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Characteristics, Risk Factors, and Associated Complications of Diabetic Patients Attending Al-Wafaa Diabetes Center, Mosul: An Analytical Cross-Sectional Study

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Abstract: - Background: Diabetes mellitus represents a significant health challenge in post-conflict regions like Mosul, Iraq, where population-specific data remains limited.

Objective: To examine demographic characteristics, risk factors, complications, and analyze associations between modifiable risks and complication onset among diabetic patients.

Methods: An analytical cross-sectional study was conducted at Al-Wafaa Diabetes Center from October 2023 to March 2024. A simple random sample of 140 diabetic patients was recruited. Data were collected via structured questionnaires and medical records. Descriptive statistics and logistic regression analyses were performed using SPSS v24.

Results: The mean age was 48.96 ± 14.42 years, with 54.3% males. Type 2 diabetes predominated (81%). Key findings included: 76% of participants reported no physical activity; 57.1% were overweight/obese. Prevalent complications were retinopathy (27.1%), cardiovascular disease (25.7%), and neuropathy (25.0%). Neuropathy developed earliest (7.9 ± 3.5 years; p=0.023). Physical inactivity significantly increased neuropathy risk (aOR=2.5; 95% CI: 1.2–5.3), and obesity independently predicted cardiovascular disease (aOR=2.8; 95% CI: 1.3–6.2).

Conclusion: Sedentary lifestyle and obesity are strongly linked to complications, with neuropathy manifesting earliest. Early screening and targeted lifestyle interventions are urgently needed.

Keywords: Diabetes mellitus; Risk factors; Complications; Iraq; Cross-sectional study

Supplementary information: The online version of this article (https://doi.org/xx.xxx/xxx.xx) contains supplementary material,which is available to autho-rized users.

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Introduction

Diabetes mellitus has become a global epidemic, with its prevalence rising dramatically worldwide (1, 2). The Middle East and North Africa (MENA) region is disproportionately affected, facing one of the highest rates of increase due to rapid urbanization and profound lifestyle changes (3). Iraq, a nation grappling with the after-effects of prolonged conflict, faces a unique and compounded public health crisis. The healthcare infrastructure, particularly in cities like Mosul, has been severely impacted, creating significant challenges in managing chronic non-communicable diseases like diabetes (4, 5).While the pathophysiology of diabetes and its primary risk factors are well-documented globally (6, 7), there is a critical scarcity of localized data that profiles the specific characteristics of the diabetic population in post-conflict Iraqi settings (8). Such data is essential for developing effective, evidence-based public health strategies and clinical guidelines tailored to the local context. This study aims to address this critical gap by providing a detailed snapshot of the patients at Al-Wafaa Diabetes Center in Mosul.

The study has three primary objectives:

1. To characterize the demographic, clinical, lifestyle, and complication profiles of diabetic patients.
2. To identify the associations between key modifiable risk factors—specifically obesity and physical inactivity—and major diabetic complications.
3. To analyze the timing of complication onset following the initial diagnosis of diabetes.

Materials and Methods

Study Design and Setting:

An analytical cross-sectional study was conducted at Al-Wafaa Diabetes Center, a primary diabetes care facility in Mosul, from October 2023 to March 2024.

Participants and Sampling:

- A simple random sampling technique was used to recruit 140 diabetic patients from the center's electronic registry.
- **Inclusion criteria:** Age ≥18 years, a confirmed diagnosis of diabetes (Type 1, Type 2, or gestational) according to American Diabetes Association criteria (9), and active follow-up at the center.
- **Exclusion criteria:** Patients with cognitive impairment preventing informed consent, those who refused to participate, or those with critically incomplete medical records.

Data Collection and Ethical Approval

A validated questionnaire was used for data collection. Clinical data were cross-verified with medical records. Ethical approval was obtained from the institutional review boards of Mosul Higher Health Institute and Al-Wafaa Diabetes Center. Written informed consent was secured from all participants.

The instrument comprised four validated sections:

1. **Sociodemographic Profile:** Age, gender, marital status, educational attainment, occupational status, residence type, and economic indicators
2. **Medical History and Clinical Profile:** Diabetes classification, diagnostic duration, familial history, and comorbid conditions
3. **Anthropometric and Lifestyle Assessment:** Body Mass Index categorization, dietary patterns, physical activity levels, and behavioral risk factors
4. **Complication Screening:** Systematic assessment of microvascular (retinopathy, nephropathy, neuropathy) and macrovascular (cardiovascular disease, peripheral vascular disease) complications

Data Collection Procedures

Trained research personnel conducted structured interviews using the validated questionnaire. Each interview duration averaged 20 minutes, with clinical data cross-referenced against available medical records when possible. Anthropometric measurements were obtained using standardized protocols, and complication assessment followed established screening guidelines.

Statistical Analysis:

Descriptive statistics, Chi-square tests, adjusted binary logistic regression, and one-way ANOVA with a Tukey post-hoc test were used for analysis ($p<0.05$ considered significant).

Study Limitations

Several methodological limitations warrant acknowledgment: single-center design could introduce selection bias; cross-sectional methodology precludes temporal relationship assessment; self-reported data may introduce recall bias; and sample size constraints limit complex statistical modeling capabilities.

Results

Table 1: Demographic and Clinical Characteristics of the Study Population (n=140)

Variable	Category	Frequency	Percentage (%)
Age (Years)	<30	27	19.3
	30–49	36	25.7
	50–64	53	37.9
	≥65	24	17.1
Gender	Male	76	54.3
	Female	64	45.7
Education	≤Primary	82	58.6
	≥Secondary	58	41.4
Residence	Urban	78	55.7
	Rural	62	44.3
Diabetes Type	Type 1	18	13.0
	Type 2	113	81.0
	Gestational	8	6.0
Family History	Yes	81	58.0
	No	59	42.0
Hypertension	Yes	41	29.0
	No	99	71.0

The demographic and clinical profile of the 140 participants is detailed in **Table 1.** The cohort represents a middle-aged population (mean age 48.96 ± 14.42 years) with a slight male predominance (54.3%). Key socio-demographic features include a majority residing in urban areas (55.7%) and a notable proportion (58.6%) having primary education or less, a factor that may influence health literacy and self-management capabilities. Clinically, the patient profile was dominated by Type 2 diabetes (81.0%), a strong genetic predisposition as indicated by family history in 58.0% of cases, and a significant comorbidity burden, with hypertension present in nearly one-third of the participants (29.0%).

Table 2: Prevalence, Onset, and Adjusted Associations of Diabetes-Related Complications

Complication	Prevalence (%)	Onset (Years ± SD)	Key Association (Adjusted OR; 95% CI)
Neuropathy	25.0	7.9 ± 3.5*	Physical inactivity (aOR=2.5; 1.2–5.3; *p*=0.015)
Cardiovascular Disease	25.7	8.7 ± 3.8*	Obesity (aOR=2.8; 1.3–6.2; *p*=0.010)
Retinopathy	27.1	9.2 ± 4.1*	Not significant
Diabetic Foot	12.1	10.1 ± 4.3*	Not significant

**** SD, Standard Deviation; aOR, Adjusted Odds Ratio; CI, Confidence Interval.***

****Onset was significantly earlier compared to diabetic foot (p < 0.05, ANOVA).***

Table 2 summarizes the complication profile and its key determinants. The study population exhibited a substantial burden of complications, with over a quarter of patients affected by retinopathy (27.1%), cardiovascular disease (25.7%), and neuropathy (25.0%). Critically, logistic regression analysis identified strong, statistically significant associations between modifiable lifestyle factors and major complications. Physical inactivity emerged as a significant predictor for neuropathy (aOR = 2.5), while obesity was independently associated with cardiovascular disease (aOR = 2.8). Analysis of complication timelines revealed that neuropathy had the earliest mean onset at 7.9 years post-diagnosis. Although retinopathy was the most prevalent complication, it did not show a significant association with the measured risk factors in the adjusted model.

Discussion

This study offers critical, localized data on the diabetic population in Mosul, providing a vital snapshot of disease management in a post-conflict setting. The findings paint a concerning picture of a patient cohort burdened by a syndicate of lifestyle and systemic risks, leading to an accelerated development of debilitating complications.A striking feature of our cohort is the convergence of multiple risk factors. The high prevalence of physical inactivity (76%) and overweight/obesity (57.1%), combined with lower educational attainment, suggests a deeply entrenched sedentary lifestyle. This "lifestyle syndrome" creates a perfect storm for the early onset of complications, where inactivity directly fuels the risk of neuropathy (aOR=2.5), and the resulting obesity independently drives cardiovascular disease (aOR=2.8), a well-established dual threat when combined with comorbid hypertension (13). The discovery that neuropathy is the earliest major complication to manifest, at a mean of 7.9 years post-diagnosis, is a significant clinical alert, underscoring the urgent need for early and targeted intervention against these modifiable behaviors (11).Perhaps the most telling finding is the paradox of retinopathy: it was the most prevalent complication

(27.1%), yet it lacked a significant association with the measured lifestyle factors. This strongly suggests that in a challenging environment like Mosul, systemic and environmental determinants may overshadow individual behaviors. Beyond just physical access to specialized ophthalmologic care (15), which is undoubtedly disrupted in a post-conflict zone (16), other powerful factors must be considered. These could include chronic psycho-social stress, a known metabolic disruptor, and nutritional insecurity leading to consumption of calorie-dense but nutrient-poor foods, both of which can worsen glycemic control independently of "choice." Furthermore, fragmented healthcare systems can impede the stable, long-term glycemic control that is essential for preventing retinopathy (14).

The delayed onset of diabetic foot complications (10.1 years) relative to neuropathy likely reflects the natural clinical progression of the disease, where sensory loss from neuropathy serves as a precursor to unnoticed injury and subsequent ulceration (1720-). This timeline further emphasizes the critical importance of early neuropathy detection as a preventative strategy for more severe outcomes.These findings have direct and actionable implications for multiple stakeholders. For clinicians, the early onset of neuropathy demands a revision of screening protocols; initiating screening with simple tools like the monofilament test within five years of diagnosis, especially for sedentary patients, could be a crucial preventative measure. For public health policymakers, this study highlights the urgent need to integrate non-communicable disease management into the healthcare system's reconstruction efforts in Iraq. Finally, for community organizations, there is a clear opportunity to implement low-cost, accessible programs, such as walking groups and nutritional education tailored to local dietary habits, to combat the root causes of obesity and inactivity.

Conclusion

1. **Neuropathy manifests earliest**, demanding a revision of screening guidelines to promote earlier detection.
2. Targeted public health campaigns must aggressively address **physical inactivity and obesity** to mitigate the risk of neuropathy and cardiovascular disease.
3. The documented complication timelines should be considered for integration into **national diabetes management protocols** to better tailor patient care pathways.

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