ORIGINAL RESEARCH

AN OVERVIEW OF BREAKFAST PATTERNS AND LIFESTYLES ASSOCIATED WITH BODY MASS INDEX IN MALAYSIA

Gambaran Umum Pola Sarapan dan Gaya Hidup yang Berhubungan dengan Indeks Massa Tubuh di Malaysia

Noorul Faiza Binti Mohamed Bharuddin[1], Ezza Fazleen[2]

[1] International Medical School, Management and Science University, 40100 Shah Alam, Selangor, Malaysia, ezzafazleen@yahoo.com

[2] International Medical School, Management and Science University, 40100 Shah Alam, Selangor, Malaysia, ezzafazleen@yahoo.com

Correspondence Author: Ezza Fazleen, ezzafazleen@yahoo.com, International Medical School, Management and Science University, 40100 Shah Alam, Selangor, Malaysia

ARTICLE INFO

How to Cite: Bharuddin, N.F.B.M & Fazleen, E. (2020). An overview of breakfast pattern and life style associated with body mass index in Malaysia. *Jurnal Berkala Epidemiologi, 8*(2), 134–140. https://dx.doi.org/10.20473/jbe.v8i22020. 134-140

ABSTRACT

Background: Over the past two decades, a high body mass index (BMI) has become the world's largest public health concern. There have been numerous studies suggesting that breakfast patterns and lifestyle choices are associated with an individual's BMI. **Purpose:** This research aims to describe the distribution of breakfast patterns and lifestyle choices according to BMI in Shah Alam, Malaysia. **Method:** This is a descriptive study with a cross-sectional design. The respondents in this study are people who live in Shah Alam, Malaysia, and are between the ages of 18 and 35 years old. The instrument used is a questionnaire. **Results:** The data shows that the majority of respondents who were obese (28.24%) were non-smokers (14.62%), never drank alcohol (15.95%), had not exercised in the past two weeks (17.28%), slept six to eight hours per day (17.28%), and had a pattern of skipping breakfast (23.92%). On other hand, the majority of respondents who were in the normal BMI range (34.55%) were non-smokers (29.57%), never drank alcohol (30.56%), slept six to eight hours per day (18.94%), and had a pattern of eating breakfast (20.60%). **Conclusion:** Obesity is more common in people who skip breakfast, as weight gain occurs because of unhealthy food choices made to replace breakfast. An unhealthy lifestyle also contributes to a high BMI, including smoking, alcohol consumption, and a sedentary lifestyle.

ABSTRAK

Pendahuluan: *Tingginya indeks massa tubuh (IMT) merupakan masalah kesehatan masyarakat yang menjadi epidemi global dalam kurun waktu dua tahun terakhir. Banyak penelitian yang menyatakan bahwa pola sarapan dan gaya hidup berhubungan dengan IMT.* ***Tujuan:*** *Penelitian ingin menggambarkan distribusi pola sarapan*

dan gaya hidup yang berhubungan dengan indeks massa tubuh pada populasi di Shah Alam. **Metode:** *Penelitian ini adalah penelitian deskripftif dengan rancan bangun potong lintang. Penelitian ini hanya fokus pada populasi di Shah Alam, Malaysia. Responden penelitian terdiri dari orang-orang yang berusia 18 sampai 35 tahun. Instrumen yang digunakan adalah kuesioner.* **Hasil:** *Data menunjukkan bahwa mayoritas responden yang obesitas (28,24%) bukan merupakan perokok (14,62%), tidak pernah minum alkohol (15,95%), tidak berolahraga selama dua minggu terakhir (17,28%), memiliki kebiasaan tidur 6-8 jam per hari (17,28) %), dan memiliki pola sering melewatkan sarapan (23,92%). Di sisi lain, mayoritas responden yang memiliki indeks massa tubuh normal (34,55%) juga bukan merupakan perokok (29,57%), tidak pernah minum alkohol (30,56%), memiliki kebiasaan tidur 6-8 jam per hari (18,94%), namun memiliki pola melakukan sarapan (20,60%).* **Kesimpulan:** *Orang yang melewatkan sarapan lebih sering mengalami obesitas. Hal ini disebabkan karena kenaikan berat badan yang berasal dari pilihan makanan yang tidak sehat untuk menggantikan sarapan serta diikuti dengan gaya hidup yang tidak sehat seperti merokok, minum minuman beralkohol, dan gaya hidup sedentari.*

INTRODUCTION

Overweight and obesity has become one of the world's biggest public health problems over past two decades. People with high overweight or obesity are at risk of musculoskeletal, cardiovascular, and metabolic diseases. Recent studies indicate that the prevalence of overweight and obesity has increased 10 times over the past 40 years, in children, adolescents, and adults, especially in developed countries (Krističević, Štefan, & Sporiš, 2018).

Many studies have suggested that breakfast patterns are linked to BMI, including the habit of skipping breakfast (Sakurai et al., 2017). Mahaletchumy, Rampal, & Sharif (2019) declared that the prevalence of obesity in Malaysia was 11.50%, while overweight was 16.00%. WHO (2014) states that, in non-communicable disease country profiles, the proportion of death in Malaysia in 2014 for all sexes and ages was cancer at 15%, diabetes mellitus at 3%, and cardiovascular disease at 36%.

There is an association between smoking and obesity. However, research has indicated differences in the effect of smoking on obesity. Nicotine is associated with a reduced appetite and calorie intake, but smoking can reduce a person's capacity to engage in physical activity because of the effects on lung functioning (Ginawi et al., 2016).

Excessive consumption of alcohol among young adults is also a global public health concern. Increased energy input through the use of alcohol can enhance the balance of positive energy and contribute to weight gain (Booranasuksakul, Singhato, Rueangsri, & Prasertsri, 2019).

Several studies have shown that regular and sufficient exercise and balanced nutrients can prevent overweight or obesity, though recent meta-analyses have indicated insignificant effects. The association between sleep duration, sleep quality, and BMI has become a great concern to researchers. However, the results are inconsistent. While some studies show a negative relationship between sleep duration and BMI, other studies have found no relationship. Inconsistent results have also been found for the relationship between sleep quality and BMI (Krističević, Štefan, & Sporiš, 2018).

The young adult population is at risk of having a overweight or obesity, as they experience many lifestyle changes, such as the use of electronics and academic needs, resulting in a reduction in the quality and duration of sleep and insufficient nutrition and physical activity. Therefore, this study aims to determine the distribution of breakfast patterns and lifestyle choices according to BMI in Shah Alam, Malaysia.

METHOD

This research is a descriptive study. The design used in this study is a cross-sectional design. The sample size for this study was 301 respondents. Inclusion criteria was people who live in Shah Alam and who were between the ages of 18 and 35 years old. Exclusion criteria included people under the age of 18 and over the age of 35, and people with health problems or chronic illnesses.

The material used was a questionnaire, which was divided into four parts. Part A asked the respondents for their socio-demographic information, part B asked for breakfast consumption information, part C asked for BMI information, and part D asked about lifestyle choices.

Socio-demographic information included gender, age, marital status, and a family history of obesity. The breakfast pattern section included six questions, asking whether respondents eat breakfast each morning, the frequency of eating breakfast in a week, the time they ate breakfast, the type of food eaten. The respondent's life style such as smoking behavior, alcohol consumption, exercise habit in the past two weeks and sleep duration. Three questions were asked regarding BMI information, on height (m), weight (kg), and BMI. BMI is a body fat measure based on height and weight that can be applied to both male and female adults. It is divided into four categories: underweight (<18.50 kg/m^2), normal weight (18.50 kg/m^2-24.90 kg/m^2), overweight (24.90 kg/m^2-29.90 kg/m^2), and obese (30 kg/m^2-34.90 kg/m^2). The lifestyle habit section asked four questions, concerning smoking habits, alcohol consumption, sleep duration, and exercise over the past two weeks.

RESULTS

The Distribution of Breakfast Patterns According to Body Mass Index in Shah Alam, Malaysia

Table 1 shows that 54.48% of respondents skipped breakfast. Of these respondents, 26 (8.64%) were classified as underweight, 42 (13.95%) as normal weight, 24 (7.97%) as overweight, and 72 (23.92%) as obese. Of the 45.52% of respondents who ate breakfast, 28 (9.30%) were classified as underweight, 62 (20.6%) as normal weight, 34 (11.30%) as overweight, and 13 (4.32%) as obese. The data shows that the respondents who regularly ate breakfast mostly had normal BMIs; the respondents who skipped breakfast were mostly obese.

The Distribution of Lifestyle Choices According to Body Mass Index in Shah Alam, Malaysia

Table 1 shows that, of the respondents who were smokers, 8.31% were classified as underweight, 4.98% as normal weight, 6.98% as overweight, and 13.62% as obese. Of the respondents who were nonsmokers, 9.63% were classified as underweight, 29.57% as normal weight, 12.29% as overweight, and 14.62% as obese. The data shows that the respondents who were nonsmokers mostly had normal BMIs; the respondents who were smokers were mostly obese.

Of the respondents who drank alcohol, 8.31% were classified as underweight, 3.99% as normal weight, 10.30% as overweight, and 12.29% as obese. Of the respondents who did not drink alcohol, 9.63% were classified as underweight, 30.56% as normal weight, 8.97% as overweight, and 15.95% as obese. The data shows that the respondents who drank alcohol were mostly obese; the respondents who did not drink alcohol mostly had normal BMIs (See Table 1).

Of the respondents who did not engage in exercise over the past two weeks, 11.30% were classified as underweight, 17.28% as normal weight, 11.63% as overweight, and 17.28% as obese. Of the respondent who had exercised over the past two weeks, 6.64% were classified as underweight, 17.28% as normal weight, 7.64% as overweight, and 10.96% as obese. The data shows that the respondents who had not exercised in the past two weeks had mostly normal and obese BMIs; the respondents who had exercised over the past two weeks mostly had normal BMIs (See Table 1).

Of the respondents who slept less than six hours per night, 9.63% were classified as underweight, 14.29% as normal weight, 6.98% as overweight, and 10.96% as obese. Of the respondents who slept between six and eight hours per night, 4.65% were classified as underweight, 18.94% as normal weight, 8.30% as overweight, and 17.28% as obese. Of the respondents who slept more than eight hours per night, 3.65% were classified as underweight, 1.33% as normal weight, and 3.99% as overweight. The data shows that the respondents who slept less than six hours and those who slept between six and eight hours per night had mostly normal BMIs; the respondents who slept more than eight hours mostly had overweight BMIs (See Table 1).

Table 1
The Distribution of Breakfast Pattern and Life Style According to Body Mass Index

| Variable | Body Mass Index | | | | | | | | Total | |
| | Underweight | | Normal | | Overweight | | Obese | | | |
	n	%	n	%	n	%	n	%	n	%
Breakfast Patterns										
Skipping Breakfast	26	8.64	42	13.95	24	7.97	72	23.92	164	54.48
Having Breakfast	28	9.30	62	20.60	34	11.30	13	4.32	137	45.52
Lifestyle										
Smoking Behavior										
Smoker	25	8.31	15	4.98	21	6.98	41	13.62	102	33.89
Non Smoker	29	9.63	89	29.57	37	12.29	44	14.62	199	66.11
Alcohol Consumption										
Yes	25	8.31	12	3.99	31	10.30	37	12.29	105	34.89
No	29	9.63	92	30.56	27	8.97	48	15.95	196	65.11
Exercise in the Past Two Weeks										
No	34	11.30	52	17.28	35	11.63	52	17.28	173	57.49
Yes	20	6.64	52	17.28	23	7.64	33	10.96	128	42.51
Sleep (hours)										
Less than 6	29	9.63	43	14.29	21	6.98	33	10.96	126	41.86
6 – 8	14	4.65	57	18.94	25	8.30	52	17.28	148	49.17
More than 8	11	3.65	4	1.33	12	3.99	0	0.00	27	8.97
Total	54	17.94	104	34.55	58	19.27	85	28.24	301	100.00

DISCUSSION

An Overview of Breakfast Patterns with Body Mass Index in Shah Alam, Malaysia

This study described the differences in BMIs among respondents who skipped breakfast and those who ate breakfast. The results revealed that the respondents who skipped breakfast were mostly obese. This could be due to binge eating, as skipping breakfast made them hungry, leading to them eating much more rapidly than usual or eating a lot of food when not hungry. Studies have shown that people who skip breakfast gain more calories and tend to be heavier and less healthy.

Some research suggests that breakfast is the most important meal of the day, as a high intake of fiber and calcium can lead to a lower BMI (Zhang, Cordeiro, Liu, & Ma, 2017). A study in Japan has shown that breakfast skipping is related to obesity. The type of food consumed means breakfast plays an important role. The tendency to skip breakfast is often seen in school students, especially junior and senior high school students. Some epidemiological studies have suggested that skipping breakfast causes academic and physical performance deterioration. Health surveys in the United States have reported that adults who skip breakfast were five times more likely to become obese than those who ate breakfast regularly (Watanabe et al., 2014).

Studies on vitamins and minerals related to breakfast skipping (including vitamins B6, B12, A, and C, riboflavin, thiamin, calcium, iron, magnesium, phosphorus, potassium, fiber, niacin, and zinc) indicate that eating a nutrient-dense breakfast is more beneficial for weight loss than skipping breakfast (Widaman, Witbracht, Forester, Laugero, & Keim, 2016). A positive association between breakfast skipping, overweight, and obesity is observed globally and is not impacted by cultural diversity. Breakfast might be beneficial for all populations.

Recent studies have suggested that the risk of narrowing and hardening of the heart arteries increases in people with obesity and heart disease who skip breakfast (Mohiuddin, 2018). Other previous studies have found no correlation between breakfast patterns and weight loss (Hermengildo et al., 2016). Zhang, Cordeiro, Liu, & Ma (2017) found that skipping breakfast is unrelated to weight gain and Sievert et al (2019) indicated that people who ate breakfast had a higher total daily energy intake than those who skipped breakfast.

Watanabe et al (2014) revealed that daily breakfast is more influential in preventing obesity than eating dinner more than three hours before bedtime. The percentage of people who eat snacks at night and those who eat dinner after 8pm is higher for the group that skips breakfast. Energy,

protein, fats, carbohydrates, and fiber intake is significantly higher for those who eat breakfast than for those who skip breakfast.

The consumption of grains, fish, and meat for those who eat breakfast is significant. The consumption of snacks and soft drinks is numerically higher, but insignificant, for those who skip breakfast than for those who eat breakfast. Although those who skip breakfast consume fewer calories, the results of this study illustrate that tendencies toward unhealthy habits increase, such as nighttime snacks, dinner after 8pm, and the consumption of snack food and soft drinks. These unrecommended eating habits can lead to obesity (Watanabe et al, 2014).

Previous studies have provided three reasons why skipping breakfast can lead to obesity, although energy consumption is reduced. First, skipping breakfast can cause a reduction in physical activity in the morning, as well as a reduction in total energy expenditure. Second, respondents who skip breakfast have a low body temperature and a decreased energy metabolism. Third, while skipping breakfast reduces overall caloric consumption, it also produces a surge in blood sugar levels. Skipping breakfast can decrease sugar levels in the blood, causing muscle tissue damage via the gluconeogenic pathway tasked with glucose provision for the brain; this decrease in muscle volume leads to a subsequent decrease in physical strength. Our results showed that a decrease in muscle volume causes a decrease in basic metabolism. When a person is hungry, they conserve energy by reducing physical activity, which can prevent the body from losing weight and encourage it to gain weight (Watanabe et al., 2014).

An Overview of Lifestyle Patterns with Body Mass Index in Shah Alam, Malaysia

This study showed that respondents who were nonsmokers mostly had normal BMIs, whereas respondents who were smokers were mostly obese. This is different to the results found by Jacobs (2019), who stated there was no correlation between cigarette smoking and BMI for both males and females. Data has indicated that smokers more often have a lower BMI than infrequent smokers or nonsmokers, with Ginawi et al (2016) revealing that obesity is most prevalent among ex-smokers. Smoking and BMI have a negative relationship, where respondents with a low BMI smoke more. Smoking rates are significantly higher among men, but BMI is increasing faster in women. Therefore, both female smokers and nonsmokers tend to have a more rapidly increasing BMI and the difference between the two groups is very small. The disparity between male smokers and nonsmokers could be growing, as more males continue to smoke later in life or are unsuccessful quitters. This analysis shows a significant behavioral impact on BMI, but the age-related relationship for men and women merits further analysis (Jacobs, 2019).

This study showed that respondents who drank alcohol were mostly obese, whereas respondents who did not drink alcohol mostly had normal BMIs. This result is consistent with Booranasuksakul, Singhato, Rueangsri, & Prasertsri (2019), who determined a correlation between alcohol consumption and BMI in university students in Eastern Thailand. That study also revealed that the average daily alcohol consumption of the overweight group was significantly higher than the underweight and normal weight groups in women. Furthermore, there was a positive relationship between alcohol consumption and BMI in university students in Eastern Thailand. A study from Albani et al (2018), suggested that youths who drink high levels of alcohol on one occasion seem to have a higher risk of obesity than those who drink at the lowest levels. Drinking alcohol every day is a risk factor for obesity. Alcohol is a source of energy, comprising an energy content of 7.10kcal/g.

This study showed that respondents who had not exercised over the past two weeks had mostly normal and obese BMIs, whereas the respondents who had exercised over the past two weeks mostly had normal BMIs. According to Martín, Vilar, & Barato (2016) an increase in non-sedentary activity is associated with a low BMI, with several studies showing that the prevalence of overweight has an inverse relationship with the level of physical activity. Another study by Grasdalsmoen, Eriksen, Lønning, & Sivertsen (2019) found different results. This study described the level of physical activity and BMIs in college and university students, revealing that the correlation between physical activity and overweight or obesity depends on the dose-response manner. Their results showed that most youths fail to find appropriate physical activities, which can cause overweight or obesity rates to increase in both males and females, and in all age groups. The relationship between physical activity and body fat or weight comes from the assumption that normal-weight people have the same energy intake or almost the same energy expenditure. That is, a person becomes overweight or obese if the energy

intake is greater than the energy expenditure. One way of maintaining the energy balance is by getting rid of the extra calories by performing physical activity. If physical activity is not sustained, even an individual with a healthy weight could easily gain weight (Martín, Vilar, & Barato, 2016).

This study showed that respondents who slept less than six hours and between six to eight hours per night had mostly normal BMIs, whereas respondents who slept more than eight hours mostly had overweight BMIs. A study by Krističević, Štefan, & Sporiš (2018) showed an association between both short and long sleep duration, poor sleep quality, and overweight/obesity status in young adults. A study by Rathod et al (2018) found a significant negative association between short sleep duration and overweight and obesity in medical students. About 22.60% of the participants had a BMI of more than 25 kg/m^2. Of the obese students, 61.54% were sleeping less than six hours per night. None of the students sleeping more than eight hours per night were obese. Meyer, Wall, Larson, Laska, & Neumark-Sztainer (2012) suggested an inverse association between sleep duration and BMI, while Peltzer & Pengpid (2017) found different results. Their findings showed no association between long sleep duration and BMI, but found a positive association between short sleep duration and BMI. Short sleep duration is associated with many hormonal changes, especially with decreased levels of leptin (the hormone that suppresses appetite) and increased levels of ghrelin (the hormone that increases appetite), which potentially mediate the association between short sleep and BMI. A study by Markwald et al (2013) showed that five consistent days of insufficient sleep increased energy needs and energy intake and decreased responsivity to gut fullness and satiety hormones. From a physiological point of view, the need for energy increases in sleep-deprived people, potentially causing a reduction in leptin and an increase in ghrelin, which leads to weight gain.

CONCLUSION

Among the Shah Alam respondents, obesity is more common in people who skip breakfast. For young adults, education about healthy food is vital for their health in the present and in the future. The type of breakfast affects individual BMIs due to the caloric content of different foods. Since being overweight and obese is a risk factor for many disease conditions, one should maintain a body weight within the normal limits. One way to do this is to make appropriate meal choices, in line with a healthy lifestyle.

CONFLICT OF INTEREST

The authors declare that no conflict of interest in this study.

AUTHOR CONTRIBUTION

NFBMB conducted a survey, participated in sequence alignment, drafted the manuscript, designed the study, and performed the statistical analysis. EF participated in its design and helped to draft the manuscript. All authors read and approved the final manuscript.

ACKNOWLEDGEMENTS

REFERENCES

Albani, V., Bradley, J., Wrieden, W. L., Scott, S., Muir, C., Power, C., … Adamson, A. J. (2018). Examining associations between body mass index in 18–25 year-olds and energy intake from alcohol: findings from the health survey for England and the Scottish Health Survey. *Nutrients*, *10*(10). https://doi.org/10.3390/nu10101477

Booranasuksakul, U., Singhato, A., Rueangsri, N., & Prasertsri, P. (2019). Association between alcohol consumption and body mass index in university students. *Asian/Pacific Island Nursing Journal*, *4*(1), 57–65. https://doi.org/10.31372/20190401.1035

Ginawi, I. A., Bashir, A. I., Alreshidi, Y. Q., Dirweesh, A., Al-Hazimi, A. M., Ahmed, H. G., … Ahmed, M. H. (2016). Association between obesity and cigarette smoking: a community-based study. *Journal of Endocrinology and Metabolism*, *6*(5), 149–153. https://doi.org/10.14740/jem378e

Grasdalsmoen, M., Eriksen, H. R., Lønning, K. J., & Sivertsen, B. (2019). Physical exercise and body-mass index in young adults: a national

survey of Norwegian University Students. *BMC Public Health*, *19*(1), 1–9. https://doi.org/10.1186/s12889-019-7650-z

Hermengildo, Y., López-García, E., García-Esquinas, E., Pérez-Tasigchana, R. F., Rodríguez-Artalejo, F., & Guallar-Castillón, P. (2016). Distribution of energy intake throughout the day and weight gain: a population-based cohort study in Spain. *British Journal of Nutrition*, *115*(11), 2003–2010. https://doi.org/10.1017/S0007114516000891

Jacobs, M. (2019). Adolescent Smoking: The Relationship between cigarette consumption and BMI. *Addictive Behaviors Reports*, *9*(December), 100153. https://doi.org/10.1016/j.abrep.2018.100153

Krističević, T., Štefan, L., & Sporiš, G. (2018). The Associations between sleep duration and sleep quality with body-mass index in a large sample of young adults. *International Journal of Environmental Research and Public Health*, *15*(4). https://doi.org/10.3390/ijerph15040758

Mahaletchumy, A., Rampal, L., & Sharif, Z. M. (2019). Prevalence of overweight/obesity and its associated factors among secondary school students in semi urban area in Malaysia. *Medical Journal of Malaysia*, *74*(6), 513–520.

Markwald, R. R., Melanson, E. L., Smith, M. R., Higgins, J., Perreault, L., Eckel, R. H., & Wright, K. P. (2013). Impact of insufficient sleep on total daily energy expenditure, food intake, and weight gain. *Proceedings of the National Academy of Sciences of the United States of America*, *110*(14), 5695–5700. https://doi.org/10.1073/pnas.1216951110

Martín, I. S. M., Vilar, E. G., & Barato, V. P. (2016). Exercise and body mass index: are those two parameters related in adults? *Journal of Negative and No Positive Results*, *1*(1), 36–41. https://doi.org/10.19230/jonnpr.2016.1.1.935

Meyer, K. A., Wall, M. M., Larson, N. I., Laska, M. N., & Neumark-Sztainer, D. (2012). Sleep duration and BMI in a sample of young adults. *Obesity*, *20*(6), 1279–1287. https://doi.org/10.1038/oby.2011.381

Mohiuddin, A. K. (2018). Skipping breakfast everyday keeps well-being away. *Research and Reviews: Journal of Dairy Science and Technology*, *7*(3), 20–30. https://doi.org/10.32552/2019.actamedica.331

Peltzer, K., & Pengpid, S. (2017). Sleep duration, sleep quality, body mass index, and waist circumference among young adults from 24 low- and middle-income and two high-income countries. *International Journal of Environmental Research and Public Health*, *14*(6). https://doi.org/10.3390/ijerph14060566

Rathod, S., Nagose, V., Kanagala, A., Bhuvangiri, H., Kanneganti, J., & Annepaka, E. (2018). Sleep duration and its association with obesity and overweight in medical students: a cross-sectional study. *National Journal of Physiology, Pharmacy and Pharmacology*, *8*(1), 113–117. https://doi.org/10.5455/njppp.2018.8.1040219102017

Sakurai, M., Yosita, K., Nakamura, K., Miura, K., Takamura, T., Nagasawa, S. Y., … Nakagawa, H. (2017). Skipping breakfast and 5-year changes in body mass index and waist circumference in Japanese men and women. *Obesity Science & Practice*. https://doi.org/10.1002/osp4.106

Sievert, K., Hussain, S. M., Page, M. J., Wang, Y., Hughes, H. J., Malek, M., & Cicuttini, F. M. (2019). Effect of breakfast on weight and energy intake: systematic review and meta-analysis of randomised controlled trials. *BMJ*, *364*, 1–11. https://doi.org/10.1136/bmj.l42

Watanabe, Y., Saito, I., Henmi, I., Yoshimura, K., Maruyama, K., Yamauchi, K., … Asada, Y. (2014). Skipping breakfast is correlated with obesity. *Journal of Rural Medicine*, *9*(2), 51–58. https://doi.org/10.2185/jrm.2887

WHO. (2014). *Non-communicable diseases country profile*. Geneva: World Health Organization.

Widaman, A. M., Witbracht, M. G., Forester, S. M., Laugero, K. D., & Keim, N. L. (2016). Chronic stress is associated with indicators of diet quality in habitual breakfast skippers. *Journal of the Academy of Nutrition and Dietetics*, *116*(11), 1776–1784. https://doi.org/10.1016/j.jand.2016.03.016

Zhang, L., Cordeiro, L. S., Liu, J., & Ma, Y. (2017). The Association between breakfast skipping and body weight, nutrient intake, and metabolic measures among participants with metabolic syndrome. *Nutrients*, *9*(4), 1–14. https://doi.org/10.3390/nu9040384