FACTORS ASSOCIATED WITH NUTRITION LITERACY AND DIETARY HABITS AMONG ADOLESCENTS IN KOTA SETAR, KEDAH

By

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Dissertation Submitted to the Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, in Partial Fulfilment of the Requirements for the Master in Nutritional Sciences

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Supervisor's Signature

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LIST OF ABBREVATIONS

AFHC	Adolescent Food Habits Checklist
ANLS	Adolescent Nutrition Literacy Scale
BAZ	BMI-for-age Z-score
BMI	Body Mass Index
CI	Confidence Interval
CNL	Critical Nutrition Literacy
EAT	Eating Among Teens
FIES	Food Insecurity Experience Scale
FNL	Functional Nutrition Literacy
IQR	Interquartile Range
JKEUPM	Ethics Committee for Research Involving Human Subject Universiti Putra Malaysia
MOE	Ministry of Education
NLQ-20	Nutrition Literacy Questionnaire
OR	Odd Ratio
RM	Ringgit Malaysia
RR	Relative Risk
SD	Standard Deviation
SEGAK	National Physical Fitness Standard
SMK	*Sekolah Menengah Kebangsaan* (National Secondary Schools)
SMKA	*Sekolah Menengah Kebangsaan Agama* (National Islamic Secondary School)
SPM	Sijil Pelajaran Malaysia (Malaysian Certificate of Education)
SSBs	Sugar-sweetened Beverages
TNL	Total Nutrition Literacy
USDA	United States Department of Agriculture
UPM	Universiti Putra Malaysia
WHO	World Health Organisation

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Adolescence is a critical period in human development, characterised by rapid physical, emotional and social changes. Nutrition literacy, which is the ability to access, comprehend, evaluate, and apply nutritional information plays a significant role in shaping dietary habits and, consequently, long-term health outcomes. Adolescents often face challenges with nutrition literacy, struggling to comprehend nutrition information, interpret it accurately, and unable to differentiate reliable sources for making healthy food choices. Therefore, this cross-sectional study aimed to assess nutrition literacy and dietary habits of school-aged adolescents and their associated factors.

The study used secondary data from a cross-sectional study conducted between September and November 2023. A total of 408 adolescents aged 14.71 ± 1.08 years old (52.0% males and 48.0% females) were recruited from two randomly selected secondary schools in Kota Setar, Kedah. Parents/caregivers of the adolescents completed a self-administered questionnaire on sociodemographic information and household food security level, while adolescents completed another set of self-administered questionnaires on sociodemographic, nutrition literacy, dietary habits, social support, home food availability, and family meal frequency. Weight and height of the adolescents were obtained from the *Standard Kecergasan Fizikal Kebangsaan Untuk Murid Sekolah Malaysia* (SEGAK) data, and BMI-for-age z score was calculated and classified using WHO growth reference.

Results showed that the mean nutrition literacy score was 68.32 ± 10.65 out of a total score of 110, indicating a moderate level of nutrition literacy among the respondents. The mean dietary habits score was 13.88 ± 4.24 out of a total score of 23, indicating moderate adherence to

healthy eating behaviours. The mean BMI-for-age z score of the respondents was -0.08 ± 1.55, with 11.9% classified as overweight and 11.3% as obese, while 7.6% were thin. The mean score for social support was 15.56 ± 3.20, while the mean score for home food availability was 1.09 ± 1.66, ranging from -3 to 5. One third of the respondents (34.1%) reported to have family meal together for three to four times in the previous week, while 19.1% reported to have household food insecurity.

Multiple linear regression analysis found that ethnicity (β = -0.232, $p < 0.001$), social support (β = 0.221, $p < 0.001$), and family meal frequency (β = 0.136, p = 0.036) were significantly associated with nutrition literacy. Chinese ethnicity was associated with lower nutrition literacy, whereas adolescents with higher social support and more frequent family meals were associated to higher nutrition literacy. On the other hand, social support (β = 0.205, $p < 0.001$), home food availability (β = 0.318, $p < 0.001$), and nutrition literacy (β = 0.101, p = 0.031) were significantly associated with dietary habits. Strong social support, greater availability of food at home and higher nutrition literacy were positively associated with healthier dietary habits.

In conclusion, social support, home food availability, and family meal frequency are all important factors in shaping adolescents' nutrition literacy and dietary habits. These findings imply that interventions aimed at improving nutrition literacy and dietary habits should include strengthening social support systems, ensuring the availability of healthy foods at home, and encouraging regular family meals. By addressing these issues, adolescents can develop and maintain healthy eating habits, thereby improving their overall health and well-being.

Keywords: nutrition literacy, dietary habits, adolescents, social support, home food availability

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FAKTOR BERKAITAN DENGAN LITERASI PEMAKANAN DAN TABIAT PEMAKANAN DALAM KALANGAN REMAJA DI KOTA SETAR, KEDAH

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Peringkat remaja merupakan tempoh kritikal dalam perkembangan manusia, yang dicirikan oleh perubahan fizikal, emosi, dan sosial yang pesat. Literasi pemakanan merupakan keupayaan untuk mengakses, memahami, menilai, dan mengaplikasikan maklumat pemakanan, memainkan peranan penting dalam membentuk tabiat pemakanan dan, seterusnya, hasil kesihatan jangka panjang. Remaja sering menghadapi cabaran dengan literasi pemakanan, mengalami kesukaran untuk memahami maklumat pemakanan, mentafsirkannya dengan tepat, dan tidak dapat membezakan sumber yang boleh dipercayai untuk membuat pilihan makanan yang sihat. Oleh itu, kajian keratan rentas ini bertujuan untuk menilai literasi pemakanan dan tabiat pemakanan remaja sekolah serta faktor-faktor yang berkaitan dengannya.

Kajian ini menggunakan data sekunder daripada kajian keratan rentas yang dijalankan antara September hingga November 2023. Seramai 408 remaja berumur 14.71 ± 1.08 tahun (52.0% lelaki dan 48.0% perempuan) telah direkrut daripada dua buah sekolah menengah yang dipilih secara rawak di Kota Setar, Kedah. Ibu bapa/pengasuh remaja melengkapkan satu set soal selidik mengenai maklumat sosiodemografi dan tahap keterjaminan makanan isi rumah, manakala remaja melengkapkan satu set lagi soal selidik yang diisi sendiri mengenai sosiodemografi, literasi pemakanan, tabiat pemakanan, sokongan sosial, ketersediaan makanan di rumah, dan kekerapan makan bersama keluarga. Berat badan dan tinggi remaja diperolehi daripada data Standard Kecergasan Fizikal Kebangsaan Untuk Murid Sekolah Malaysia (SEGAK), dan skor z BMI-untuk-umur dikira dan diklasifikasikan menggunakan rujukan pertumbuhan WHO.

Hasil kajian menunjukkan bahawa skor purata literasi pemakanan adalah 68.32 ± 10.65 daripada jumlah keseluruhan skor 110, menunjukkan tahap literasi pemakanan yang sederhana dalam kalangan responden. Skor purata tabiat pemakanan adalah 13.88 ± 4.24 daripada jumlah keseluruhan skor 23, menunjukkan kepatuhan sederhana terhadap tingkah laku pemakanan sihat. Skor z BMI-untuk-umur purata responden adalah -0.08 ± 1.55, dengan 11.9% diklasifikasikan sebagai berlebihan berat badan dan 11.3% sebagai obes, manakala 7.6% adalah kurus. Skor purata untuk sokongan sosial adalah 15.56 ± 3.20, manakala skor purata untuk ketersediaan makanan di rumah adalah 1.09 ± 1.66, dengan julat antara -3 hingga 5. Seramai satu pertiga daripada responden (34.1%) melaporkan makan bersama keluarga sebanyak tiga hingga empat kali dalam seminggu, manakala 19.1% melaporkan mengalami ketidakjaminan makanan dalam isi rumah.

Analisis regrasi linear berganda mendapati bahawa etnik (β = -0.232, $p < 0.001$), sokongan sosial (β = 0.221, $p < 0.001$), dan kekerapan makan bersama keluarga (β = 0.136, p = 0.036) berkaitan secara signifikan dengan literasi pemakanan. Etnik Cina dikaitkan dengan literasi pemakanan yang lebih rendah, manakala remaja dengan sokongan sosial yang lebih tinggi dan lebih kerap makan bersama keluarga dikaitkan dengan literasi pemakanan yang lebih tinggi. Sebaliknya, sokongan sosial ($\beta = 0.205, p < 0.001$), ketersediaan makanan di rumah ($\beta = 0.318$, $p < 0.001$), dan literasi pemakanan (β = 0.101, p = 0.031) berkaitan secara signifikan dengan tabiat pemakanan. Sokongan sosial yang kuat, ketersediaan makanan yang lebih banyak di rumah, dan literasi pemakanan yang lebih tinggi berkait rapat dengan tabiat pemakanan yang lebih sihat.

Kesimpulannya, sokongan sosial, ketersediaan makanan di rumah, dan kekerapan makan bersama keluarga adalah faktor penting dalam membentuk literasi pemakanan dan tabiat pemakanan remaja. Penemuan ini mencadangkan bahawa intervensi yang bertujuan untuk meningkatkan literasi pemakanan dan tabiat pemakanan harus merangkumi pengukuhan sistem sokongan sosial, memastikan ketersediaan makanan yang sihat di rumah, dan menggalakkan makan bersama keluarga secara berkala. Dengan menangani isu-isu ini, remaja dapat mengembangkan dan mengekalkan tabiat pemakanan yang sihat, seterusnya meningkatkan kesihatan dan kesejahteraan mereka secara keseluruhan.

Kata kunci: Literasi pemakanan, tabiat pemakanan, remaja, sokongan sosial, ketersediaan makanan di rumah

CHAPTER 1

INTRODUCTION

1.1 Background

Nutrition literacy refers to the ability to access, comprehend, evaluate, and apply nutritional information (Abdi et al., 2018), enabling individuals to make informed dietary choices for overall health and well-being. The significant effect of nutrition literacy on health outcomes has attracted the attention of professionals in a variety of fields, from public health to education to marketing (Naeem et al., 2021). Improving nutrition literacy is important for individuals to make informed dietary decisions, differentiate genuine nutritional needs from potentially misleading marketing strategies (Karatzi et al., 2023).

Today, nutrition literacy has emerged as a prominent global concern. Attention to health interventions and dietary supplements has intensified, particularly in the aftermath of the COVID-19 pandemic (Djaoudene et al., 2023). The COVID-19 pandemic has raised public awareness of health and well-being, promote interest in dietary supplements as a way to boost immunity and overall health. This situation has highlighted the critical role of nutrition literacy. With a surge in marketing campaigns capitalizing on pandemic-related fears and uncertainties (Hassoun et al., 2022), the need for reliable, evidence-based nutrition and dietary supplement knowledge has never been more critical. Nutrition literacy serves as a safeguard against misinformation, allowing individuals to distinguish between reliable recommendations and unverified claims, particularly in the realm of dietary supplements that claim to prevent or cure diseases (Islam et al., 2020; Ruani & Reiss, 2023).

Nutrition literacy plays an important role in shaping dietary habits by enabling individuals to critically assess nutrition-related information and adopt healthier eating habits (Karatzi et al., 2023). It provides individuals with the knowledge and skills necessary to interpret food labels, distinguish between healthy and unhealthy foods, and understand the impact of dietary choices on overall health (Scalvedi et al., 2021). Generally, individuals with higher levels of nutrition literacy are more likely to adopt healthier eating patterns (Kalkan, 2019). Studies have found a positive association between nutrition literacy and the adoption of healthier eating habits (Al

Tell et al., 2023; Depboylu et al., 2023; Joulaei et al., 2018; Kabir et al., 2018; Koca & Arkan, 2021; Liao et al., 2019; Qi et al., 2023).

Conversely, poor nutrition literacy may result in poor dietary choices, potentially leading to nutritional imbalances, inadequate intake of essential nutrients, and increased risks of various health conditions (Taylor et al., 2019). Limited nutrition literacy is frequently linked with poorer dietary habits, possibly due to difficulties in understanding healthy diet concepts (Taylor et al., 2019). Individuals with adequate nutrition literacy are better equipped to avoid nutritional deficiencies, effectively manage their body size, reduce the risk of non-communicable diseases, and improve overall well-being (Al Tell et al., 2023; Li et al., 2022; Taylor et al., 2019). Thus, understanding the relationship between nutrition literacy and dietary habits is critical to promoting healthier dietary habits and improving overall public health.

According to the World Health Organization (WHO), adolescence lasts from the ages of 10 to 19. The cultivation of nutrition literacy among adolescents or secondary school students is extremely important in the promotion of long-term health and wellness. Adolescence is a period of rapid growth and development during which lifestyle habits, including dietary choices, are formed (Scaglioni et al., 2018). This crucial developmental stage establishes the foundation for lifelong dietary habits and health behaviours. The significance of studying adolescents' dietary habits arises from their critical role in shaping dietary behaviours and long-term health outcomes into adulthood (Mukanu et al., 2022).

During adolescence, individuals start to make more independent choices about their food preferences and eating behaviours (Scaglioni et al., 2018). Peer influence, media exposure, family eating patterns, and personal beliefs all have an impact on their food choices (Ziegler et al., 2021). Furthermore, adolescent dietary habits influence the risk of chronic diseases later in life, such as obesity, cardiovascular disease, and diabetes (Ruiz et al., 2020). As a result, the decisions made during adolescence have a significant impact on the development of long-term dietary habits that frequently last into adulthood. Understanding and improving adolescent dietary habits is therefore critical for preventing and managing these health conditions later in life (Chaudhary et al., 2020).

Adolescence is a "second window of opportunity" for implementing interventions that improve long-term health outcomes by promoting healthy eating habits (Sparrow et al., 2021). Given

the importance of adolescent dietary habit formation, interventions aimed at promoting healthy eating behaviours during this time can have long-term consequences. Targeting healthy eating behaviours in adolescents increases the likelihood of establishing lifelong patterns that contribute to better health and lower disease risk in adulthood (Scaglioni et al., 2018). Improved nutrition literacy provides adolescents with the knowledge and skills necessary to meet their nutritional requirements for growth and cognitive development (Koca & Arkan, 2021).

Global trends show a decline in the quality of adolescents' eating habits, marked by a failure to adhere to recommended dietary guidelines, increased consumption of processed foods, fats, and sugary beverages (Tallon et al., 2019). In an era of widespread information, particularly on the internet, adolescents are exposed to conflicting information about food, diets, and body image (Kamiński et al., 2020). Existing studies suggest that adolescents often struggle to comprehend nutrition information, have difficulty interpreting it accurately, and are unable to distinguish reliable sources (Ayer & Ergin, 2021). This will result in poor dietary choices, increased risk of health problems, and a limited ability to advocate for their health (Silva, 2023). Therefore, it is important to educate adolescents with the ability to distinguish nutritional facts from myths. Adolescents with strong nutrition literacy skills are better equipped to navigate the influx of nutrition information across social media platforms and distinguish between accurate and inaccurate nutritional advice (Chung et al., 2021).

1.2 Problem Statement

Adolescents begin to make independent food choices that are influenced by a number of personal and socioenvironmental factors that have a significant impact on their dietary habits and long-term health outcomes (Scaglioni et al., 2018). Despite the importance of establishing healthy eating behaviours during adolescence, there is limited understanding of the relationships of these factors with nutrition literacy and dietary habits of school-aged adolescents.

Nutrition literacy varies across populations and demographic groups, resulting in differences in health outcomes (Delbosq et al., 2022). This noticeable trend is characterized by an increasing gap between individuals' understanding of nutritional information and their dietary decisions. As adolescents progress through the developmental stages, their cognitive abilities, knowledge acquisition, and decision-making abilities change (Silva, 2023). Deslippe et al.

(2021) discovered that adolescent girls may be more concerned with body image and weight management, influencing their dietary habits and nutrition literacy differently than boys. Body weight can influence individual views of health and nutrition. A recent study found that adolescents with a higher BMI-for-age may have weight-related concerns, resulting in changes in dietary habits and motivation to improve nutrition literacy (Delbosq et al., 2022). Besides, ethnicity influences exposure to certain foods, cultural norms around meal preparation and consumption, and access to nutrition-related information (Koca & Arkan, 2021), all of which affect nutrition literacy and dietary habits.

Socioenvironmental factors, such as household food security, social support, home food availability, and family meal frequency, also play crucial roles in shaping on adolescents' nutrition literacy and dietary habits. Household food security impacts the consistency and quality of food intake, while social support from family members can create a conducive environment for healthy eating behaviours, particularly through regular family meals (Hammons & Fiese, 2011). The availability of nutritious foods at home and the frequency of family meals, reinforces adolescents to consume balanced diets and learn about healthy eating (Mahmood et al., 2021). These familial influences have a significant impact on adolescents' nutrition literacy and dietary habits, highlighting the importance of family involvement in promoting healthier eating behaviours during this critical period.

Despite the importance of establishing healthy eating behaviours during adolescence, there is limited understanding of the relationships between these personal and socioenvironmental factors and the nutritional literacy and dietary habits of school-aged adolescents, particularly in Malaysia. Nutrition literacy encompasses functional, interactive and critical dimensions that collectively determine an individual's ability to obtain, process and understand basic nutrition information and services needed to make healthy eating decisions (Al Tell et al., 2023; Karatzi et al., 2023). However, there is a paucity of research exploring how personal and socio-environmental factors relate to adolescents' nutritional literacy. This knowledge gap also extends to the understanding of dietary habits, as the mechanisms by which these factors influence healthy and unhealthy eating behaviours remain unclear. Without a comprehensive understanding of the relationships of these factors with nutrition literacy and dietary habits, it is difficult to design effective interventions tailored to the specific needs of adolescents. More research is therefore needed to determine these relationships, which is crucial for developing

strategies that can promote lifelong healthy eating behaviours and reduce the risk of chronic disease in adulthood.

Furthermore, the relationship between nutrition literacy and dietary habits is not well understood, which is a significant barrier to promoting healthy eating behaviours among adolescents. While some local studies have examined the relationship between nutrition literacy and dietary habits in adults and athletes (Jusoh et al., 2021; Siow, 2022), as well as its implications in specific medical contexts such as hemodialysis patients (Lim et al., 2020), research on this topic in school-aged adolescents in Malaysia has been notably limited. As a result, the purpose of this study is to fill a research gap by examining the relationship between nutrition literacy and dietary habits among school-aged adolescents.

Understanding the factors associated with nutrition literacy and dietary habits is important in addressing the global health challenge caused by poor dietary choices and their associated health consequences. As a result, investigating nutrition literacy and dietary habits is an important and timely research that will contribute to the development of effective interventions and policies aimed at improving public health and overall well-being. Therefore, the purpose of this study was to assess nutrition literacy and dietary habits and their associated factors among school-aged adolescents in Kota Setar, Kedah. These are a few research questions to be addressed in this study:

1. What are the factors associated with nutrition literacy among school-aged adolescents?
2. What are the factors associated with dietary habits among school-aged adolescents?

1.3 Significance of the Study

In recent years, there has been an increasing focus on nutrition literacy research. However, there is a lack of information on the three dimensions of nutrition literacy, which are functional nutrition literacy, interactive nutrition literacy, and critical nutrition literacy, specifically among adolescents in Malaysia. Therefore, the findings of this study have the potential to address this knowledge gap and provide a baseline understanding for future research efforts related to nutrition literacy among adolescents. In addition, there is a shortage of research focusing on nutrition literacy and its association with dietary habits among adolescents in Malaysia. Understanding how personal factors and socioenvironmental factors associated with nutrition literacy and dietary habits in adolescents can lead to targeted interventions that focus on

improving overall health outcomes in this population. Therefore, findings of this study can provide actionable insights for policymakers, educators, and healthcare professionals including nutritionists to design customized programs aimed to improve nutrition literacy and promote healthier dietary habits among adolescents.

1.4 Research Objectives

1.4.1 General objective

To determine factors associated with nutrition literacy and dietary habits in school-aged adolescents in Kota Setar, Kedah.

1.4.2 Specific objectives

1. To examine the personal factors (age, sex, ethnicity, body weight status, parents' education level, monthly household income) and socioenvironmental factors (household food security, social support, home food availability, family meal frequency) among school-aged adolescents.
2. To assess nutrition literacy (functional nutrition literacy, intervention nutrition literacy, and critical nutrition literacy) and dietary habits (healthy and unhealthy dietary habits) among school-aged adolescents.
3. To determine the relationships between personal factors and socioenvironmental factors with nutrition literacy among school-aged adolescents.
4. To determine the relationships between personal factors, socioenvironmental factors and nutrition literacy with dietary habits among school-aged adolescents.

1.5 Research Hypotheses

1. Personal factors (age, sex, ethnicity, parents' education level, monthly household income) and socioenvironmental factors (household food security, social support, home food availability, family meal frequency) are significantly related with nutrition literacy among school-aged adolescents.
2. Personal factors (age, sex, ethnicity, parents' education level, monthly household income), socioenvironmental factors (household food security, social support, home

food availability, family meal frequency) and nutrition literacy are significantly related with dietary habits among school-aged adolescents.

1.6 Conceptual Framework

Figure 1.1 shows the conceptual framework of this study. This framework included three primary components: determinants including personal factors (age, sex, ethnicity, BMI-for-age, parents' education level, monthly household income) and socioenvironmental factors (household food security, social support, home food availability, family meal frequency), with nutrition literacy serving as the independent variable and dietary habits serving as the dependent variable.

Personal factors and socioenvironmental factors were hypothesized to be positively related to better nutrition literacy and healthier dietary habits. For example, higher education levels or better social support may positively correlate with improved nutrition literacy and healthier dietary habits (Al Tell et al., 2023). Similarly, a secured and supportive food environment at home, including the availability of nutritious food options and regular family meals, can positively impact nutrition literacy and encourage healthier dietary habits (Silva, 2023). In general, there is a relationship between nutrition literacy and healthier dietary habits (Al Tell et al., 2023; Depboylu et al., 2023; Koca & Arkan, 2021; Liao et al., 2019). Higher nutrition literacy is related to better dietary habits, leading to individuals making more informed and healthier food choices. Those with higher nutrition literacy may have a better understanding of the nutritional value of foods and are more likely to adopt healthier eating habits by including a variety of nutrient-rich foods into diets (Al Tell et al., 2023; Silva, 2023; Siow, 2022).

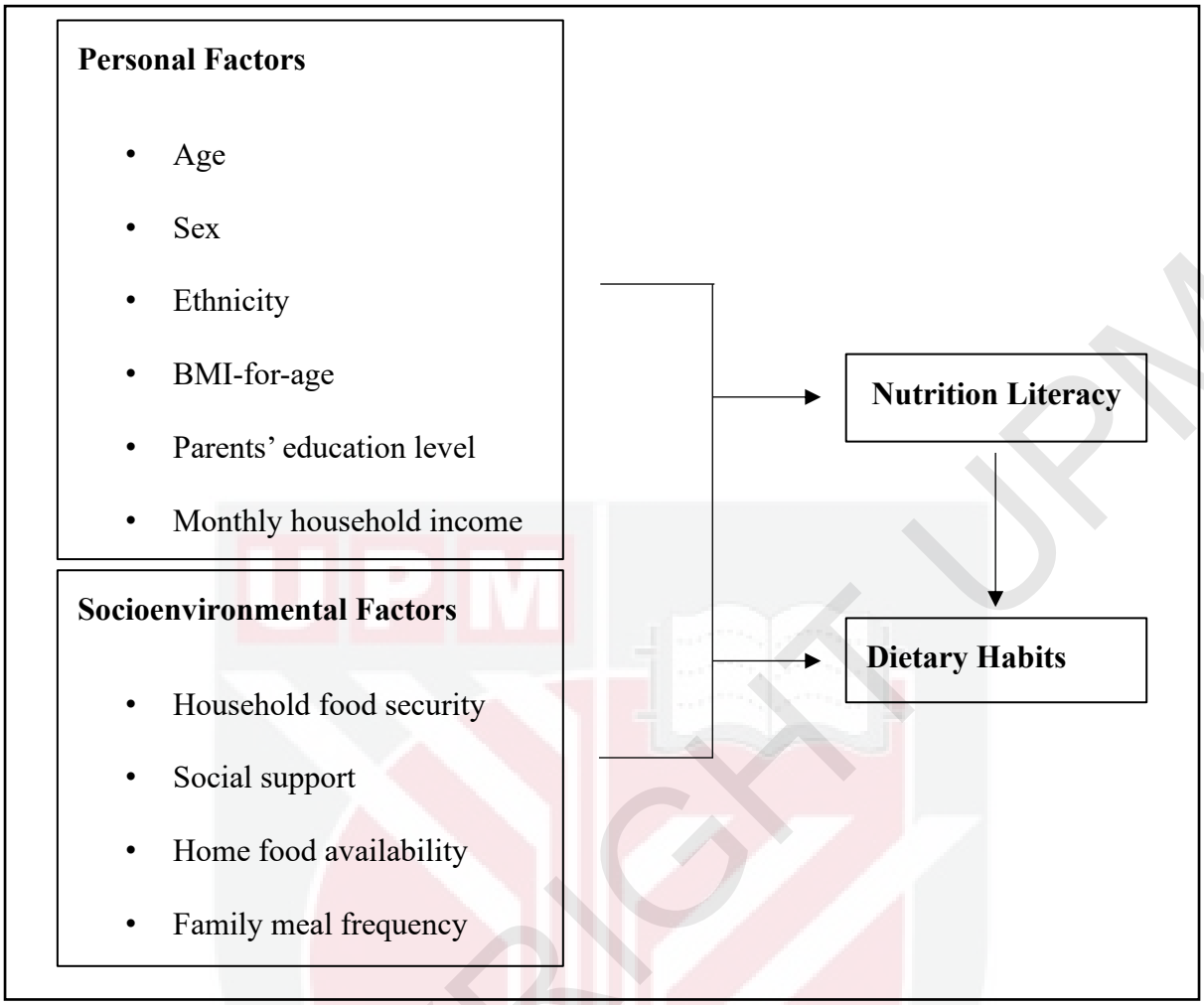

Figure 1.1: Conceptual framework

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