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Cervical mucus secretions on the day of intercourse: An accurate marker of highly fertile days

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Abstract

Objective: To provide estimates of the probabilities of conception according to vulvar mucus observations classified by the woman on the day of intercourse.
Study design: Prospective cohort study of 193 outwardly healthy Italian women using the Billings Ovulation Method. Outcome measures include 161 conception cycles and 2594 non-conception cycles with daily records of the type of mucus and the occurrences of sexual intercourse.
Results: The probability of conception ranged from 0.003 for days with no noticeable secretions to 0.29 for days with most fertile-type mucus detected by the woman. The probability of most fertile type mucus by day of the menstrual cycle increased from values <20% outside of days 10–17 to a peak of 59% on day 13.
Conclusion: Regardless of the timing of intercourse in the menstrual cycle, the probability of conception is essentially 0 on days with no secretions. This probability increases dramatically to near 30% on days with most fertile-type mucus, an association that accurately predicts both the timing of the fertile interval and the day-specific conception probabilities across the menstrual cycle.

Keywords: Cervical mucus; Conception; Fertile interval; Menstrual cycle; Ovulation; Pregnancy probability; Secretions

1. Introduction

For healthy women in their reproductive years, there are typically 6 days of the menstrual cycle during which intercourse has a non-neglible probability of resulting in a pregnancy; this ''fertile window'' comprises the five days before ovulation and the day of ovulation itself [1,2]. The timing of the six fertile days varies substantially from cycle to cycle, and highly reliable methods to prospectively predict the fertile window are thought to be lacking [3].

For women using natural family planning and fertility awareness methods, characteristic changes in vulvar mucus observations have long been used to predict the onset and end of the fertile interval [4]. Such methods have a well-established biological justification, because estrogenic-type cervical mucus secretions are known to increase in volume about 5–6 days prior to ovulation stimulated by an increase in estrogen [5,6]. Women can reliably identify amount and type of cervical mucus based on feeling and observation of vaginal discharge [7,8]. In addition, estrogenic-type mucus serves not only as a marker of the fertile days [9] but also as a direct predictor of conception success, because sperm are incapable of survival and transport to the ovum in the absence of sufficient levels of estrogenic-type mucus [10–12].

Although the role of cervical mucus is well known [13], such information is not widely used to identify days with high conception probabilities [14], and many clinicians instead recommend ovulation-detection kits. Unfortunately,

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the day of ovulation occurs after the 1–3 days of highest fertility in the cycle, and hence methods that predict the start of the fertile interval should be more efficacious. One such procedure is the Billings Ovulation Method [4], a well-established and validated [15] approach that relies on women's own observations of changes in vulvar mucus observations to predict fertile and infertile phases of the cycle.

This article uses data from a large prospective Italian study of couples using the Billings Ovulation Method to investigate the relationship between characteristics of vulvar mucus observations on the day of intercourse, as recorded by the woman, and the probability of conception. The goal of this study is to evaluate the extent to which vulvar mucus observations predict the timing of the fertile interval and the day-specific probabilities of conception across the menstrual cycle. Previous studies were unable to properly address this question due to under-reporting of intercourse [15,16] or to missing mucus data early and late in the cycle [17–19].

2. Materials and methods

Data are drawn from an Italian study of daily fecundability [20], which enrolled women from four centers providing instruction in use of the Billings Ovulation Method of natural family planning [4]. Information on the study was provided at the participating centers, and women were invited to enroll by their instructors if they satisfied the entry criteria. During 1993–1997, 193 women were recruited. The protocol was approved by the International Review Board of Fondazione Lanza (Padua, Italy).

Entry criteria included: experienced in the use of the Billings Method, married or in a stable relationship, between 18 and 40 years of age, had at least one menses after cessation of breastfeeding or after delivery, and not taking hormonal medication or drugs affecting fertility. In addition, neither partner could have known permanent infertility or illnesses that might cause sub-fertility. It was also required that couples did not regularly use condoms or other barrier methods, and cycles in which such methods were used were discarded from the analysis.

Although many of the women in the study were initially attempting to avoid conception through the use of the Billings method, intentions often changed as the study progressed, with avoiders becoming achievers. Study investigators encouraged women planning to start a pregnancy attempt to enroll in the study in order to increase efficiency in estimating day-specific pregnancy probabilities and to avoid differential selection of infertile couples. Many of these women had a recent pregnancy, had just stopped breastfeeding, and were planning another attempt. This sample has some differences from previous studies, which focused primarily on couples discontinuing use of hormonal contraceptives prior to the pregnancy attempt [1].

At enrollment the women were given a questionnaire to obtain demographic and reproductive history information. The women were then followed prospectively as they collected detailed daily records of menstrual bleeding, vulvar mucus observations, and acts of vaginal–penile intercourse. The Ovulation Method is based on self-classification of characteristic changes in vulvar mucus observations during the fertile and infertile phases of the cycle. The women had received training at the study centers on how to identify different types of mucus symptom, and were strict follower of the "official" Billings Method. The four Centers classified each day of women's cycles according to a five point scale. As discussed in Colombo et al. [20], the two most fertile types of mucus symptom are very similar clinically. Therefore, we collapsed these into one category and used the four point scale described in Table 1. Higher scores indicate higher levels of estrogenic-type mucus and hence conditions more conducive to sperm survival and transport.

Day 1 of the menstrual cycle was defined by the first day of fresh red bleeding, excluding any previous days with spotting. For purposes of the study, the main outcome measure was clinical conception, defined as an ongoing pregnancy at 60 days from the onset of the last menses. Clinically detected miscarriages were also recorded. Cycles were excluded from the analysis as non-informative if there were no reported intercourse acts or if mucus symptom was not recorded on a day with intercourse, excluding days with menstrual bleeding. Out of 2755 cycles of data with 177 conceptions, 2536 cycles from 191 women remained, including 161 conception cycles. A simple analysis on cycles excluded turned out that no selection was made for that, and that these records are missing at random. In contrast to the recent study of Bigelow et al. [19], which only had mucus data for a limited mid-cycle interval, we had complete mucus symptom records across the cycle. Only on a day following one on which intercourse occurred, any observation of the mucus was generally deliberately omitted, due to the risk of confusion deriving from the

Table 1
Classification of mucus symptoms from vaginal discharge

Code	Sensation	Appearence
1	No sensation or dry sensation	No substantial discharge nor any noticeable mucus
2	Slightly moist	No substantial discharge nor any noticeable mucus
3	Damp sensation	Thick, creamy, whitish, yellowish, sticky, stringy mucus
4	Wet slippery sensation	Clear, stringy (or stretchy), fluid, watery mucus, blood trails

Note: If during a day there are different observations of the mucus symptom, the coding is determined by the most fertile type.