



ASSESSMENT OF FACTORS MODULATED DURING MENSTRUAL PERIOD; A WAY TO PREDICT TIMING OF MENSTRUAL PHASES

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ABSTRACT

The menstrual period is one of the important cycles associated with female reproductive system. This cycle mainly regulated by endocrine system during reproductive age of female (from puberty to menopausal age). Hormones like; estradiol, follicular stimulating, progesterone and luteinizing hormones govern physiology of menstrual cycle. Effects of these hormones alter biochemical and physiological responses of body. Sometimes this alteration may take places just before ovulation period followed by menstrual bleeding, at this time women require lot of attentiveness. Therefore any techniques that can predict expected starting time of menstrual bleeding would help greatly to enhance quality of life of women suffered with infrequent menstrual bleeding. Present article summarizes some parameters that modulate during or before menstrual bleeding and these parameters can serve as alarming tool to predict timing of menstrual bleeding.

KEYWORDS: *Menstrual cycle, menstrual bleeding, luteinizing hormones, menopause.*

INTRODUCTION

The menstrual cycle is a period of approximately 28 days that occurs in female of reproductive age groups and mainly governs through the various hormonal systems. The hormonal system not only regulates various phases of this cycle but also block menstrual cycle during pregnancy period. The ovulation takes places during middle of the 28th days of menstrual cycle. There are some abnormalities associated with menstrual cycle like; amenorrhea, metrorrhagia, menorrhagia and hypermenorrhea.^[1,2] The abnormal menstrual functioning may leads temporary or permanent infertility.

Pathological Conditions Associated with Menstrual Period^[3-5]

The endocrine structure formed by ovulating follicle is called corpus luteum that produces progesterone and estradiol, the maximum effects observed following to 6 days of ovulation. It is believed that decrease in ovarian follicle numbers and irregularity in cycle onset sometimes leads complete cessation of menses. The genetic factors can also affect age of natural menopause.

The premature ovarian failure another pathological condition associated with abnormal menstrual cycle, it is believed that around 1% of women below 40 years of age suffered with this condition globally. The condition

involves disturbed ovarian functioning due to the diminution of primordial follicle pool before age 40 years. Genetic defects, autoimmune abnormalities and infections, etc. may be considered responsible for premature ovarian failure.

Similarly infrequent menstrual cycle (oligomenorrhea) found in women of reproductive age as pathological condition that is mainly involves abnormalities of endocrine system.

Endometriosis occurs when endometrial tissue misplaced and developed as lesions in respond to hormonal changes.^[3-5]

These all pathological conditions may cause irregularity in ovulation and bleeding time that can affect quality of life significantly. Considering these all aspect we are here summarizing some factors that may help to track various phases of menstrual cycle.

Biological Changes related to Menstrual Cycle

The research study conducted by *Hagemann et. al.* (2011) revealed variation in brain morphology during the menstrual cycle. Study observed rise in grey matter volume at the time of ovulation and this rise in grey matter volume was found to be unaffected by the hormonal levels of estradiol or progesterone.^[6]

Another study revealed correlation between menstrual cycle and environmental conditions especially for women migrated from different socioeconomic status. Study observed early age of menstrual bleeding in women who had migrated towards good socioeconomic country during infancy or early childhood (up to 8 years). The progesterone level varies depending upon dietary or life style pattern and these factors govern by socioeconomic status of human being. Thus variation in menses observed in women migrated from poor country to developed country.^[7]

Temperature Modulation Associated with Menstrual Cycle

The body temperature fluctuate during menstrual cycle, temperature rises and falls in respond to hormonal changes. The fluctuation in temperature is very slight but significant enough to predict timing of ovulation or bleeding period.

Modulation in Hematological and Biochemical Parameters during Menstrual Cycle

The menstruation cycle involves modulation in various hematological and biochemical parameters. A study observed significant changes in hematological and biochemical parameters during menstrual cycle, these changes are as follows:

- ❖ RBC count may decreases in menstrual phase as compared to other phases of cycle.
- ❖ Leucocyte count increases in follicular phase and decreases in luteal phase.
- ❖ Platelet count may increases in follicular phase as compared to other phases.
- ❖ Erythrocyte sedimentation rate increases in menstrual phase.
- ❖ Serum magnesium levels may reaches up to maximum level during luteal phase and it reduced to minimum level during follicular phase.
- ❖ Calcium level in serum rises in follicular phase than other phases of cycle.
- ❖ The sodium levels in serum decreases in luteal phase as compared to other phases of menstrual cycle.

The body speed up process of erythropoiesis to compensate blood loss that occurs during menses, the increased rate of erythropoiesis enhances hemoglobin count in menstrual phase & luteal phase. Effect of progesterone believed to reduce sodium and water level in luteal phase. The changes in blood estrogen and effect of blood gonadotrophic hormone may be considered responsible for the changes in circulating leucocyte count during menstrual cycle. The leuteal hormone inhibits releasing of platelets from spleen which resulted gradual decline in platelet count. The serum calcium levels increases during follicular phase may be due to the effect of estrogen on parathyroid glands. The serum level of magnesium increases in luteal phase and reduced in follicular phase, this decline may be due to the effect of

estrogen on activity of parathyroid hormone that decreases reabsorption of magnesium by renal tubules.^[8]

Metabolic Pattern during Menstrual Cycle

A study reported that amount of amino acids and lipid derivatives decreases in luteal phase which may be considered as an indicative of anabolic state that acts as recovery process. The rate of metabolism of amino acid, carbohydrate, lipid and vitamin differ in various phases of menstrual cycle. The metabolic rate decreases in luteal phase as compared to menstrual and follicular phases. Endometrial biosynthesis and high energy utilization reduces biomarkers in luteal phase. Increased protein biosynthesis and progesterone's upregulation affect rate of amino acid metabolism during different phases of cycle. The anabolic effect decreases lipids in luteal phase may be due to the high utilization of fat for steroid biosynthesis. It is believed that anabolic use for thickening of endometrial tissue decreases phosphatidylcholines and lysophosphatidylcholines levels in luteal phase. It is also believe that changes in levels of sex hormones may alter signaling of endocannabinoid. These changes sometime may affect physiology of central nervous system (CNS) due to the high abundance of endocannabinoids in CNS.

Cholesterol is the main component involved in synthesis of sex hormones and utilized mainly in luteal phase for the synthesis of progesterone and estrogen. The concentrations of triglyceride reduced in luteal phase, inositol reduces in luteal phase due to the high anabolic requirement for pregnancy preparation. The reduced glucose level in luteal phase may also be considered responsible for reduced production of inositol.

It is also well known that there is reduction in neurotransmitter like serotonin and other metabolic precursors such as; tyrosine, tryptophan and L-phenylalanine thus alteration in mood was also observed in the luteal phase.^[9]

Future Scope to Design Alarming Devices

As discussed earlier there are certain factors that modulate during menstrual period and assessment of these factors may help to track menstrual cycle, by this way timing of irregular cycle can be predicted that can help to plan ahead for period related preparation. The exact prediction about the timing of various phases of cycle will help to achieve hormone free birth control. The electrolytic balances also changes during premenstrual days along with hematological parameters. The assessment of electrolyte level along with hormonal analysis can provide useful information about the timing of menstrual bleeding. Similarly changes in basal body thermometer during menstrual period can be helpful to predict timing of ovulation period. Generally it is recommended that daily measurement of body temperature during morning time help to identify

ovulation period. In nut shell present article explore a possibility to develop a medical device or chip based on artificial intelligent to narrow down the fertile window that may be used either to prevent or plan a pregnancy. The device or chip based prediction of menstrual period not only help to prevent or plan pregnancy but also improve quality of life of women in terms to preplan safety protection related to the irregular menstrual bleeding.

CONCLUSION

There are various factors which alter during the different phases of menstrual cycle and these modulations can be used as identification marker of ovulation period. Biochemical modulation, metabolic alteration and temperature fluctuation generally observed during different phases of menstrual cycle. The assessment of these changes will definitely serve as a tool to predict expected time of menstrual ovulation and bleeding. The exact prediction about menstrual ovulation can help to achieve or avoid pregnancy while prediction about bleeding time can help to avoid problems that may arise due to the sudden menstrual bleeding. Present article explored a possibility to design an alarming device that can help to improve quality of life of women belonging from reproductive age group.

REFERENCES

1. Rostami Dovom M, Ramezani Tehrani F, Djalalinia S, Cheraghi L, Behboudi Gandavani S & Azizi F. Menstrual Cycle Irregularity and Metabolic Disorders: A Population-Based Prospective Study, PLoS one, 2016; 11: 1-13.
2. Fraser IS, Critchley HO, Munro MG & Broder M. Can we achieve international agreement on terminologies and definitions used to describe abnormalities of menstrual bleeding, Hum. Reprod, 2007; 22: 635-43.
3. Ferrara N, Chen H, Davis-Smyth T, Gerber HP, Nguyen TN, Peers D, Chisholm V, Hillan KJ & Schwall RH, Vascular endothelial growth factor is essential for corpus luteum angiogenesis, Nat. Med., 1998; 4: 336-40.
4. Wilcox AJ, Dunson D & Baird DD, The timing of the "fertile window" in the menstrual cycle: day specific estimates from a prospective study, BMJ, 2000; 321: 1259-62.
5. Matijevic R & Grgic O., Predictive values of ultrasound monitoring of the menstrual cycle. Curr. Opin. Obstet. Gynecol., 2005; 17: 405-10.
6. Hagemann G, Ugur T, Schleussner E, Mentzel HJ, Fitzek C, Witte OW & Gaser C., Changes in brain size during the menstrual cycle, PLoS ONE, 2011; 6: 14655.
7. Harlow SD & Ephross SA, Epidemiology of menstruation and its relevance to women's health, Epidemiol Rev, 1995; 17: 265-86.
8. Usha Rani Y.S., Manjunath P. and Narasimhaswamy K. N., Comparative Study of Hematological and Biochemical Parameters during Different Phases of Menstrual Cycle in Young Healthy Women Aged 18-22 Years, J. dent. med. sci., 2014; 13: 89-93.
9. Draper C. F., Duisters K., Weger B., Chakrabarti A., Harms A. C., Brennan L., Hankemeier T., Goulet L., Konz T., Martin F. P., Moco S. & Van Der Greef J., Menstrual cycle rhythmicity: metabolic patterns in healthy women, Sci Rep., 2018; 8: 14568.