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Assessment of Lifestyle-Related Risk Factors and Health Awareness of Diabetes Mellitus in an Iraqi Population

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Abstract

General Background: Diabetes Mellitus represents a rapidly growing non-communicable disease burden across the Middle East. **Specific Background:** In Iraq, demographic shifts, rapid urbanization, and shifting lifestyle patterns have led to an increased incidence of metabolic disorders. **Knowledge Gap:** However, comprehensive community-based evaluations combining behavioral risk profile assessments with public diabetes awareness remain sparse in the region. **Aims:** This cross-sectional study investigated the prevalence of lifestyle-related risk factors and evaluated health awareness among 208 Iraqi adults. **Results:** Statistical analysis revealed that 51.92% of participants were overweight or obese, 42.31% had a first-degree family history of diabetes, 48.07% were physically inactive, and 92.30% experienced moderate-to-high stress levels. **Novelty:** This research provides an integrated epidemiological mapping of biological, behavioral, and psychological risk factors specifically tailored to urban Iraqi demographics. **Implications:** The findings underscore the critical need for culturally adapted public health interventions, early screening strategies, and community nutrition education to mitigate the rising national burden of diabetes.

Keywords: Diabetes Mellitus, Lifestyle Risk Factors, Health Awareness, Body Mass Index, Public Health

Key Findings Highlights:

- Over half of the surveyed cohort demonstrated elevated body mass index alongside significant genetic predisposition.
- High rates of physical inactivity and frequent consumption of sugar-sweetened beverages prevail among urban demographics.
- Psychological stress and inadequate sleep duration represent prominent unaddressed non-communicable risk components.

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Introduction

Diabetes Mellitus (DM) refers to a group of different types of chronic metabolic disorders characterized by increased levels of blood glucose caused by either inadequate insulin production, diminished efficiency of the hormone, or both. This condition features as one of the most prevalent non-communicable diseases in the world and constitutes an important public health problem because of its increasing incidence rate, progressive nature, and significant burden associated with the disease (morbidity, early mortality, high costs of care, among others). Although there have been many strides in terms of diagnostics and treatments, the burden of the disease worldwide has not ceased increasing (1).

T2DM accounts for around 90-95% of the total number of diabetes cases and is highly susceptible to changes in behavior and environmental factors. Overweight or obese condition, physical inactivity, improper nutrition, smoking habits, chronic stress, and excessive sitting have been repeatedly found to be the major contributing causes of T2DM and abnormal glucose metabolism (2). The above-mentioned risk factors tend to occur simultaneously and combine together with genetic predisposition to aggravate the development of the disease and increase the chances of getting complications such as diabetic retinopathy, nephropathy, neuropathy, coronary diseases, and cerebrovascular diseases (3).

The prevalence of type 2 diabetes mellitus (T2DM) has increased dramatically in the MENA region in recent decades. The combination of urbanization, transition to nutrition with highly calorific food products, reduction in physical activity levels, and other socioeconomic changes has resulted in the increasing rates of diabetes incidence in this particular region (4). Similar epidemiological trends have occurred in Iraq, with growing population size and lifestyle changes that increase people's vulnerability to the well-known risk factors. As a result, diabetes mellitus is a serious medical problem facing significant challenges (5).

In addition to the increasing cases of diabetes, Iraq is faced with various challenges regarding its healthcare system that might negatively impact prevention of the disease and its management. The variability in the availability of primary care services, lack of screening programs, and the lack of public health education might result in the delay in diagnosing the disease, poor glycemic control, and complications due to diabetes (6). Furthermore, the lack of knowledge about diabetes risks, signs, prevention techniques, and ways of improving lifestyles might be an obstacle to adopting healthy behaviors (7).

Evidence is now growing about the fact that lifestyle changes continue to rank among the most efficacious interventions to either prevent or postpone T2DM onset (8). Improvements in the quality of diet, involvement in physical activity, keeping healthy weight, not smoking, and managing stress effectively have always been found to have a positive influence on blood glucose and to reduce cardiometabolic risk (9). However, such preventive measures can be effective only depending on how much health literacy people in this population have about diabetes and its risk factors and complications (10).

While numerous studies have considered the epidemiology of diabetes mellitus among different communities, there is still little research concerning the combined evaluation of risk factors related to lifestyle behaviors and diabetes awareness among the Iraqi community through a public health approach (11). The identification of the distribution of modifiable risk factors associated with behaviors along with the evaluation of public awareness is very important for developing culturally-specific preventive measures and health promotion programs among the Iraqi community (12).

Therefore, the present study is meant to determine the prevalence of lifestyle-based risk factors for Diabetes Mellitus and to measure the awareness level of the general public regarding the causative factors, complications, preventive measures, management, and etiology of this condition. It is hoped that the results of this study will provide data to help develop health policies in the future for preventing the increased incidence of Diabetes Mellitus in Iraq (13-15).

Methodology :

2.1 Study Design and Setting

A descriptive cross-sectional study design was used to study the behavioral risk factors in relation to metabolic conditions associated with Diabetes Mellitus amongst the adult population of Iraq. Subjects were selected from several geographical locations which included specialty centers for Diabetes and Nutrition and the general community. The objective of recruiting subjects from various sources was to improve representativeness of the sample and thus improve external validity.

2.2 Ethical Considerations

Approval by the relevant Institutional Review Board (IRB) was granted before the beginning of the study (16). Informed consent, either written or oral, was taken after giving a thorough briefing about the aim of the study to all the participants (17). It was a voluntary process, and confidentiality was strictly maintained. All the personal identifiers were stripped off from the data. The study was carried out according to the ethical guidelines for conducting clinical studies on humans, as mentioned in the Declaration of Helsinki (18).

2.3 Participants and Sampling

The cross-sectional study was carried out in a community where participants from various geographic locations in Iraq took part in the study between January 2025 and June 2025. A total number of 208 participants participated in the study after being selected using a convenient sampling technique. The criteria used in recruiting the participants included people above the age of 18 years.

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The data collection process involved administering a self-filled survey based on a structured questionnaire, which had been designed by the researchers from previous research work and guidelines for assessing the risk of developing diabetes (20, 21). It was distributed through an electronic medium by utilizing Google forms in order to allow the participation of respondents from different demographics and geographical locations. Data included sociodemographic factors (age, gender, marital status, and education), family history of Diabetes Mellitus, smoking habit, stress level, dietary habits, meals, type of dietary fat, intake of sugary drinks, and diabetes awareness.

Body measurements in terms of body weight and height were recorded from the participants through their self-report and used in calculating their Body Mass Index (BMI) based on the formula where the body weight (in kg) is divided by the height squared (in m2). Participants were grouped based on the WHO BMI criteria for adults which have been used in determining the relationship between weight and metabolic disease risk (22).

2.5 Statistical Analysis

Statistical analysis was done through SPSS software package version 26.0 (IBM Corp., Armonk, NY, USA). Categorical data is presented in terms of frequency counts and percentages. The Chi-square test (χ^2) was used to determine relationships among categorical variables. A significance level of 0.05 was considered statistically significant (23).

3. Results and Discussion

3.1. Socio-Demographic Matrix of the Cohort

Table 1: Socio-Demographic Characteristics of the Study Population ($N = 208$)

Demographic Variable	Category	Frequency (n)	Percentage (%)	Chi-Square ($\chi2$)	P-value
Gender	Male	72	34.62	19.692	$<0.0001^{**}$
	Female	136	65.38		
Age Groups (Years)	$18 - <25$	36	17.31	82.502	$<0.0001^{**}$
	$25 - <35$	28	13.46		
	$35 - <45$	76	36.54		
	$45 - <55$	40	19.23		
	$55 - <65$	20	9.62		
	$65 - 70$	8	3.85		
Academic Degree	Postgraduate	144	69.23	109.260	$<0.0001^{**}$
	Bachelor's	32	15.38		
	High School	36	17.31		
Marital Status	Married	132	63.46	199.384	$<0.0001^{**}$

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Demographic Variable	Category	Frequency (n)	Percentage (%)	Chi-Square ($\chi 2$)	P-value
	Single	60	28.85		
	Widowed	12	5.77		
	Divorced	4	1.92		
Educational Level	Higher Education	128	61.54	77.098	$<0.0001^{**}$
	Bachelor's	32	15.38		
	Secondary	48	23.08		

3.1 Socio-demographic Characteristics of the Study Population

Sociodemographic data on the studied group of Iraqis (N = 208) shows significant differences in key variables ($p < 0.0001$), which sets the basis for the understanding of the context of metabolic risk distribution. According to Table 1 (file 151566.jpg), 65.38% (n = 136) of respondents were females and 34.62% (n = 72) – males, thus creating an important difference ($\chi^2 = 19.692$). This difference correlates with previous epidemiological data on the high representation of women in health-oriented surveys and screening programs, especially in community-based surveys among people in Middle Eastern countries (24,25). From the clinical perspective, this predominance is relevant because women may be more prone to metabolic disorders caused by hormonal imbalance, physiological features, and lack of physical activity associated with cultural traditions (26).

In regards to age distribution, a noticeable clustering occurred at ages 35 to below 45 years (36.54%, n = 76; $\chi^2 = 82.502$), implying the clustering of patients at productive and socially active age. This finding is supported by international data that demonstrate the increase of Type 2 Diabetes Mellitus (T2DM) prevalence in young and middle-aged people, which is associated with the development of insulin resistance caused by the process of adaptation of lifestyle, such as more sedentary activity, eating a western-type diet, and occupational stress (27,28). The change of age distribution can be seen as one of the examples of epidemiological transition when T2DM occurs not only in elderly population but in working-age people as well (27).

Concerning educational status, most of the subjects (61.54%, n = 128) were highly educated. Despite the fact that better education generally implies better health literacy and lower risks of developing non-communicable diseases, results from the current study suggest that there is no relationship between education and health-related behaviors. Such phenomenon can be explained by the "lifestyle paradox" described in contemporary literature on public health, in which case people who are more highly educated or professional tend to have sedentary lifestyle, experience chronic stress at work, and consume an unhealthy diet due to their life in the modern city (29,30). Thus, education does not automatically give a person immunity to metabolic risks if he/she is not practicing healthy behaviors.

In summary, the demographic structure of the sample highlights the broad distribution of the metabolic risk factors among working aged people living in urbanized areas with relatively higher levels of education. The need for the development of preventative approaches, targeting behavior change at the population level is clearly illustrated here (31).

3.2. Hereditary and Comorbidity Matrix

Table 2: Clinical Profile and Family History of Diabetes ($N = 208$)

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Clinical Parameter	Response Category	Frequency (n)	Percentage (%)	Chi-Square (χ2)	P-value
First-Degree Family History of DM	Yes	88	42.31	4.923	0.0265^{*}
	No	120	57.69		
Current Co-morbidities	Hypertension	48	20.17	75.593	$<0.0001^{**}$
	Hyperlipidemia	32	13.45		
	Polycystic Ovary Syndrome (PCOS)	40	16.81		
	None	116	48.74		
Ever Told Your Blood Sugar is High?	Yes	76	36.54	15.076	$<0.0001^{**}$
	No	132	63.46		

3.2 Clinical and Metabolic Risk Profile

The assessment of the clinical features and markers of metabolic risk reveals a complex relationship of genetic predisposition and acquired metabolic disorders in the studied population. The analysis of data presented in Table 2 demonstrates that 42.31% (n = 88) of patients had a positive first-degree family history of Diabetes Mellitus, which was statistically significant ($\chi^2 = 4.923$, $p = 0.0265$). The results emphasize the important role of the genetic component in the development of T2DM, which is mostly based on polygenetic inheritance, with the genes responsible for the function of beta cells, insulin secretion, and glucose metabolism involved (32,33). In the Middle Eastern population, the presence of genetic susceptibility is often complicated by common environmental factors and lifestyle that result in earlier development of metabolic disorders and increased risks of diabetes mellitus (33).

In light of the current changes in lifestyles, this genetic background speeds up the pathogenesis from normoglycemia to glucose dysregulation and diabetes. The combination of genetics and environmental triggers such as sedentary lifestyle, poor nutrition, obesity, and stress is a major contributing factor to the development of insulin resistance and impaired function of the pancreas, leading to chronic hyperglycemia (34).

In addition to familial risk factors, there is a clear clustering of chronic diseases ($\chi^2 = 75.593$, $p < 0.0001$), including high blood pressure (20.17%), hyperlipidemia (13.45%), and Polycystic Ovary Syndrome (PCOS) (16.81%). This trend is consistent with the criteria for the Metabolic Syndrome (MetS), which includes insulin resistance, dyslipidemia, vascular endothelial dysfunction, visceral obesity, and low-grade chronic inflammation (35). The coexistence of such diseases significantly increases the risk of cardiometabolic disorder and the onset of Type 2 Diabetes

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Mellitus.

Polycystic ovary syndrome (PCOS), among other disorders listed above, plays an important role in the regulation of metabolism in women. According to the recent scientific research, hyperandrogenism and inflammation affect the development of insulin resistance through alteration of IRS-1/PI3K/Akt signaling pathway; thus, causing decreased GLUT-4 transport to the cell membrane and poor glucose intake. Therefore, these processes result in insulin resistance and deterioration of the beta-cells functions, making PCOS one of the predictors of type 2 diabetes mellitus (T2DM) (36).

Moreover, 36.54% (n=76) of subjects were found to have a previous alert about their increased blood sugar level, which proved to be statistically highly significant (χ^2=15.076, p<0.0001). This implies that there is a sizeable number of patients who have already reached the prediabetic/dysglycemia stage before diagnosis. In terms of public health implications, this finding emphasizes the importance of early screening and appropriate interventions among primary care services. Early detection of impaired glucose metabolism and rigorous lifestyle change have been proven to slow down the development or even to halt the development of type 2 diabetes mellitus and its consequences (37, 38).

In conclusion, the results show that the metabolic risk among this population comes about due to a combination of genetic susceptibility, comorbidity clusters, and dysglycemia, making it necessary to have an integrated program for screening of family histories and metabolic risk (38).

3.3. Anthropometric Analysis

Table 3: Anthropometric Status (Body Mass Index - BMI) of the Sample ($N = 208$)

Body Mass Index (BMI) Category	Frequency (n)	Percentage (%)	Chi-Square (χ2)	P-value	Clinical Interpretation
Overweight / Obese	108	51.92	94.348	$<0.0001^{**}$	Severe high metabolic risk prevalence
Normal Weight	96	46.15			Baseline reference range
Underweight	4	1.92			Minimal baseline presentation

3.3 Anthropometric Profile and Metabolic Risk

Anthropometric assessment of the recruited study sample reveals a clear trend towards body mass gain, reflecting a high-risk metabolic profile. According to Table 3, the vast majority of subjects (51.92%, n = 108) was overweight or obese, showing substantial statistical difference among BMI groups (χ^2 = 94.348, p < 0.0001). The observed prevalence of increased body fat reflects the worldwide epidemiological data on obesity and being overweight as major predisposing factors for development of T2DM and cardiometabolic diseases (39,40).

Insulin resistance is caused by excessive fat accumulation from a physiological perspective. Fat cell hypertrophy causes an increase in non-esterified fatty acids (NEFAs) and the production of pro-inflammatory cytokines, which include tumor necrosis factor alpha (TNF-α) and interleukin-6 (IL-6), in addition to lowering the levels of adiponectin, which helps sensitize insulin. This imbalance causes inflammation, which

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plays a key part in the development of insulin resistance (41).

Biologically, high levels of NEFAs increase lipid deposits in the skeletal muscles and the liver, a process called lipotoxicity, leading to impairment of insulin receptor function and inhibition of glucose uptake by cells. Such an event involves disturbance of the insulin signaling pathway, including impaired IRS function and decreased GLUT4 translocation. Hence, chronic metabolic stress leads to β-cell dysfunction and a reduction in the ability of insulin secretion (42).

The results presented herein further confirm the idea that high BMI serves not only as an anatomical feature but rather as a biological risk factor involved in the pathogenesis of metabolic diseases. The strong relationship between overweight and dysglycemia found among the subjects included in the present study is consistent with population-level data showing that obesity is one of the main modifiable risk factors in the development of T2DM globally (39,40).

In summary, all of the results emphasize the fact that the high frequency of obesity and being overweight among this population is one of the main upstream causes of metabolic and insulin resistance disorders, highlighting the immediate need for weight reduction interventions (43).

3.4. Nutritional Patterns and Glycemic Load

Table 4: Dietary Habits and Nutritional Patterns ($N = 208$)

Dietary Factor	Category	Frequency (n)	Percentage (%)	Chi-Square ($\chi 2$)	P-value
Number of Daily Meals	2 Meals	72	34.62	56.586	$<0.0001^{**}$
	3 Meals	112	53.85		
	More than 3	24	11.54		
Daily Vegetable & Fruit Intake	Sometimes	64	30.77	2.507	0.2845 (NS)
	Mostly	64	30.77		
	Always	80	38.46		
Sugar-Sweetened Beverages Intake	Never	4	1.92	97.846	$<0.0001^{**}$
	Rarely	56	26.92		
	A few times a week	104	50.00		
	Daily	44	21.15		
Most Frequently Used Type of Fat	Plant-based Fats (Oils)	84	40.38	38.405	$<0.0001^{**}$

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Dietary Factor	Category	Frequency (n)	Percentage (%)	Chi-Square (χ2)	P-value
	Animal Fats (Ghee/Butter)	28	13.46		
	Mixed Fats	96	46.15		

3.4 Dietary Patterns and Metabolic Risk

Analysis of diet profile shows a marked trend towards energy dense and high glycemic profile which could possibly result in metabolic dysfunction of the subjects studied. Even though fruit and vegetable intake in a day was statistically insignificant ($p = 0.2845$), the trend that emerges is low intake of fiber containing foods by the subjects. Dietary fiber has been shown to have beneficial effects on glycemic regulation, insulin resistance, and cardiometabolic health risks, while low fiber intake could result in metabolic dysfunction (44). On the other hand, other dietary trends showed statistical significance ($p < 0.0001$), as highlighted in Table 4 below.

The adverse dietary behavior that was found included high consumption of sugar-sweetened beverages (SSBs) whereby 50.00% (n = 104) took it weekly while 21.15% (n = 44) consumed them on a daily basis ($\chi^2 = 97.846$). This finding is in line with other studies where SSB intake has been found to increase the risks of developing obesity, insulin resistance and T2DM due to high energy content and adverse effect on glucose metabolism (45,46). The constant consumption of easily digestible carbohydrates leads to high postprandial blood glucose levels and consequently, high need for insulin (46).

Metabolically, high levels of sugar consumption, particularly in the form of fructose-based drinks, lead to liver fat production, increase triglyceride production, and ectopic fat accumulation and insulin resistance in the liver. These changes represent major metabolic pathways by which high sugar intake causes metabolic syndrome and leads to dysglycemia (47).

Furthermore, regular intake of a mixture of cooking fats as evidenced by 46.15% (n=96) of respondents is another significant feature of diet among the study sample. Fat in the diet affects metabolism mostly through its fatty acid content. Diets with high levels of saturated fat have been associated with pro-inflammatory, pro-oxidant, and insulin resistant states while substitution of saturated fats with unsaturated fatty acids has shown improvement in cardiometabolic conditions (48). Therefore, the combination of exposure to high glycemic index diet and poor quality fats may result in increased risk of insulin resistance and type 2 diabetes mellitus.

In general, from the diet characteristics of the population studied, it is evident that there are many modifiable nutrition risk factors, among them low fiber intake, high intake of sugar-sweetened drinks, and possibly unfavorable fat intake behaviors. Such results indicate the need for culturally sensitive nutrition interventions to help reduce consumption of sugars and fats, while improving intake of protective foods in order to minimize the risk of developing diabetes in the future (44,49).

3.5. Physical Activity, Behavioral Choices, and Stress Dynamics

Table 5: Behavioral, Physical Activity, and Lifestyle Stress Indicators ($N = 208$)

Lifestyle & Behavioral Factor	Category	Frequency (n)	Percentage (%)	Chi-Square (χ2)	P-value
Physical Activity Frequency	Sedentary (No exercise)	100	48.07	85.528	$<0.0001^{**}$

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Lifestyle & Behavioral Factor	Category	Frequency (n)	Percentage (%)	Chi-Square ($\chi 2$)	P-value
	$1-2$ times / week	64	30.77		
	$3-4$ times / week	32	15.38		
	>5 times / week	12	5.77		
Daily Sleep Duration	<5 hours	52	25.00	30.153	$<0.0001^{**}$
	$6-7$ hours	80	38.46		
	$7-8$ hours	52	25.00		
	>8 hours	24	11.54		
Daily Stress Levels	Low Stress	16	7.69	108.801	$<0.0001^{**}$
	Moderate Stress	136	65.38		
	High Stress	56	26.92		
Smoking Status	Non-Smoker	160	76.92	60.307	$<0.0001^{**}$
	Smoker	48	23.08		

3.5 Behavioral and Psychosocial Risk Factors

Evaluation of the behavioral and psychosocial factors of the lifestyle, as outlined in Table 5, highlights the existence of considerable proportion of negative lifestyle traits among the participants. Almost half of the respondents stated their lack of any physically active lifestyle (48.07%, n = 100; $\chi^2 = 85.528$, $p < 0.0001$). The high rate of inactivity is consistent with international evidence which associates insufficient physical activity with obesity, insulin resistance, poor glucose metabolism, and an increased risk of T2DM (50,51).

In terms of physiology, consistent muscular contraction plays a crucial role in maintaining glucose homeostasis through facilitating glucose uptake independently of insulin through the process of increased GLUT4 transport to the surface of the skeletal muscle cells. Low levels of physical activity lead to impaired utilization of glucose by skeletal muscles, development of insulin resistance, and ultimately contribute to metabolic dysfunction, especially in patients with other risk factors (52).

The sleep habits were significantly correlated with metabolic risks, as 25.0% (n = 52) of the participants had a habit of sleeping for less than 5 hours in a day ($\chi^2 = 30.153$). It is becoming widely accepted that the shortened duration of sleep is an important behavioral risk factor in the development of metabolic disorders due to its association with insulin resistance, abnormal appetite control, increased inflammation, and an increased risk of developing type 2 diabetes mellitus (T2DM) (53).

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Stress was one of the identified risk factors in the study population where 65.38% (n = 136) experienced moderate stress and 26.92% (n = 56) high stress levels (χ^2 = 108.801). The presence of long-term psychological stress is known to negatively impact glucose metabolism through HPA axis stimulation and cortisol production. High cortisol levels could increase glucose production by the liver, reduce insulin sensitivity and cause adverse metabolic conditions for people at high risk of diabetes (54). In addition, behavioral changes associated with the experience of stress including poor nutritional habits, eating disorders, and reduced physical activity could contribute to the development of metabolic risk (55).

Conclusion

In summary, the research suggests that being inactive, sleeping inadequately, and experiencing psychological stress represent interrelated factors of a person's lifestyle that together have an impact on metabolic problems. It is important to note that the study highlights the significance of using an integrated approach to diabetes prevention by addressing all these factors along with proper nutrition (55).

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