Use of cycle length alone to predict ovulation, as utilized by some Apps, is highly inaccurate

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Introduction

- Women trying to conceive will often use methods to time intercourse
- In October 2017, we found 55 free Apps that predicted ovulation based on cycle length alone
- This study sought to determine whether accurate prediction is possible based only on cycle length characteristics

Methods

This was an observational study (NCT01577147) of women >18 years old who were seeking to conceive (N=850). Volunteers collected daily urine samples for quantitative measurement of luteinizing hormone (LH) (AutoDELFIA®, Perkin Elmer), with day of ovulation determined as the day following the LH surge. A probability map ovulation day for each cycle length was generated using the data from the urine samples. As Apps do not publish the method they use to predict ovulation and fertile phase, published calendar-based methods were applied to the clinical data in order to determine accuracy of app predictions.

These predictive methods were:

- Standard days method: days 8–19 considered fertile days[1]
- Rhythm method: fertile period starts on day [x–18] and ends on day [y–11], where x is the shortest and y is the longest cycle in the last 6 months[2]
- The alternative rhythm method: fertile days start on day (½x–5) and last for (y–x+8) days, where x is the shortest and y is the longest cycle in the last 6 months[3]
- Simple calendar method, which subtracts 14 and 15 days from the last cycle length to give the peak fertility days[4]

Results

For each cycle length there was a wide spread of possible days of ovulation (figure 1). For a 28-day cycle, day 16 was most common (21%), range 11–20.

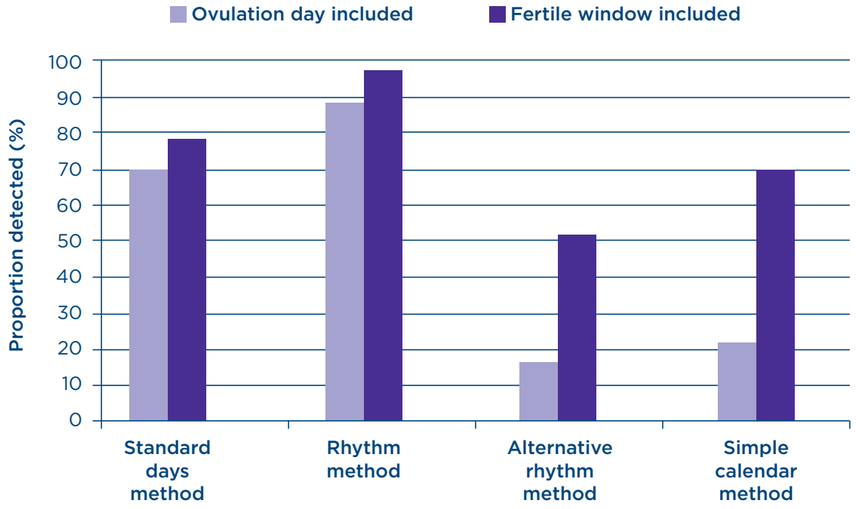
Figure 1: Ovulation probability map for any given cycle length

Actual cycle length	Mean	SD	N	Probability of ovulating on this day																							
				7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
23	13.15	2.41	13	1%	2%	4%	7%	11%	15%	17%	16%	12%	8%	5%	2%	1%	0%	0%	0%	0%	n/a	n/a	n/a	n/a	n/a	n/a	n/a
24	13.16	1.99	37	0%	1%	2%	6%	11%	17%	20%	18%	13%	7%	3%	1%	0%	0%	0%	0%	0%	0%	n/a	n/a	n/a	n/a	n/a	n/a
25	13.72	1.81	69	0%	0%	1%	3%	7%	14%	20%	22%	17%	10%	4%	1%	0%	0%	0%	0%	0%	0%	0%	n/a	n/a	n/a	n/a	n/a
26	14.22	1.51	83	0%	0%	0%	1%	3%	9%	19%	26%	23%	13%	5%	1%	0%	0%	0%	0%	0%	0%	0%	0%	n/a	n/a	n/a	n/a
27	15.14	1.71	118	0%	0%	0%	0%	1%	4%	11%	19%	23%	21%	13%	6%	2%	0%	0%	0%	0%	0%	0%	0%	0%	n/a	n/a	n/a
28	15.76	1.91	119	0%	0%	0%	0%	1%	3%	7%	14%	19%	21%	17%	10%	5%	2%	0%	0%	0%	0%	0%	0%	0%	0%	n/a	n/a
29	16.77	1.61	74	0%	0%	0%	0%	0%	0%	2%	6%	14%	22%	25%	19%	9%	3%	1%	0%	0%	0%	0%	0%	0%	0%	0%	n/a
30	17.56	1.75	73	0%	0%	0%	0%	0%	0%	1%	3%	8%	15%	22%	22%	16%	9%	3%	1%	0%	0%	0%	0%	0%	0%	0%	0%
31	18.87	2.26	61	0%	0%	0%	0%	0%	0%	1%	2%	4%	8%	13%	16%	18%	16%	11%	7%	3%	1%	0%	0%	0%	0%	0%	0%
32	19.23	1.50	31	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%	9%	19%	26%	23%	13%	5%	1%	0%	0%	0%	0%	0%	0%	0%
33	20.55	2.02	38	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	4%	9%	15%	19%	19%	15%	9%	5%	2%	1%	0%	0%	0%	0%
34	21.60	1.63	35	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	7%	15%	23%	24%	17%	8%	3%	1%	0%	0%	0%	0%
35	21.82	2.51	17	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	2%	5%	8%	12%	15%	16%	14%	11%	7%	4%	2%	1%	0%	0%

The clinical data was then applied to each of the calendar methods to determine both the probability of day of ovulation and the probability of any fertile day (days –5 to 0, relative to day of ovulation) being included in the App predictions by comparing against the actual day of ovulation determined through urinary LH testing.

The most accurate calendar method was the rhythm method which included ovulation day in 89% of predictions, but provided an average fertile window of 11 days, whereas the simple calendar method provided a 2-day window, but only included ovulation day in 22% of predictions (figure 2).

Figure 2: Probability of determining the ovulation day and fertile window using calendar-based Apps



Methods that provided better prediction only did so because they gave the user a broader fertile window: rhythm method, 11 days (range 8–64 days); standard days method, always 12 days; alternative rhythm method, 4 days (range 0–63 days); simple calendar method, always 2 days.

Conclusions

- The only way cycle length alone can be used to predict ovulation is by providing a very wide window of potential fertile days, which is no more effective in achieving pregnancy than frequent intercourse
- Therefore, Apps using cycle length alone are either providing inaccurate or imprecise information
- If women wish to time intercourse to enhance their chance of pregnancy, they should use a true prospective method such as home ovulation tests

References

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Declaration of interest

This study was funded by SPD Development Company Limited, a wholly owned subsidiary of SPD Swiss Precision Diagnostics GmbH, the manufacturers of Clearblue™ pregnancy and ovulation tests. Sarah Johnson and Lorrae Marriott are employees of SPD Development Company Limited. For professional audiences only.