

# Variability in the Length of Menstrual Cycles Within and Between Women - A Review of the Evidence



## Key Points

- Mean cycle length ranges from 27.3 to 30.1 days between ages 20 and 40 years, follicular phase length is 13-15 days, and luteal phase length is less variable and averages 13-14 days<sup>1-3</sup>
- Menstrual cycle lengths vary most widely just after menarche and just before menopause primarily as cycles are anovulatory<sup>1</sup>
- Mean length of follicular phase declines with age<sup>3,11</sup> while luteal phase remains constant to menopause<sup>8</sup>
- The variability in menstrual cycle length is attributable to follicular phase length<sup>1,11</sup>

## Introduction

Menstrual cycles are the re-occurring physiological changes that happen in women of reproductive age. Menstrual cycles are counted from the first day of menstrual flow and last until the day before the next onset of menses. It is generally assumed that the menstrual cycle lasts for 28 days, and this assumption is typically applied when dating pregnancy. However, there is variability between and within women with regard to the length of the menstrual cycle throughout life. A woman who experiences variations of less than 8 days between her longest and shortest cycle is considered normal. Irregular cycles are generally defined as having 8 to 20 days variation in length of cycle, whereas over 21 days variation in total cycle length is considered very irregular.

The length and variability of menstrual cycles have been widely studied, and the findings of these studies are all very similar. Indeed, our findings of mean cycle length  $27.7 \pm 3.4$  days<sup>12</sup> are consistent with those of Cole<sup>11</sup>,  $27.7 \pm 2.4$  days and within the ranges in cycle lengths previously published<sup>2,3,9,13-15</sup>.

Variability in menstrual cycle length appears to be greatest at intervals immediately after menarche and shortly before menopause, which last between 2-5 years in each case. Both intervals are characterised by an increased frequency of both very long and very short cycles and, consequently, an increased range of cycle lengths. Cycle length between 20-40 years of age exhibit considerably less variability, although the population mean cycle length shortens from 30.1 to 27.3 days over these two decades<sup>1</sup>.

## Follicular and luteal phase lengths – variability of menstrual cycle attributable to follicular phase

### Key Points

- Follicular phase length averages 13-15 days<sup>1,11,12</sup>
- Luteal phase length averages 13-14 days<sup>1-3</sup>
- Follicular phase shows much greater extent of variation in length than the luteal phase<sup>1,11,12</sup>
- Mean length of follicular phase declines with age<sup>3</sup>
- Luteal phase remains constant to menopause<sup>8</sup>
- The variability in menstrual cycle length is attributable to follicular phase length<sup>1,11,12</sup>

The menstrual cycle is divided into two phases, follicular and luteal. The follicular phase begins at the onset of menses and during this phase there is thickening of the endometrium and recruitment and maturation of dominant ovarian follicles. It ends at ovulation, which is triggered by the LH surge, whereupon the luteal phase begins. During the luteal phase the follicle becomes a corpus luteum. If conception does not occur, the corpus luteum disintegrates and menstruation occurs. The luteal phase ends with the onset of menstruation and the next follicular phase begins.

Many studies have been conducted on the lengths of the follicular and luteal phases and report relatively consistent findings. However, the methods used to assess ovulatory status, the rules used to define the start of the luteal phase, and differences in eligibility criteria create slight disparities in phase length estimates between studies. Several investigators restricted their samples to ovulatory cycles within a defined range of menstrual cycle lengths<sup>2,3</sup>. Also, the division of the menstrual cycle into the follicular or luteal phase was accomplished using a variety of techniques including use of the peak day of cervical mucus<sup>4</sup>, daily plasma hormonal profiles from women with “regular” cycles<sup>2,3</sup>, urinary hormone analysis<sup>11,12</sup> and basal body temperature changes<sup>5</sup>. Some of these methods (hormonal measurements) are much more accurate than others (cervical mucus and temperature) for identifying ovulation.

Our study<sup>12</sup> used menstrual diaries and measurement of LH in daily urine samples to identify LH surge. Mean follicular phase length was  $14.5 \pm 3.4$  days and mean luteal phase length was much more consistent at  $13.2 \pm 1.9$  days. There was significant correlation ( $r^2=0.7$ ) between follicular phase and total cycle length, whereas the luteal phase showed no association. Again these findings are consistent with Cole<sup>11</sup> who reported follicular phase length of  $14.7 \pm 2.4$  days and luteal phase of  $13.2 \pm 2.0$  days.

In the studies that excluded long cycles, the follicular phase varied in length from approximately 10 to 23 (mean 13-15) days and the luteal phase from 8 to 17 (mean 13-14) days. Inclusion of the longer cycles yielded much longer estimates for the follicular phase (mean 17 to 18 days), but had little effect upon the length of the luteal phase<sup>1</sup>. The major source of cycle length variability was attributable to the follicular phase, and the increased frequency of very short cycles late in reproductive life also appeared to be attributable to short follicular phases.

Mean length of the follicular phase declines with age, from about 14.2 days at age 18-24 to about 10.4 days at 45-60 years, whereas chronological age has only a small effect with regard to shortening the luteal phase, which tends to occur more frequently at either end of the reproductive spectrum<sup>3</sup>. Once reproductive maturity has been attained, luteal phase length remains relatively constant through to menopause<sup>8</sup>. Other factors reported to affect follicular phase length include smoking and exercise, but these appeared to have no effect upon the luteal phase<sup>10</sup>.

Several other studies have also concluded that the follicular phase is the source of variation in menstrual cycle length<sup>2,3,9,16,17</sup>. It is thought that this variation is attributable to the follicular selection system that occurs in the human female reproductive system, where there is competition between oocytes to become the primary oocyte<sup>18</sup>.

## Conclusion

While there is variation with regard to total menstrual cycle duration between and among women, this variation appears to primarily result from variations in the early, follicular phase of the cycle, while the duration of the luteal phase remains relatively constant. Gestational aging using last menstrual period will include the variability of the follicular phase, so can be inaccurate by several days. Given that the luteal phase begins with the LH surge (and ovulation), estimates of gestational age from this are more accurate.

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