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Review article

Knowledge of age-related fertility decline in women: A systematic review

Désirée García[a], Sarai Brazal[a], Amelia Rodríguez[a], Andrés Prat[b], Rita Vassena[a,*]

[a] Clínica EUGIN, Barcelona 08029, Spain
[b] Department Medicine, School of Medicine, University of Barcelona, Spain

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ABSTRACT

Age-related fertility decline (ARFD) knowledge has been evaluated in the past decade, showing that there is a general knowledge of the reduction of fertility with age. Here we review the studies published up to date which quantitatively measure this ARFD knowledge, to answer the question: how aware about ARFD is our society? We searched the terms "age", "fertility knowledge", "fertility awareness", "reproduction knowledge", "reproductive knowledge" and "reproductive health knowledge" in PubMed, Web of Science, PsychINFO and Scopus, within January 2000 and December 2016. We found 41 studies that quantitatively measured ARFD knowledge by asking for the most fertile age for a woman and/or when there are a *slight* and a *marked* decrease in female fertility. We obtained this searching for the questions: *What is the most fertile age for a woman? (Q1). When there is a slight decrease in female fertility? (Q2) and, When there is a marked decrease in female fertility? (Q3).* We further evaluated the knowledge increase in the 6 studies assessing an educational intervention, 4 of them randomized controlled trials (RCT). Participants reporting the most fertile age for women to be at 20–24 y.o. ranged 16%–89.4% (Q1); participants reporting a *slight* decrease in female fertility at 25–29 y.o. ranged 5.1%–83% (Q2), and those reporting that a *marked* decrease occurs between 35–39 y.o. ranged 5.6%–60% (Q3). On the whole, the studies included in this review conclude that ARFD knowledge is insufficient, particularly in determining when female fertility *markedly* decreases. ARFD knowledge can be increased through targeted campaigns, but few interventional studies have been performed up to date. In view of these results, ARFD campaigns targeted to reproductive age people and healthcare providers are necessary; this would help the society to make informed reproductive decisions throughout life.

Contents

Introduction . . . 110
Materials and methods . . . 110
Search strategy . . . 110
Study selection . . . 110
Study screening . . . 110
Data collection . . . 111
Results . . . 111
Search results . . . 111
Most fertile age for a woman (Q1) . . . 111
Age when a slight decrease in female fertility occurs (Q2) . . . 111
Age when a marked decrease in female fertility occurs (Q3) . . . 111
Educational interventions performed . . . 113
Discussion . . . 113

* Corresponding author at: Clínica EUGIN, Travessera de les Corts 322, 08029 Barcelona, Spain.
E-mail address: rvassena@eugin.es (R. Vassena).

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Funding . . . 117
Conflict of interest . . . 117
Acknowledgements . . . 117
References . . . 117

Introduction

There is a loss of fertility with aging in both women and men, mainly due to the decrease of gamete's quantity and quality with the passage of the years [1]. In the case of women, a slight decrease in women's fertility has been estimated between the late 20s [2,3] and the early 30s [4–6] followed by a more marked decrease from the mid to late 30s [2,4,7–10]. Women's fertility comes to an end at a median age of 45 years; this is several years before menopause, [11], which occurs at a median age of 50 years [11,12].

A woman's advancing age is one of the most important nonmodifiable risk factors for suffering from infertility [13], i.e., the inability to conceive within a year of regular unprotected intercourse [14,15]. Infertility is mainly due to a decrease in fecundability, i.e. the probability to conceive within each menstrual cycle [16]. This probability ranges from 0% to 60% within a menstrual cycle [15] and up to 83% within a year [8]. Accordingly, a woman is presumed fertile until her fecundability falls to 0%, when a state of permanent sterility ensues [17]. Permanent sterility is estimated to be low before 30 (1–10%) [2,15,17–19], but closer to 50% at 41–42 [2,15,18]. Given its effect on gamete quality and quantity, age is again the main prognostic factor to achieve a pregnancy through IVF [20], as assisted reproduction technologies (ART) cannot fully compensate for the age-related infertility [11]. Stated otherwise, IVF adds to a natural pregnancy extra chances in couples between 30 and 40 but, in women over 40, both natural pregnancy rates and IVF success rates decrease drastically [21].

In contemporary high-income societies, age-related fertility decrease (ARFD) in women is particularly relevant because of societal tendencies to postpone childbearing until the 30 s or even the 40 s [22], leading in some cases to permanent involuntary childlessness (PIC) and smaller than desired family sizes [23]. This delay is in part attributable to the broad availability of effective contraception, and to the increase in women's education and labour market participation [24]. Another factor that might contribute to this trend is inaccurate ARFD knowledge [25], which mediates both a perception of control over long-lasting fertility [26], and a positive attitude towards delaying motherhood [27]. The aim of this review is to evaluate quantitatively the ARFD knowledge in the population.

Materials and methods

Search strategy

A literature search was performed following PRISMA guidelines [28] using the PubMed, Web of Science, PsychINFO and Scopus databases. Original papers published in scientific journals and written in English, French, Spanish, Italian and Portuguese were searched, with no country restriction. Timeframe was limited to January 2000December 2016. The search terms and selection strategy are listed in Table 1 and were used in all possible combinations. MeSH terms were used whenever possible. Additional studies were identified through the reference lists of included studies and from previous reviews.

Study selection

The papers retrieved following the first general search were evaluated based on title and abstract in order to exclude duplicates and those not focused on ARFD knowledge (by instance papers about sexuality, contraception, pregnancy and abortion). Because we aimed to evaluate ARFD knowledge in people not concerned by a medical condition or treatment threatening fertility (e.g. VIH, cancer), papers on gametes cryopreservation for medical reasons were also excluded. Inclusion and exclusion criteria are summarized in Table 1.

Study screening

Selected articles were full-text reviewed to determine if they evaluated ARFD qualitatively or quantitatively. Only papers evaluating the following questions quantitatively were retained:

Table 1
Search terms and selection strategy for systematic review about age related fertility decline (ARFD) in women knowledge.

Databases searched	PubMed, Web of Science, PsycInfo and Scopus
Search keywords (MeSH terms were used where appropriate)	age AND fertility knowledge OR fertility awareness OR reproduction knowledge OR reproductive knowledge OR reproductive health knowledge NOT contraception NOT abortion NOT HIV NOTcancer
Other sources checked	Additional studies were identified through references of included studies and previous reviews
Inclusion criteria of studies	(1) Published in scientific journals (2) ARFD knowledge quantitatively measured through some of these questions: Q1. What is the most fertile age for a woman? Q2. When there is a slight decrease in female fertility? Q3. When there is a marked decrease in female fertility? (3) English, French, Italian, Portuguese or Spanish languages (4) Publication date within 2000 and 2016
Exclusion criteria of selected studies	(1) Full article not available (2) Performed in patients with a medical condition or treatment threatening fertility (e.g. HIV, cancer)
Categories of studies	(1) Knowledge about women's ARFD in general population (2) Knowledge about women's ARFD in specific populations (3) Knowledge about women's ARFD after educational intervention