DAILY CALORIE INTAKE, DIABETES AWARENESS AND BEHAVIORAL GAPS AMONG MALAYSIAN ASSISTANT MEDICAL OFFICERS

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Abstract. The prevalence of non-communicable diseases like Diabetes Mellitus (DM) is mostly attributable to lifestyle variables such as food and calorie consumption, which continue to be a big issue in world health. The objective of the study is to evaluate the average daily calorie intake based on gender, to evaluate knowledge as well as level of awareness regarding diabetes risk among Assistant Medical Officers (AMOs) employed at Hospital Tengku Permaisuri Norashikin. A descriptive, cross-sectional survey was conducted by selecting samples among AMOs utilising a self-administered questionnaire encompassing sections on demographic information, dietary practices, and awareness of diabetes risk factors. The gathered data were examined to ascertain the correlation between calorie intake and levels of awareness. The present study found no significant difference in total daily calorie intake between male and female AMOs, which means that gender did not significantly affect average energy consumption amongst the sample population. Final data indicated that 90% respondents had a high level of awareness regarding diabetes risk factors. Final data have found a small, non-significant negative correlation between total daily calorie intake and awareness of diabetes risk factors among AMOs ($\rho = -.289$, $p = .122$). As conclusion, the study underscores the necessity for focused educational interventions and workplace health promotion initiatives to improve dietary habits and elevate diabetes risk knowledge among healthcare professionals. These kinds of programs are important not just for improving one's own health, but also for providing a good example in patient care and community health promotion.
Keywords: *daily calorie intake, diabetes awareness, behavioral gaps, Assistant Medical Officers (AMO)*

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterised by elevated blood glucose levels resulting from defects in insulin secretion, insulin action, or both. The term “diabetes” originates from the Greek word meaning “to pass through,” while “mellitus,” derived from Latin, refers to “sweet,” reflecting the presence of glucose in urine. Historically, the disease has been recognised for thousands of years, with early descriptions dating back to ancient Egypt. Despite this long history, DM remains a major global health concern, with its prevalence continuing to rise at an alarming rate. According to the International Diabetes Federation (IDF), approximately 537 million adults were living with diabetes in 2021, and this number is projected to increase to 643 million by 2030 (Isma’il et al., 2024; Kumar et al., 2020). In Malaysia, diabetes represents a significant public health burden, with prevalence increasing markedly from

11.2% in 2011 to 18.3% in 2019. It is estimated that millions of individuals are currently affected, with a substantial proportion remaining undiagnosed. The increasing prevalence of DM has been closely associated with factors such as urbanisation, population ageing, sedentary lifestyles, and unhealthy dietary patterns. Among these, dietary behaviour particularly excessive calorie intake has been identified as a key modifiable risk factor contributing to the development of type 2 diabetes mellitus (T2DM) (Yameny, 2024; Akhtar et al., 2022).

Daily calorie intake is a fundamental aspect of human nutrition and plays a crucial role in maintaining physiological and metabolic functions. A calorie is defined as the amount of heat required to raise the temperature of one gram of water by one degree Celsius, and in nutritional terms, it is commonly expressed as kilocalories (kcal). The energy derived from food and beverages is essential for sustaining vital processes such as breathing, blood circulation, digestion, and cellular activities, as well as supporting physical movement. The primary sources of this energy are the three macronutrients: carbohydrates, proteins, and fats (Biltoft-Jensen et al., 2022; Hodgson, 2020). The Malaysian Dietary Guidelines (MDG) and Recommended Nutrient Intake (RNI) provide structured recommendations for optimal energy and nutrient consumption. According to these guidelines, carbohydrates should contribute 55-70% of total daily energy intake, fats 20-30%, and proteins 10-15%. Furthermore, daily energy requirements vary based on individual factors such as age, sex, and physical activity levels. For Malaysian adults, the recommended daily energy intake ranges from approximately 1,800 to 2,000 kcal for women and 2,200 to 2,500 kcal for men with moderate activity levels. Maintaining an appropriate balance between energy intake and expenditure is essential for weight management, metabolic regulation, and the prevention of non-communicable diseases, including diabetes mellitus (Tee et al., 2023; MOHM, 2020).

However, modern lifestyle patterns, particularly among working adults, have contributed to increasingly unhealthy dietary behaviours. Busy schedules, occupational stress, and limited time for meal preparation often lead to irregular eating habits, including skipping meals, consuming high-calorie convenience foods, and adopting sedentary lifestyles. These behaviours contribute to excessive calorie intake and increase the risk of metabolic disorders such as obesity and T2DM. Evidence suggests that high caloric intake, particularly from energy-dense and high glycaemic index foods, is associated with increased insulin resistance and impaired glucose metabolism, which are key mechanisms in the development of T2DM. Conversely, balanced dietary patterns with appropriate caloric intake and healthier food choices have been shown to improve glycaemic control and insulin sensitivity (Muhammed et al., 2021; Donin et al., 2014). Healthcare professionals, including Assistant Medical Officers (AMOs), play a vital role in promoting healthy lifestyles and educating the public on the prevention of non-communicable diseases. As trained medical personnel, AMOs are expected to possess adequate knowledge regarding diabetes risk factors and healthy dietary practices. However, studies have shown that healthcare workers themselves may engage in unhealthy eating behaviours. Factors such as long working hours, shift duties, high workload, and stressful working environments can negatively influence dietary habits, leading to irregular meal patterns and increased consumption of high-calorie foods. These occupational challenges may limit the ability of AMOs to translate their knowledge into practice (Quinn et al., 2024; Lam et al., 2023).

Although awareness of diabetes risk factors is important, it does not necessarily translate into healthier lifestyle practices. Research has indicated that knowledge alone is insufficient to drive behavioural change, as dietary habits are also influenced by environmental, occupational, and psychosocial factors. Among healthcare workers, barriers such as limited access to healthy food options within hospital settings, time constraints, and workplace stress may further hinder the adoption of healthy dietary behaviours. As a result, even individuals with high levels of awareness may still engage in unhealthy eating practices (Bakar et al., 2025; Koo et al., 2023). In addition, assessing dietary intake and awareness presents several methodological challenges. Self-reported dietary data are subject to recall bias and social desirability bias, which may affect the accuracy of reported calorie intake. Participants may underestimate their consumption of unhealthy foods or overestimate healthy behaviours. Furthermore, cross-sectional study designs capture data at a single point in time and do not allow for the establishment of causal relationships between variables. Given these considerations, it is essential to examine both daily calorie intake and awareness of diabetes risk among healthcare professionals. Assistant Medical Officers represent a unique group who possess medical knowledge yet are exposed to occupational factors that may influence their lifestyle behaviours. Understanding the relationship between calorie intake and awareness among AMOs is important for identifying potential gaps between knowledge and practice. Therefore, this study aims to determine the average daily calorie intake among AMOs, assess their level of awareness regarding diabetes risk factors, and examine the relationship between these variables. The findings are expected to provide valuable insights for the development of targeted workplace health promotion strategies aimed at improving dietary behaviours and reducing the risk of diabetes among healthcare professionals.

Materials and Methods

This study employed a quantitative cross-sectional design to assess daily calorie intake and the level of awareness regarding diabetes risk among Assistant Medical Officers (AMOs). A descriptive approach was adopted to systematically quantify and describe patterns of dietary intake and awareness within the study population. This design allows for the collection of numerical data at a single point in time, enabling the identification of trends, relationships, and potential gaps between knowledge and practice. Furthermore, the findings from this study may serve as a foundation for future research and inform the development of targeted healthcare policies and workplace interventions. The study was conducted at Hospital Tengku Permaisuri Norashikin, Kajang, Selangor, Malaysia. This hospital was selected due to its accessibility, availability of a sufficient number of AMOs, and suitability for data collection within a clinical environment. The setting also reflects a typical healthcare workplace where occupational demands may influence dietary behaviours and health awareness. The study population consisted of Assistant Medical Officers currently working at Hospital Tengku Permaisuri Norashikin. A total of 30 participants were included in this study. A convenience sampling method was employed due to feasibility and accessibility within the hospital setting.

Participants were eligible if they: (1) Were registered Assistant Medical Officers currently employed at the study site. (2) Had at least 6 months of working experience. (3) Were able to read and understand the questionnaire. (4) Provided informed consent.

Participants were excluded if they: (1) Had a diagnosed history of diabetes mellitus (Type 1 or Type 2). (2) Were pregnant or lactating. (3) Were unable to understand the questionnaire. (4) Were on long-term leave (>1 month) or not actively working. (5) Were temporary or locum staff. (6) Had cognitive or psychiatric conditions affecting comprehension. (7) Had acute illness affecting dietary intake. Data were collected using a structured questionnaire developed based on an extensive review of relevant literature on dietary intake and diabetes risk awareness. The questionnaire consisted of: (1) Section A: Demographic characteristics. (2) Section B: Daily calorie intake (food frequency-based). (3) Section C: Awareness and knowledge of diabetes risk factors. The questionnaire included primarily closed-ended questions to facilitate quantitative analysis, with selected open-ended items to capture additional insights. To ensure content validity, the instrument was reviewed by subject experts and refined through pilot testing. The questionnaire was designed to ensure clarity, relevance, and ease of understanding among participants. A pilot study was conducted prior to the main data collection to evaluate the clarity, reliability, and feasibility of the questionnaire. A small group of AMOs, representative of the target population, participated in the pilot testing. Feedback obtained from the pilot study was used to refine the wording, structure, and layout of the questionnaire to improve data quality and participant comprehension.

Data were collected through self-administered questionnaires distributed to participants during working hours. Participants were briefed on the purpose of the study, and informed consent was obtained prior to participation. To enhance response rate and flexibility, data collection was conducted using both: (1) Paper-based questionnaires (in-person distribution). (2) Online survey platform (Google Forms). Participants were assured of the confidentiality and anonymity of their responses. Completed questionnaires were reviewed for completeness before inclusion in the analysis. Data were analysed using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were employed to summarise the data, where frequencies and percentages were used for categorical variables, while mean and standard deviation were calculated for continuous variables. Inferential statistical analysis was conducted to further explore relationships and differences within the data. The Mann–Whitney U test was used to compare daily calorie intake and awareness levels between gender groups, as the data did not meet normality assumptions. Additionally, Spearman's rank correlation was applied to assess the relationship between total daily calorie intake and awareness of diabetes risk factors. A p-value of less than 0.05 was considered statistically significant for all analyses. Participation in this study was voluntary, and informed consent was obtained from all participants prior to data collection. Participants were assured that their responses would remain confidential and anonymous, and that the data would be used solely for academic and research purposes.

Materials and Methods

Frequency distribution and percentage of respondents' demographic characteristics

The descriptive analysis of respondents' sociodemographic characteristics for the study A Survey on Daily Calorie Intake and Awareness of Diabetes Risk among Assistant Medical Officers Working at Hospital Tengku Permaisuri Norashikin involved a total of 30 participants (*Table 1*). The male respondents are more (n = 16, 53.3%) than females (n = 14, 46.7%). In terms of race, the majority of respondents were Malay (n = 14, 46.7%), followed by Bumiputera Sabah/Sarawak (n = 10, 33.3%), Indian

(n = 4, 13.3%), and Chinese (n = 2, 6.7%). Most participants were aged between 30 and 59 years (n = 17, 56.7%), while 43.3% (n = 13) were in the 19–29 years age group. Regarding educational background, a substantial proportion of respondents held a diploma qualification (n = 21, 70.0%), whereas the remaining participants possessed a degree qualification (n = 9, 30.0%). Meanwhile, working hours per day are include 43.3% of respondents reported working 7 hours (n = 13), followed by 8 hours (n = 10, 33.3%) and 9 hours (n = 7, 23.3%).

Table 1. *Frequency distribution and percentage of respondents' demographic characteristics.*

Category	Frequency	Percentage
Gender		
Male	16	53.3
Female	14	46.7
Race		
Malay	14	46.7
Chinese	2	6.7
Indian	4	13.3
Bumiputera Sabah/Sarawak	10	33.3
Age		
19 – 29 years old	13	43.3
30 – 59 years old	17	56.7
Education		
Diploma Level	21	70.0
Degree Level	9	30.0
Working hours per day		
7 hours	13	43.3
8 hours	10	33.3
9 hours	7	23.3

Daily calorie intake

Next are the descriptive analysis of daily calorie intake among the 30 AMOs (*Table 2*). The result showed that the highest mean calorie intake occurred at breakfast (M = 431.67, SD = 621.57 kcal), followed by lunch (M = 397.00, SD = 183.76 kcal). The third highest is dinner (M = 391.83, SD = 246.69 kcal). Meanwhile, snack meals contributed fewer calories, with afternoon snacks (M = 164.67, SD = 157.01 kcal), morning snacks (M = 71.67, SD = 145.68 kcal), and supper (M = 88.00, SD = 142.55 kcal). These snacks provide relatively smaller energy intake. The large standard deviations that are particularly for breakfast and dinner suggest substantial variation in individual eating patterns among participants. This indicates that while main meals contribute the majority of daily energy intake, there is considerable heterogeneity in portion sizes or types of food consumed. These findings provide insight into the dietary habits of AMOs and will serve as a foundation for further analysis of the relationship between total calorie intake and awareness of diabetes risk factors.

Table 2. *Descriptive statistics of daily calorie intake among AMOs (N=30).*

Meal	Mean (kcal)	SD (kcal)
Breakfast	431.67	621.57
Morning Snack	71.67	145.68
Lunch	397.00	183.76

Afternoon Snack	164.67	157.01
Dinner	391.83	246.69
Supper	88.00	142.55

Awareness of diabetes risk

As shown in *Table 3*, the distribution of diabetes awareness among the respondents shows that most respondents have a high level of awareness. Approximately 27 (90.0%) respondents show high awareness. While only 3 (10.0%) were classified as having moderate awareness. No respondents fell into the low awareness category. These findings suggest that most participants were knowledgeable about the risk factors, preventive measures, and know about diabetes. This is reflecting a generally positive awareness level within the research sample.

Table 3. *Distribution of respondents by diabetes awareness level (N=30).*

Awareness level	Frequency	Percentage
Moderate	3	10.0
High	27	90.0
Total	30	100.0

The average daily calorie intake of AMOs based on gender using validated dietary recall or food frequency methods

The average daily calorie intake of AMOs was 1537.2 ± 1208.5 kcal for males and 1553.6 ± 621.9 kcal for females (*Table 4*). Shapiro-Wilk test indicated that the male group's calorie intake was not normally distributed ($p < .001$), while the female group's intake was approximately normal ($p = .794$). Therefore, a Mann-Whitney U test was conducted to compare daily calorie intake between genders. The results showed that there was no statistically significant difference in calorie intake between males (mean rank = 13.84) and females (mean rank = 17.39), $U = 85.50$, $Z = -1.102$, $p = .271$ (two-tailed). This indicates that gender did not have a significant effect on the average daily calorie intake of AMOs in this sample.

Table 4. *Comparison of total daily calorie intake between male and female AMOs.*

Gender	N	Mean rank	Sum of ranks
Male	16	13.84	221.50
Female	14	17.39	243.50
Total	30	-	-

The level of awareness regarding diabetes risk factors among AMOs working at Hospital Tengku Permaisuri Norashikin

Second analyzes are using A Mann-Whitney U test to examine differences in awareness levels regarding diabetes risk factors between male and female AMOs (*Table 5*). The results show that female AMOs (Md = 3.00) tend to have slightly higher awareness scores than male AMOs (Md = 3.00). However this difference was not statistically significant, $U = 91.00$, $Z = -1.679$, $p = .093$. This suggests that there is no strong evidence of a gender difference in awareness levels among AMOs at Hospital Tengku Permaisuri Norashikin. Although female respondents showed a slightly higher mean rank, the difference could be due to chance and does not reach the minimum level of significance ($p < .05$).

***Table 5**. Comparison of awareness levels regarding diabetes risk factors between male and female AMOs.*

Gender	N	Mean rank	Sum of ranks
Male	16	14.19	227.00
Female	14	17.00	238.00
Total	30	-	-

Note: Mann-Whitney U=91.00, Wilcoxon W=227.00, Z=-1.679, p=.093 (two-tailed).

The relationship between calorie intake and awareness of diabetes risk among AMOs working at Hospital Tengku Permaisuri Norashikin

Lastly, a Spearman rank-order correlation was conducted to examine the relationship between total daily calorie intake and awareness of diabetes risk factors among AMOs (*Table 6*). The results showed a small negative correlation between calorie intake and awareness, ρ = -.289, p = .122. This showed that AMOs who consumed more calories had lower awareness scores. But this relationship was not statistically significant. Therefore, there is no evidence of a meaningful association between calorie intake and awareness of diabetes risk factors in this sample. In summary, the descriptive analysis showed that the majority of the 30 AMOs were male (53.3%), Malay (46.7%) that are aged between 30 and 59 years (56.7%), and held a diploma qualification (70.0%). Daily calorie intake was highest at breakfast, lunch, and dinner. It is with substantial individual variation. While most respondents showed a high level of awareness regarding diabetes risk factors (90.0%). Inferential analyses indicated that there were no significant differences in total daily calorie intake or awareness levels between male and female AMOs. Additionally, a Spearman correlation revealed a small, non-significant negative relationship between calorie intake and awareness (ρ = -.289, p = .122). This suggesting that higher calorie consumption was not meaningfully associated with awareness of diabetes risk factors in this sample. Overall, these findings showed high awareness among AMOs, with gender and calorie intake showing no significant influence.

***Table 6**. Spearman correlation between total daily calorie intake and awareness of diabetes risk factors among AMOs.*

Variable	1	2
Awareness level	1.00	3.00
Total calorie	-.289	1.00

Note: N=30; Spearman's rho reported; p=.122 (two-tailed).

The average daily calorie intake of AMOs based on gender using validated dietary recall or food frequency methods

The present study found no statistically significant difference in total daily calorie intake between male and female AMOs, indicating that gender did not significantly affect average energy consumption in this sample. This result correlates with previous research in which showing no meaningful gender differences in habitual energy intake when measured per unit requirement or under specific conditions. There was no statistically significant difference in the average daily calorie intake of males and females (Coleman et al., 2022). These results show that gender might not be the main factor in determining total daily calorie intake in specific adult samples such as

professional groups like AMOs. This is possibly because occupational demands and lifestyle patterns cause a stronger influence on consumption than gender alone. However, past literature reviews often report gender differences in energy and nutrient intakes. These past literature reviews show that males typically consume higher calories than females. This is likely due to physiological differences such as higher basal metabolic rates and high lean body mass (Rasouli et al., 2019). Despite these, the absence of a significant difference in the present research may reflect the relatively homogeneous lifestyle and work patterns of respondents. This can happen because of small sample size that can reduce the power to detect small differences. Overall, these results are consistent with previous research showing no significant gender differences in daily energy intake under certain controlled or occupationally similar conditions. While past literature review suggests that the gender differences may emerge when larger and more diverse samples are examined.

The level of awareness regarding diabetes risk factors among AMOs working at Hospital Tengku Permaisuri Norashikin

Next, this research outcome have found no statistically significant difference in awareness levels regarding diabetes risk factors between male and female AMOs, despite females showing a slightly higher mean rank. This finding is consistent with some previous research. Research such as community research in rural India has reported that there is no significant gender difference in overall diabetes awareness among adult residents (Kumar et al., 2017). Similarly, large population surveys have found that both males and females can show a comparable level of diabetes knowledge when sociodemographic factors are accounted for (Li et al., 2019). Such results suggest that gender alone may not be a robust predictor of diabetes awareness in certain populations when individuals have similar educational backgrounds, access to health information, and occupational exposure as is the case with healthcare workers like AMOs. However, other studies have demonstrated gender disparities in specific aspects of diabetes knowledge and risk perception. For example, research in the United States found that women were significantly more likely than men to recognize at least one symptom of type 2 diabetes after adjusting for confounders (Fukuoka et al., 2014). Moreover, another past research shows that the chronic disease awareness has shown that gender differences can emerge due to difference factors. The factors are such as health-seeking behavior, health literacy, and psychosocial factors that influence disease perception and self-management (Li et al., 2019). These research shows that overall awareness may not differ significantly by gender in some settings. However, the factors such as cultural norms, health education, and public health campaigns can lead to gender-specific strengths or gaps in knowledge. The present findings reinforce the importance of tailored health education strategies that ensure equal opportunities for awareness enhancement across both male and female AMOs.

The relationship between calorie intake and awareness of diabetes risk among AMOs working at Hospital Tengku Permaisuri Norashikin

Lastly, this research finding based on third objective have found a small, non-significant negative correlation between total daily calorie intake and awareness of diabetes risk factors among AMOs ($\rho = -.289$, $p = .122$). This result shows that the higher calorie intake was not associated with high awareness in this sample. This

finding correlates with past literature review results that show that knowledge or awareness of nutrition and dietary risks does not always directly translate into healthier dietary behaviors or lower energy intake. For example, research examining the relationship between nutrition knowledge and dietary intake has found weak or non-significant associations overall. Many past literature are reporting that nutrition knowledge alone explains only a small portion of variance in actual food consumption patterns especially total energy intake (O'Leary et al., 2025; Fukuoka et al., 2014). These prior research suggest that even when individuals understand health risks, other factors such as food preferences, habits, availability, and socio-cultural influences may significantly shape dietary behavior beyond awareness alone. Other research has shown that higher nutrition knowledge is sometimes associated with healthier dietary patterns. Although these associations are often modest and vary by context and measurement methods. For example, past literature reviews focusing on specific aspects of diet quality (such as fruit and vegetable intake) often find positive correlations with nutrition knowledge. This shows that individuals with high understanding are more likely to engage in some good eating behaviors (O'Leary et al., 2025). The lack of a significant relationship in this research may reflect similar complexities. The AMOs might possess general awareness of diabetes risk factors without it translating into differences in calorie intake. This is especially when high awareness is related to dietary habits or occupational constraints. Thus, the research results show that awareness alone may not be sufficient to influence overall energy consumption. This supports the view that interventions aiming to improve diet and reduce chronic disease risk may need to address behavioral and environmental determinants beyond basic knowledge.

Several limitations of this research should be acknowledged and justified. First, the relatively small sample size and the inclusion of AMOs from a single hospital limit the generalizability of the findings to other healthcare settings or populations. Single-centre samples may reduce external validity and statistical power that potentially limit the detection of significant associations (Polit and Beck, 2008). Second, this research relied on self-reported dietary recall and questionnaire-based awareness measures. In which are susceptible to recall bias and social desirability bias. Such biases are well documented in nutritional and behavioral research, as participants may underreport or overestimate food intake and health-related knowledge (Thompson and Subar, 2017). Third limitation are involving the cross-sectional design of the research precludes causal inference between calorie intake and awareness of diabetes risk factors, as exposures and outcomes were measured simultaneously. According to epidemiological principles, cross-sectional studies are suitable for identifying associations but cannot establish temporal or causal relationships (Setia, 2016). Finally, unmeasured confounding factors such as physical activity level, work-related stress, shift patterns, and individual metabolic differences were not controlled and may have influenced both dietary behavior and awareness levels. Despite these limitations, this research provides important preliminary evidence and serves as a foundation for future research using larger samples, longitudinal designs, and objective dietary assessment methods.

Conclusion

This study examined daily calorie intake, awareness of diabetes risk factors, and the relationship between these variables among Assistant Medical Officers (AMOs) at Hospital Tengku Permaisuri Norashikin. The findings demonstrated that although

female AMOs exhibited slightly higher calorie intake and awareness scores than males, no statistically significant gender differences were observed. Overall, respondents showed a high level of awareness regarding diabetes risk factors, indicating good baseline knowledge within this healthcare workforce. However, no significant association was found between total daily calorie intake and awareness of diabetes risk. Despite a weak negative correlation, the results suggest that higher awareness does not necessarily translate into healthier dietary behaviour. This highlights a critical gap between knowledge and practice, indicating that awareness alone is insufficient to drive behavioural change. The findings underscore the influence of external factors such as occupational demands, time constraints, and workplace environment on dietary habits among AMOs. Therefore, effective interventions should extend beyond educational approaches to include comprehensive workplace health promotion strategies that address behavioural, organisational, and environmental determinants. Such multifaceted interventions are essential to support healthier dietary practices and reduce the risk of diabetes among healthcare professionals.

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Conflict of interest

The authors confirm that there is no conflict of interest involve with any parties in this research study.

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