



Awareness of listeriosis among Portuguese pregnant women



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ABSTRACT

In pregnant women listeriosis may cause abortion, foetal death or neonatal morbidity in the form of septicaemia and meningitis. Improved education concerning the disease, its transmission and prevention measures have been identified as a pressing need. The aim of this study was to evaluate the food safety knowledge and practices among pregnant women in Portugal, giving particular relevance to listeriosis. For this purpose, a written questionnaire was constructed and answered by 956 women. Half of the respondents considered they had received a sufficient amount of information on food safety during pregnancy. This information was mainly provided from their doctors, who were considered the most competent to give this information. Although 32.3% of women interviewed had not changed their habits of preparation and cooking foods after becoming pregnant, the greater the amount of information received the more effective the change of habits was. A significant number of women avoided the consumption of foods considered to be high risk, however, for 32.0% of these women these foods were only avoided in meals taken outside home. The amount of information received influenced the foods avoided. Only 12.2% of the women interviewed had heard about listeriosis and, 47.0% of these did not know about the problems it can cause. Women who have had three or more pregnancies were those that most frequently reported not having received information or having received little information. These women also demonstrated less knowledge about listeriosis. The larger number of pregnancies corresponded with less economic resources and less education of the respondents. Women showed plenty of interest in receiving information about listeriosis; doctors and written information in flyers or in the Pregnancy bulletin provided by the State Medical Service were the main sources of information referred. It appears that planning is required, to raise awareness amongst health professionals of the need for food safety education for pregnant women.

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1. Introduction

Listeria monocytogenes is a bacterium that causes a rare but severe disease in susceptible individuals with a mortality rate of 20–30% (Swaminathan & Gerner-Smidt, 2007), one of the highest among bacterial infections (EFSA & ECDC, 2014). Listeriosis was the most frequent cause of death due to the consumption of contaminated food in Europe (2008–2012) (EFSA & ECDC, 2014), and the third foodborne infection concerning illness cost and quality life losses in the USA (Hoffmann, Batz, & Morris, 2012).

Certain groups within the general population are particularly susceptible to infection, e.g. neonates, pregnant, elderly and cellular immuno-compromised individuals (Swaminathan & Gerner-Smidt, 2007).

Southwick and Purich (1996) and Ogunmodede et al. (2005) estimated that pregnant women have an infection risk twenty times higher than healthy adults. During pregnancy, cellular immunity is minimal (Scheule, 2004), making pregnant women particularly susceptible to intracellular microorganisms like *L. monocytogenes* (Ogunmodede et al., 2005). The vertical cell-to-cell transmission is frequent since *L. monocytogenes* shows uterus and placenta tropism (DiMaio, 2000; Ogunmodede et al., 2005). Poulsen and Czuprynski (2013) reviewed the immune response to *L. monocytogenes* infection during pregnancy.

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A survey of 782 listeriosis cases reported in 20 countries showed that 43% of the infections were related with pregnancy (FAO/WHO, 2004). Silk et al. (2012) reported that in the US 17% of invasive listeriosis cases from 2004 through 2009 were pregnancy-associated. Sisó et al. (2012) reported a four-fold increase in listeriosis rate during pregnancy over the last decade. In Portugal, listeriosis is a notifiable infection since only April 2014 and there is still no official surveillance system for the infection. Despite their being no cases of listeriosis in the country recorded in official reports (EFSA & ECDC, 2014), the threat of *L. monocytogenes* to public health is of a similar dimension to that in other countries (Almeida, Gibbs, Hogg, & Teixeira, 2006; Almeida, Morvan, Santos, Leclercq, Teixeira, & Research Team, 2010). 15% of the cases that occurred in Portugal between 1994 and 2007 were related to pregnancy (Almeida et al., 2010).

Infection by *L. monocytogenes* during pregnancy may result in serious outcomes including miscarriage, stillbirth, chorioamnionitis, pre-term delivery and maternal and neonatal sepsis (Lamont et al., 2011; Mylonakis, Paliou, Hohmann, Calderwood, & Wing, 2002). According to Silk et al. (2012) 29% of *Listeria* infections in pregnant women resulted in foetal loss or neonatal death. Listeriosis may produce sequelae, but the incidence rarely is determined. Up to 11% of neonates and 30% of patients that survive central nervous system infections, suffer from residual symptoms and psychiatric sequelae (Delgado, 2008; FAO/WHO, 2004; Platnaris et al., 2009).

Since listeriosis is transmitted primarily through consumption of contaminated foods (Swaminathan & Gerner-Smidt, 2007), and that there are gaps in knowledge about listeriosis among individuals included in at-risk groups, reduction in food contamination and education of at-risk individuals and of the professionals providing care for them, are proposed as key strategies in the reduction of the incidence of the infection (ILSI, 2005; Silk et al., 2012; Swaminathan & Gerner-Smidt, 2007). In fact, previous studies demonstrated that pregnant women were unfamiliar with listeriosis (Cates, Carter-Young, Conley, & O'Brien, 2004; Ogunmodede et al., 2005; Pereboom, Manniën, Spelten, Schellevis, & Hutton, 2013; Taylor et al., 2012) and few received information about food safety from their health care providers while pregnant (Bondarianzadeh, Yeatman, & Condon-Paoloni, 2007; Cates et al., 2004; Jevšnika, Hoyerb, & Rasporc, 2008). Although the reasons from this unawareness may be different for different populations, previous works refer the lack of written information targeted for pregnant women (Athearn et al., 2004; Scheule, 2004), lower education and household income (Bondarianzadeh et al., 2007) and health care providers not talking about food safety in general and risks of listeriosis during pregnancy in particular with their clients (Morales, Kendall, Medeiros, Hillers, & Schroeder, 2004; Kirkham & Berkowitz, 2010; Smith & MacLaurin, 2011; Taylor et al., 2012). Awareness of listeriosis among Portuguese pregnant women has not been investigated before and there are no official materials for education of higher risk groups and their health care providers about listeriosis prevention.

In this study we constructed a questionnaire to be administered to pregnant women in the last trimester of pregnancy, or women who had babies up to 3 months old; the main aims were to: identify the knowledge of these women about food safety in general and listeriosis in particular; recognise the information sources associated with the demonstrated knowledge; evaluate the impact of received information on food safety practices and behaviours; understand the influence of education level in the demonstrated knowledge; relate the number of pregnancies with the level of demonstrated knowledge; assess the best ways for transmission of food safety information to pregnant women.

2. Material and methods

The construction of the questionnaire was begun after considering the literature about food safety, listeriosis and transmission of information to pregnant women. Exploratory studies were conducted with two broad groups: pregnant women and mothers of one or two children. These studies consisted of meetings, some having been filmed for later viewing and analysis, with the aim of gathering information for the preparation of the draft of the exploratory interview. The exploratory interview was then tested on a total of 20 women who had been pregnant between 2 months and 3 years previously. The interviews were conducted either individually, sometimes in groups of 2, 3 or 4 women, interviewing a diverse group, taking into account age, number of pregnancies and education. Based on the results of these exploratory interviews, a draft questionnaire was developed, tested and reviewed by several women, especially with regard to the terms used and the types of questions to include. This has resulted in the final questionnaire, composed of a sequence of twenty-two questions (Annex I, Supplementary Information) of multiple choice or open-ended where respondents were asked to write the answers themselves.

The definition of the sample was one of convenience and included women between the third trimester of pregnancy and up to three months after delivery, when they should have acquired all the information on food safety during pregnancy.

The questionnaires were sent to several medical clinics, doctors' offices, pharmacies, health centres and hospitals. Only three hospitals answered and allowed their patients to complete the questionnaire: Bissaya Barreto Maternity in Coimbra, Alfredo da Costa Maternity in Lisboa, and Pedro Hispano Hospital Obstetrics Service, in Matosinhos. The questionnaire has also been posted on-line at Escola Superior de Biotecnologia da Universidade Católica Portuguesa Webpage.

Nationally, 956 women were surveyed, the vast majority (90.2%) in person and on-line in 9.8% of cases.

Statistical analysis was conducted using appropriate software (Statistical Package for Social Sciences - SPSS version 13.0) and focused on the construction of frequency tables, and, for the association tests on the construction of chi-square (χ^2). In these tests we were concerned to examine, first, the relative values, and also to demonstrate statistically significant associations resulting from a cross between categories of variables, with reference to the degree of error of less than 5% or statistical significance ($p < 0.05$) and associated test Cramer's *V*, varying between 0 and 1, which allows a reading of the intensity of association between variables. While there is no standardization in the reading of the values of this test, we consider here noteworthy associations over 0.300 (Pestana & Gageiro, 1998, pp. 91–99).

3. Results and discussion

The socio-demographic characterization of the participants is presented in Table 1.

3.1. Food safety information

When asked about food safety information received during pregnancy, half of the women believed they had received a sufficient amount of information. This had been provided primarily by doctors, nurses, magazines and/or childcare books, and via the Internet (Table 2). Similar sources of information had been reported in previous studies although at different levels of relevance (Bondarianzadeh et al., 2007; Jevšnika et al., 2008; Taylor et al., 2012). Views of the respondents were sought to ascertain whether the amount of information received was associated with

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