



Time for food and glucose levels in pregnant women

By Dr. Loy See Ling, Research Fellow, KK Women's and Children's Hospital

The human body has an intrinsic 24-hour cycle, a circadian rhythm which is entrained by light and food to regulate daily physiological events, including glucose metabolism.¹ Such circadian patterns or oscillations are seen in glucose tolerance and insulin secretion as the day progresses, with the lowest insulin sensitivity occurring at night.² The timing of when we eat is an important determinant of circadian rhythms in glucose regulatory pathway. By restricting eating hours to specific windows of time within a day and fasting thereafter, glycemic outcomes improve in rodents, particularly when feeding-fasting cycles are synchronised with dark-light phases of the day.³



The concept of chrono-nutrition, defined as eating according to the body's circadian rhythm, is an emerging field which is suggested to be used as a potential dietary approach to combat metabolic diseases. However, human research in this area is relatively scarce, especially in pregnant women, a high risk population vulnerable to gestational hyperglycemia. Singapore, a country which receives sunlight exposure at a fairly constant length of 12

hours daily throughout the year (i.e. sunrise at ~0700h and sunset at~1900h), provides an ideal environment to conduct studies related to circadian time.

Here, I would like to share my findings of a study which aimed to examine the glycemic outcomes of Singaporean pregnant women in relation to circadian timing of food intake, from the aspects of night-fasting intervals and daily eating episodes. This study, under supervision of Associate Professor Fabian Yap Kok Peng and Associate Professor Mary Chong Foong-Fong, had recently awarded for "Best Oral Paper" at the 2016 *SingHealth Duke-NUS Scientific Congress*. It serves as an important recognition and

motivator for the team's effort in working on this study and several related topics in the field of chrononutrition.



Using data from the 'Growing Up in Singapore Towards healthy Outcomes' (GUSTO) study involving 1,061 multiethnic pregnant women, we found that each hourly increase in night-fasting interval was associated with a 0.03 mmol/L decrease in fasting glucose (95% CI: -0.06, -0.01 mmol/L), while each additional daily eating episode was associated with a 0.15 mmol/L increase in 2-hour glucose (95% CI: 0.03, 0.28 mmol/L) among women in their late-second trimester of pregnancy (Loy et al., 2016). Dietary assessment was conducted using 24-hour recall where night-fasting intervals were based on the longest fasting duration during the night-time (1900-0659h); while eating episodes were defined as events which provided more than 50 kcal, with a time interval between eating episodes of at least fifteen minutes.

Although only modest reductions in maternal glucose levels were observed in this study, which may appear trivial, we believe that such improvements over time may have a cumulative effect throughout pregnancy, which may eventually help to prevent the consequences of gestational hyperglycemia. It is hoped that a simple and feasible dietary strategy following time-based eating pattern can be applied to pregnant women to improve their glycemic control. To confirm our findings and evaluate the clinical practice applicability, more long-term and large-scale randomised trials are warranted. However, based on the results of few observational studies we conducted recently in this area, I am excited that the direction appears positive with several papers already published and others currently in review.

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About the Author



Dr Loy See Ling is a research fellow with the KK Women's and Children's Hospital, investigating preconception and pregnancy prospective cohort studies in Singapore – namely the 'Growing Up in Singapore Towards healthy Outcomes' (GUSTO) study and 'Singapore PREconception Study of long-Term maternal and child Outcomes' (S- PRESTO) study.

Dr Loy completed her Bachelor of Science (Dietetics) and Doctor of Philosophy (Human nutrition) in

Malaysia. She has a special interest in chrono-nutrition and its effects on health outcomes, in particular obesity and diabetes.

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References

1. Stenvers DJ, Jonkers CF, Fliers E, Bisschop PH, Kalsbeek A. Nutrition and the circadian timing system. *Prog Brain Res* 2012; 199: 359-376.
2. Saad A, Dalla Man C, Nandy DK, Levine JA, Bharucha AE, Rizza RA, Basu R, Carter RE, Cobelli C, Kudva YC, Basu A. Diurnal pattern to insulin secretion and insulin action in healthy individuals. *Diabetes* 2012; 61: 2691-2700.
3. Asher G, Sassone-Corsi P. Time for food: the intimate interplay between nutrition, metabolism, and the circadian clock. *Cell* 2015; 161: 84-92.
4. Loy SL, Chan JKY, Wee PH, Colega MT, Cheung YB, Godfrey KM, Kwek K, Saw SM, Chong YS, Natarajan P, Müller-Riemenschneider F, Lek N, Chong MFF, Yap F. Maternal Circadian Eating Time and Frequency Are Associated with Blood Glucose Concentrations during Pregnancy. *Journal of Nutrition*. jn239392; first published online October 19, 2016. doi:10.3945/jn.116.239392