppression was identified in three newborns. Regarding clinical involvement, 2.7 % developed bacteremia, 29.8 % meningoencephalitis, and 51.1 % sepsis. No cases of endocarditis or arteritis were identified. In-hospital mortality was 9.8 %.

Clinical features, complications, and outcomes of newborns with listeriosis are shown in Table 3 **and** Fig. 1. Overall, 265 (58.9 %) were premature, 18 (4 %) extremely premature, 67 (14.9 %) presented with LBWGA, 121 (26.9 %) ARDS, 29 (6.4 %) congenital pneumonia, and 119 (26.9 %) jaundice. After adjustment, ARDS (OR=2.76, 95 % CI: 1.39–5.46) and prematurity (OR=5.07, 95 % CI: 1.68–15.32) were associated with perinatal death in newborns with listeriosis.

Impact of listeriosis on fetal and newborn features and outcomes

We performed a multivariate analysis of all hospital admissions for pregnant women in Spain to estimate the impact of listeriosis on fetal and newborn outcomes (Fig. 3). In total, 10,389,077 admissions were included, along with 8096,725 declared newborns. Maternal listeriosis was associated with a significantly increased risk of miscarriage (OR=1.75, 95 % CI: 1.33–2.31), intrauterine death (OR=17, 95 % CI: 11.94–24.21), preterm labor (OR=8.78, 95 % CI: 7.27–10.60), fetal distress (OR=2.10, 95 % CI: 1.70–2.59), cesarean section (OR=1.68, 95 % CI: 1.39–2.03) and stillbirth (OR=23.57, 95 % CI: 17.82–31.19). Overall, maternal listeriosis was independently associated with adverse fetal–newborn outcomes (OR=3.76, 95 % CI: 3.06–4.62).

Discussion

We have described the epidemiology, clinical features and outcomes of pregnancy-related listeriosis in one of the largest reported series [3,10,11]. Our nationwide population-based study included 540 obstetric and 450 neonatal listeriosis cases with hospitalization in Spain over 22 years. Overall, our findings emphasize the rising incidence and substantial impact of listeriosis on fetal outcomes [2,3,10].

The incidence and outcomes of obstetric and neonatal listeriosis in Spain are similar to those reported in other European and Western countries [6,8,9,13]. Interestingly, Spanish data are scarce, typically derived from single center experiences, and are frequently overlooked in national reports [13,22–28]. Our study demonstrates that both the incidence and prognosis have worsened in the past two decades, despite the Spanish Government's 2015 mandate designating listeriosis as a notifiable disease, in accordance with European

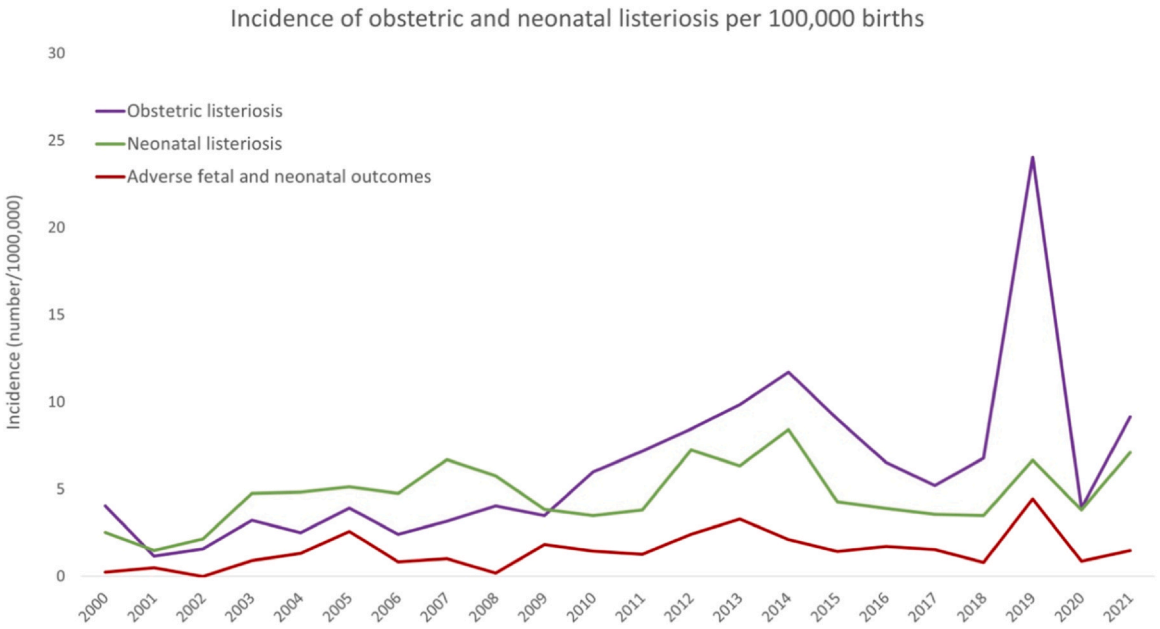

Fig. 2. Obstetric and neonatal listeriosis incidence per 100,000 deliveries in Spain since 2000–2021. *Footnote: The figure shows the incidence of obstetric listeriosis, neonatal listeriosis, and adverse fetal and neonatal outcomes per 100,000 deliveries in Spain.*

Table 2
Main obstetric features of listeriosis and outcomes.

	Overall
Patients (N, %)	540
Multiple gestation (n, %)	23 (4.3)
Corioamnionitis (n, %)	202 (37.4)
Obstetric outcomes	
Miscarriage (n, %)	53 (9.8)
Intrauterine death (n, %)	34 (6.3)
Intrauterine growth retardation (n, %)	8 (1.5)
Deliveries (n, %)	254 (47)
Chorioamnionitis (n, %)	220 (77.7)
Preterm labor (n, %)	153 (28.3)
Fetal distress (n, %)	100 (18.5)
Cesarean section (n, %)	140 (25.9)
Stillbirth (n, %)	15 (2.8)
Newborn (n, %)	240 (44.4)

Table 3
Main clinical features of neonatal listeriosis and outcomes.

	Overall	Death newborn	Non-death newborn	p-value
Patients (N, %)	450	44 (9.8)	406 (90.2)	-
Female (n, %)	217 (48.2)	19 (43.2)	198 (48.8)	0.527
Immunosuppressed (n, %)	3 (0.7)	0	3 (0.7)	1
Listeria involvement				
Bacteremia (n, %)	12 (2.7)	0	12 (3)	0.617
Sepsis (n, %)	230 (51.1)	29 (65.9)	201 (49.5)	0.04
Meningoencephalitis (n, %)	134 (29.8)	7 (15.9)	127 (31.3)	0.037
Endocarditis (n, %)	0	0	0	-
Arteritis (n, %)	0	0	0	-
Congenital pneumonia (n, %)	29 (6.4)	4 (9.1)	25 (6.2)	0.512
Neonatal clinical features and outcomes				
Premature (n, %)	265 (58.9)	40 (90.9)	225 (55.4)	< 0.001
Extreme premature (n, %)	18 (4)	12 (27.3)	6 (1.5)	< 0.001
LBWGA n, %)	67 (14.9)	11 (25)	56 (13.8)	0.071
ARDS (n, %)	121 (26.9)	26 (59.1)	95 (23.4)	< 0.001
Jaundice (n, %)	119 (26.4)	8 (18.2)	111 (27.3)	0.213

LBWGA: Low birth weight for gestational age. ARDS: Acute respiratory distress syndrome.

Commission regulations [6,29,30]. Notably, the surge in incidence and mortality observed since the 2000s appears to be largely driven by infection in high-risk groups, including pregnant women [13,24,25,27,28,31–33].

A more thorough analysis of pregnancy-related listeriosis epidemiology during the study period revealed several important findings. First, the incidence of obstetric listeriosis increased more markedly after 2009 likely due to highetened awareness following the recognition of several listeriosis outbreaks in northern Spain [13,25,33,34]. Consequently, listeriosis was more frequently tested for and diagnosed in pregnant women. Conversely, this increased awareness of pregnancy-related listeriosis may have slowed the rising incidence of neonatal listeriosis after 2009. Unfortunately, it did not reduce adverse fetal and neonatal outcomes. Second, admissions for pregnancy-related listeriosis rose steadily from 2000 to 2013–2014, prior to its designation as a mandatory notifiable disease [6]. Rates continued to climb until 2019, when a large outbreak occurred in Andalusia, affecting 15 pregnant women [31]. Overall, the increased incidence of pregnancy related-listeriosis in Spain, as in countries such as France and the United States, can be partially explained by demographic changes in the population [3,10,14,35]. According to a 2019 review, the growing proportion of inmigrant Hispanic and African pregnant women in these countries, who often have distinct dietary habits and different socio-econocomic profiles, both linked to an elevated risk of LM transmission, may have contributed to this trend [7]. Moreover, changes in food safety regulations and improvements in health care practices focused on LM prevention may not be sufficiently effective or may present delayed or long-term results compared to endemic pregnant populations. Additionally, our study highlights that, contrary to the claims of Craig *et. Al.*, these epidemiological changes have had a significant clinical impact given the maternal and neonatal outcomes observed in our study [7].

In our study, we characterized the clinical features and outcomes of listeriosis in pregnant women and further evaluated its impact on

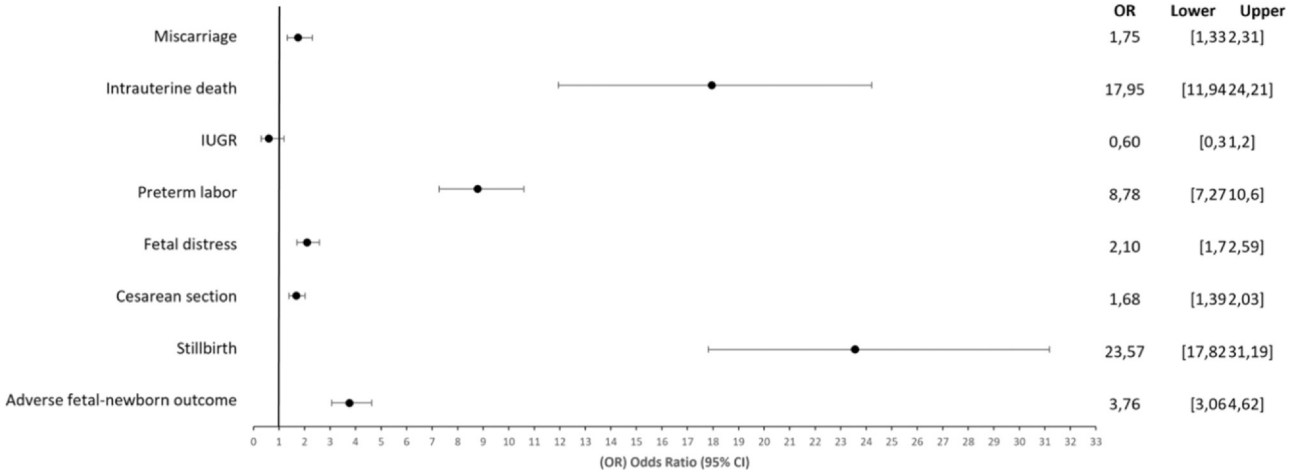

Fig. 3. Impact of obstetric listeriosis on fetal outcomes during pregnancy. *Footnote: Forest-plot of multivariable logistic regression on the impact of maternal listeriosis on fetal outcomes. Odds ratio are represented by squares and the lines correspond to 95 % confidence intervals. IUGR: Intrauterine grown restriction.*

fetal outcomes by comparing them to the general Spanish population. While maternal listeriosis generally carried a favorable prognosis, as reported previously [3,7,10,11], fetal and neonatal outcomes were concerning. Up to 19 % of pregnancies in women hospitalized with *Listeria* infection resulted in adverse fetal and neonatal outcomes. Although other researchers have documented comparable rates of miscarriages, intrauterine death, stillbirth, ARDS, prematurity, neonatal sepsis, and neonatal mortality, our study offers additional insight unto their pathogenesis [3,7,10,11]. For instance, maternal bacteremia was strongly associated with miscarriage, while neonatal ARDS and prematurity were linked to perinatal death. Moreover, chorioamnionitis emerged as pivotal factor in intrauterine death and stillbirth. In our cohort, *Listeria* infection of the chorion and/or amnion was identified in over three-quarters of pregnant women, accounting for the elevated rate of adverse fetal outcomes. Collectively, our findings underscore the need for aggressive obstetric monitoring and treatment, including prompt cesarean section following meticulous fetal viability assessment, in pregnant women with listeriosis who develop chorioamnionitis.

Finally, we evaluated the impact of maternal listeriosis on obstetric outcomes, generating findings that, to our knowledge, have not been previously reported. When compared to the general Spanish population, listeriosis during pregnancy was associated with a 4-fold increased risk in adverse fetal or newborn outcomes, including a 1.75-fold heightened risk of miscarriage, a 17-fold higher risk of intrauterine death, a 23-fold higher risk of stillbirth, a 8-fold higher risk of preterm labor and a 2-fold higher risk of cesarean delivery. These data underscore the profound effect of pregnancy-related listeriosis and emphasize the significance of maternal bacteremia, chorioamnionitis, neonatal ARDS, and prematurity on fetal and neonatal prognoses.

Overall, our findings underscore the rising incidence of pregnancy-related listeriosis and adverse fetal-neonatal outcomes in Spain since the 2000s. In the absence of active national preventive policies for listeriosis in pregnancy, our data highlights the pressing need to implement targeted surveillance and prevention programs on expectant mothers [13,15,16]. Education should be reinforced for pregnant women through healthcare personnel, including obstetricians, midwives, and primary care physicians, both during routine prenatal visits and via accessible written materials for at-home reference. Recommendations should focus on identifying high-risk foods potentially contaminated with *Listeria*, maintaining strict household hygiene practices, handling, chilling, and cooking food appropriately, and avoiding cross-contamination [36]. Such guidance must also emphasize the avoidance of frequently overlooked sources of *L. monocytogenes* infection, such as fresh cheese, raw meats, and smoked fish [15,23]. In addition, following the recommendations from French authors, it is vital to address unique dietary habits among specific cultural groups and minorities [3]. Finally, broather measures to prevent foodborne transmission and outbreaks from animal reservoirs, such as abstaining form feeding animals with spoiled produce, or silage in endemic areas, proper hygiene and sanitation on farms, conducting regular animal testing, facilitating prompt reporting, and disposing of contaminated waste properly [37]. This measures should be considered and encouraged at the national level.

Several limitations of our study should be acknowledged. First, the retrospective nature of the database, as well as the potential lack of certain data, entail intrinsic selection and reporting biases, that may partly explain discrepancies with some findings reported by the MONALISA prospective studies. Additionally, crucial information regarding disease course, treatment, and source of infection were not always accessible and could have strengthened our conclusions. For instance, data on the onset of neonatal listeriosis, which has proven to be key on listeriosis complications and neonatal prognosis, were unavailable [3,8]. Similarly, we could not determine a direct link between maternal and neonatal listeriosis cases, restricting certain analysis. Second, the database's structure only allows for exploration of associations between two variables (e.g. chorioamnionitis and neonatal outcomes), hindering the capacity to accurately identify potential causal relantionships. Further research is needed to elucidate both the associations and any causal links between *L. monocytogenes*, specific clinical factors, and obstetric or neonatal outcomes, as well as to clarify the temporal sequence of these events to inform preventive strategies. Third, we lacked detailed microbiological information for *Listeria* isolates, precluding genotype or serotype analyses; consequently, we could not evaluate the role of hypervirulent strains recently documented in Spain and France [38]. Only microbiologically confirmed cases were recorded in the SNHDD, and therefore retrieved and analyzed. In addition, our analysis was restricted to hospital admissions, potentially excluding clinically milder forms of listeriosis that did not require hospitalization. However, we consider this to be unlikely, given the intrinsic severity and risks associated with LM infection among pregnant women and newborns. Nevertheless, it should be acknowledged that our results could underestimate the number of listeriosis-related hospitalizations in Spain. Despite these limitations, our data are nationwide, span for over two decades and represent real world clinical practice. In this regard, the large sample size and the extended study period provide a robust foundation for our objectives.

Overall, our data underscore the significant public health implications of of pregnancy-related listeriosis in Spain.

In summary, the number of patients hospitalized with obstetric and neonatal listeriosis in Spain has significantly increased from 2000–2021. Pregnancy-related listeriosis imposes a substantial burden on fetal and neonatal outcomes, including miscarriages, fetal loss, stillbirth, neonatal death, and prematurity. Ongoing surveillance, prevention efforts, prompt diagnosis, and timely treatment for pregnant women with listeriosis and infected newborns should be prioritized. Moreover, stricter control against foodborne transmission and outbreaks stemming from animal reservoirs are imperative.

Ethical approval information

The study complies with the Declaration of Helsinki and was approved by the local research ethics committee (UNIR CEI ref. PI035/2024). The data were provided after all potential patient's identifiers had been deleted, and all data were given anonymously. According to the Spanish law, informed consent was not required for the study.

Patient and public involvement

None declared.

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Data availability

The data proceeds from a public registry from the Spanish National Hospital Discharge Database. All data are freely available. The database from the Spanish Ministry of Health can be accessed upon request. Data are anonymously given.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

Declaration of Generative AI and AI-assisted technologies in the writing process

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jiph.2025.102706.

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