

UNIVERSITI TEKNOLOGI MARA

**A VALIDATION OF A MALAY-CHRONONUTRITION
QUESTIONNAIRE (M-CNQ) FOR MALAYSIAN ADULTS**

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July 2025

ACKNOWLEDGMENT

Firstly, I would like to express my deepest gratitude to Allah SWT for granting me the strength and patience to complete this thesis successfully. I am very grateful for His guidance and glory for making this path an easy one to go through this journey with grace.

I want to take this opportunity to thank my supervisor, Professor Madya Dr Nur Islami Binti Mohd Fahmi Teng, for her guidance, constructive feedback, and unwavering support throughout this project, from the beginning of the project until the end. Her expertise and encouragement have been invaluable in helping me complete this research.

I would also like to thank all the experts who participated in the validation phases of this study, as well as the general adult and shift-working participants who took part in the data collection process. Your cooperation and time made this research possible.

To my friends and fellow researchers, thank you for your constant motivation, moral support, and willingness to lend a helping hand whenever I needed it. Lastly, I am forever grateful to my beloved family for their unconditional love, understanding, and prayers. Your endless support has been my pillar of strength throughout this journey.

ABSTRACT

Chrononutrition emphasizes the role of meal timing, frequency, and regularity in alignment with the circadian rhythm, influencing cardiometabolic health. In Malaysia, there is a lack of validated instruments to assess chrononutrition behaviours, especially for shift workers who are vulnerable to circadian misalignment. This study aimed to adapt and validate a Malay version of the Chrononutrition Questionnaire (M-CNQ) for use among Malaysian general adults and shift workers. The CNQ was translated using forward and backwards translation. Content validity was evaluated by expert panels ($n = 10$ for the general population, $n = 11$ for the shift workers), and face validity involved pilot testing with both populations. Test-retest reliability was conducted over a two-week interval among 147 participants using Cronbach's alpha, Intraclass Correlation Coefficient (ICC), and Bland-Altman analysis. Chrononutrition behavioural profiles were established using cut-off criteria to classify patterns of sleep and eating behaviour. The results showed that the M-CNQ had acceptable content and face validity for both groups. Sleep-related variables demonstrated moderate reliability (α and ICC = 0.42–0.67) in the general population and good to excellent reliability (0.74–1.0) in the shift workers. Temporal eating pattern variables showed lower reliability in the general adults but higher reliability in certain shift types. The M-CNQ effectively classified the chrononutrition behaviours, identifying patterns such as late chronotype, prolonged eating windows, and irregular meal timing. In conclusion, the M-CNQ is a valid and reliable tool for assessing chrononutrition behaviours among Malaysian adults. This tool may aid in future research and public health initiatives aimed at improving circadian-aligned eating practices and reducing diet-related health risks.

Keyword: Chrononutrition, Circadian Rhythm, Meal Timing, Shift Work, Questionnaire Validation

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CHAPTER 1: INTRODUCTION

1.1 Research Background

In recent years, researchers have increasingly focused on the impact and influence of circadian rhythms on nutrition, giving rise to a new field of study known as chrononutrition. Chrononutrition is the relationship between meal timing, circadian rhythms, and cardiometabolic health. It has become an important field of study in understanding and enhancing the well-being of the general population (Raji et al., 2024). Unlike the traditional dietary assessments, which focus on nutrient content and calorie intake, chrononutrition assesses the timing of food intake in relation to the body's biological clock and its influence on metabolism.

Circadian rhythms are biological mechanisms that regulate an individual's metabolism, physiology, and behaviour within a daily cycle (Poggiogalle et al., 2017). The circadian system regulates important physiological processes such as the sleep-wake cycle, hormone secretion, body temperature, and metabolism, all of which follow a 24-hour cycle in response to environmental cues such as light and food intake (Franzago et al., 2023). The timing of behaviours such as sleeping, waking, and eating has a significant role in maintaining circadian alignment, which is important for metabolic health and overall well-being (BaHammam & Pirzada, 2023). Disruption to these rhythms, known as circadian misalignment, has been associated with adverse health outcomes such as metabolic syndrome, obesity, diabetes, cardiovascular disease (CVD), and non-communicable diseases (NCDs) (Baidoo & Knutson, 2023).

Modern lifestyle patterns such as increased social activities at night, extended screen exposure, irregular work hours, and shift work have led to widespread circadian rhythm disruptions worldwide (Zaucha et al., 2024). In particular, individuals with inconsistent sleep and meal timing often experience metabolic disturbances, as eating at biologically inappropriate times can impair glucose tolerance and lipid metabolism. Other than that, various epidemiological studies have proven that late-night eating, breakfast skipping, irregular meal patterns, and short sleep duration are linked with a