IJBMC
International Journal of Body, Mind and Culture

Volume 13, Issue 2, pp 55-62
DOI: 10.61838/ijbmc.v13i2.1061

Article type:
Original Research

Effectiveness of Lifestyle on the Incidence of Type 2 Diabetes among Administrative Employees in Primary Health Care Centers

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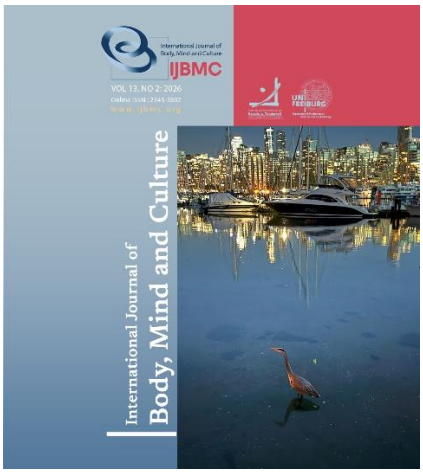

Article history:

Received 11 Oct 2025
Revised 27 Dec 2025
Accepted 30 Jan 2026
Published online 01 Feb 2026

How to cite this article:
Hussien, A. M., & Naji, A. B. (2026). Effectiveness of Lifestyle on the Incidence of Type 2 Diabetes among Administrative Employees in Primary Health Care Centers. International Journal of Body, Mind and Culture, 13(2), 55-62.

ABSTRACT

Objective: Diabetes is a global, chronic, life-threatening metabolic condition that affects people of all ages. It was the sixth leading cause of death in Iraq, and because the cause of many chronic diseases lies in the delayed diagnosis of the disease, about 90% of diabetic patients around the world have type 2 diabetes, and almost half of them do not know that they have the disease. To evaluate the incidence of diabetes mellitus type II among administrative employees, especially among people who are asymptomatic and undiagnosed, and do not know that they have diabetes.

Methods and Materials: A cross-sectional descriptive design study was carried out in Nineveh Governorate during the period from October 1, 2023, to April 22, 2024. The study sample was selected using purposive (non-probability) sampling and comprised 508 participants. Data were collected using questionnaires and interviews, and descriptive and inferential statistical analyses were applied.

Findings: The result shows that the average age of administrative employees in Mosul is (37.8 ± 11) years; the highest percentage refers to young employees falling within the age group of (20 – 29) years. The sex ratio shows that the female employees were (50.6%) were the male ratio was (49.4%). And the higher percentage of administrative employees was categorized as non-diabetic (69.7% of the total sample). Pre-diabetic individuals comprised (16.7%). while (13.6%) were diagnosed as diabetic persons based on “FBS” and “RBS” levels, and the average HbA1c level was (8.02 ± 1.250).

Conclusion: Screening for type II diabetes among administrative employees is essential for early detection and prevention of complications. The study recommended the necessity of conducting early detection tests for type 2 diabetes, especially among people who have a family history of diabetes and are overweight.

Keywords: Diabetes Mellitus Type II, Administrative Employees, Pre-Diabetic, Screening, Early Detection.

Introduction

Diabetes is a chronic metabolic disease that arises from either the body's resistance to insulin or from inadequate insulin, which impairs glucose metabolism (Mukhiddin Ugli et al., 2024; Najee & Hassan, 2019). Diabetes mellitus is a disorder of the endocrine system characterized by abnormal fluctuations in blood glucose levels (Hassan & Mansur, 2020). Diabetes is a serious worldwide health issue that has a substantial financial, social, and human cost for all nations, developed or impoverished, and it is considered one of the most prevalent non-communicable diseases worldwide (Cardoso et al., 2021; Shafeea & Naji, 2021). Since diabetes is regarded as a chronic, non-communicable disease that cannot be spread through infection, it is also one of the top ten reasons for Iraqi diabetics' frequent outpatient visits (Lyu et al., 2024).

The prevalence of diabetes in Iraq has increased significantly and rapidly over the past four decades, reaching approximately 20% of the total population. Individuals with T2DM constitute 8.5 - 13.9% of Iraqis (Al-Saadi et al., 2022; Organization, 2011).

Diabetes is known to be a major contributing factor to mortality rates in many developing countries, including Iraq, especially among undiagnosed and otherwise healthy individuals (Mottaghi et al., 2023).

Globally, diabetes is one of the top 10 causes of ~~death~~, mortality, and disability worldwide. Amputation of a lower limb, myocardial infarction, stroke, blindness, and renal failure are all consequences of advanced diabetes. International Diabetes Federation [IDF] (2019) communicated that Diabetes mellitus may be a serious, chronic condition that happens when there are high levels of blood glucose since the body cannot produce enough or adequate insulin or cannot effectively utilize the insulin it produces (ANSARI et al., 2011; Pereira et al., 2012).

According to the 2019 Global Burden of Diseases, Injuries and Risk Factors research, diabetes is the eighth most prevalent cause of mortality and disability globally and a leading cause of mortality in the majority of nations. Nearly 460 million people of various ages and ethnicities are afflicted by the illness (Mikhael et al., 2018). Undiagnosed and untreated high blood sugar can cause serious complications, such as kidney failure, neurological, cardiovascular, and vision problems, as well as problems with the feet and bones. All of these complications, called diabetic complications, can lead to serious damage to various organs in the body. These complications can ultimately lead to high mortality rates (Al-Fahham & Al-Jubouri, 2023; Heshmati et al., 2014). To prevent all these issues in the future, family members' awareness of the significance of early type II diabetes detection and adoption of an unhealthy lifestyle must also be raised. There are various solutions to maintain blood sugar within an appropriate range in these patients. Diet, weight control, daily exercise, and taking a stroll are examples of such strategies (Salim et al., 2025; Vos et al., 2020).

Methods and Materials

Study Design

Diabetes is divided into three general categories: type 1 diabetes, type 2 diabetes, and gestational diabetes. Type II diabetes (DMII) constitutes over 90% of all diabetes instances and is the predominant form (Organization, 2003). Type II diabetes (DMII) is a chronic metabolic disorder characterized by decreased insulin sensitivity, insufficient insulin production, and high blood sugar levels, which together lead to insulin resistance (Hasan et al., 2016; Orok et al., 2024). It is now easier to diagnose the disease through examinations and early detection (Aravindalochanan et al., 2014). Rapid social change and a decline in physical activity have resulted in unhealthy lifestyle choices, such as bad eating habits and a lack of exercise, which have raised the prevalence of type 2 diabetes, increased consumption of sugary and fast meals, and caused weight gain. A person's risk of type 2 diabetes can be ascertained by these health-related behaviors (Khazew & Faraj, 2024). But regrettably, no study has been undertaken into the efficacy of existing methods for adhering to a correct, balanced diet, managing blood sugar levels, consistently taking prescribed medications, and engaging in regular physical activity to promote, control, and prevent glycemic levels in the blood for diagnosed and undiagnosed persons with DM (Najee & Hassan, 2019).

Historically, diabetes predominantly affected older adults. The incidence of type II diabetes is increasing in children, adolescents, and young adults due to escalating obesity rates, poor dietary practices, and overall lifestyle modifications (Behnam Rad et al., 2015).

Diabetes should be diagnosed early to improve management, control, and prevent major consequences (Sadeghi et al., 2020). Additionally, early detection helps improve one's quality of life, reduces complications from diabetes, and promotes health. It helps reduce costs and pressure on people and society, and also enhances the long-term viability of healthcare systems (Risérus et al., 2009). Because of the severity of these issues, it is now essential to use contemporary screening and early detection technologies for type II diabetes symptoms for an early diagnosis and prevention of the disease, particularly in those who are not aware of their affliction. Therefore, the present study aimed to screen for type II diabetes among administrative employees of primary healthcare centers.

Findings and Results

Table 1

Distribution of Administrative Employees According to Their Socio-demographic Characteristics

List	Characteristics		F	%
1	**Age (year)**	20 – 29	150	29.5
	M±SD= 37.8 ± 11	30 – 39	146	28.7
		40 – 49	120	23.6
		50 – 59	86	16.9
		60 +	6	1.2
		Total	***508***	***100***
2	**Sex**	Male	251	49.4
		Female	257	50.6
		Total	***508***	***100***
3	**Marital status**	Married	347	68.3
		Unmarried	113	22.2
		Widowed/er	28	5.5
		Divorced	20	3.9
		Total	***508***	***100***
4	**Level of education**	Primary school	8	1.6
		Intermediate school	17	3.3
		Preparatory school	111	21.9
		Diploma	226	44.5
		Bachelor	135	26.6
		Postgraduate	11	2.2
		Total	***508***	***100***
5	**Residency**	Urban	343	67.5
		Rural	165	32.5
		Total	***508***	***100***
6	**Body Mass Index**	Underweight	4	0.8
		Normal	122	24
		Overweight	288	56.7
		Obesity I	65	12.8
		Obesity II	19	3.7
		Obesity III	10	2
		Total	***508***	***100***

f: Frequency, %: Percentage, M: Mean, SD: Standard deviation

The analysis of findings in Table 3-1 shows that the average age of administrative employees in Mosul is (37.8 ± 11) years; the highest percentage refers to young employees falling within the age group of (20 – 29) years (29.5%), followed by the (30 – 39) year age group with (28.7%) percentage.

The sex of administrative employees is close to half for each sex; the female employees were (50.6%), which is higher than the males, who reported (49.4%).

The marital status refers that (68.3%) of administrative employees are married, and 22.2% are still unmarried. A few were widowed (5.5%) or divorced (3.9%).

Regarding level of education, the highest percentage is diploma (44.5%), followed by bachelor's degree (26.6%) and preparatory school (21.9%).

The residency reveals that (67.5%) of employees are residents in urban areas, while (32.5%) are residents in rural areas.

The body mass index indicates that (56.7%) of administrative employees are overweight, (12.8%) are classified as obesity degree I, while (3.7%) are reported as obesity with degree II.

Table 2

Distribution of Administrative Employees According to Their Work-related Variables

List	Variables		F	%
1	**Average hours of sitting in a chair during work**	2 – 3	163	32.1
		4 – 5	293	57.7
		6 – 7	52	10.2
		Total	***508***	***100***
2	**Method of transportation to work**	Private car	232	45.7
		Public car	215	42.3
		Walk on foot	61	12
		Total	***508***	***100***
3	**Snacks during work**	Sweets or pastries	140	27.6
		Fast food (sandwich)	194	38.2
		Fruits	28	5.5
		None	146	28.7
		Total	***508***	***100***
4	**Genetic DM in the family**	No	344	67.7
		Yes	164	32.3
		Total	***508***	***100***

f: Frequency, %: Percentage

The findings in Table 3-2 reveal that the average hours of sitting in a chair during work are (4 – 5) hours per day among (57.7%) of employees, while (10.2%) of them reported (6 – 7) hours, and only (32.1%) reported (2 – 3) hours.

The method of transportation indicates that (45.7%) of employees arrive at work by their own private car, (42.3%) arrive through public transportation, and only (12%) arrive on foot.

Concerning snacks during work, (28.7%) of employees prefer to eat nothing during work, (38.2%) of employees prefer fast food during work, as the highest reported percentage, followed by (27.6%) for those who prefer sweets and pastries.

The genetic history of diabetes mellitus in the family is reported by (67.7%) of administrative employees, while (32.4%) did not disclose their enrollment in the genetic history of diabetes.

Table 3

Assessment of the Levels of Administrative Employees' Lifestyle regarding "Physical Activities"

List	Physical Activities	M	SD	Assessment
1	Do you engage in physical activity such as walking or sports?	1.11	0.808	Moderate
2	Does your work require physical effort?	0.42	0.585	Low
3	Do you walk at least 20 minutes a day?	0.94	0.848	Moderate
4	Do you go to the gym regularly?	0.46	0.590	Low
Total average		***2.92***	***2.831***	neutral

M: Mean, SD: Standard Deviation

Low= 0 – 0.66, Moderate= 0.67 – 1.33, High= 1.34 – 2

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The results shown in Table 3-7 indicate that the general lifestyle of administrative employees about physical activities and daily walking was rated as "average" with an overall mean of (M = 2.92) (SD = 2.831) for physical activities and with an overall mean (M = 0.94) (SD = 0.848) for daily walking. While other items also showed low levels of engagement, including regular gym attendance with an overall mean of (M = 0.46) (SD = 0.590) and extra effort at work (M = 0.42, SD = 0.585).

Table 4

Assessment of the Levels of Administrative Employees' Lifestyle regarding "Nutrition Pattern"

List	Nutrition Pattern	M	SD	Assessment
1	Eat carbohydrates such as whole grains, fruits, and vegetables.	1.60	0.650	High
2	I eat starches like potatoes, rice, and pasta	1.67	0.619	High
3	I eat natural fats such as olive oil and corn oil	1.33	0.638	Moderate
4	I eat fiber such as lentils, chickpeas, and peas	0.96	0.841	Moderate
5	I eat proteins such as fish, chicken, and legumes.	1.29	0.763	Moderate
6	I drink plenty of water to maintain my health	1.39	0.753	High
7	Drink sugary drinks (such as juices and sweetened tea)	1.64	0.636	Moderate
8	I eat fast food	1.54	0.644	High
9	Avoid saturated fats (such as animal fats)	0.91	0.783	Moderate
10	Avoid added sugars, such as those in sweets and soft drinks.	1.61	0.564	Moderate
Total average		***13.94***	***6.891***	**Moderate**

M: Mean, SD: Standard Deviation

Low= 0 – 0.66, Moderate= 0.67 – 1.33, High= 1.34 – 2

The results in Table 4 indicate that the general lifestyle of administrative employees in terms of dietary patterns was rated as "diverse", with an overall mean score of (M = 13.94), (SD = 6.891). High levels were observed for several behaviors, including consumption of carbohydrates (M = 1.60) (SD = 0.650), starches (M = 1.67), (SD = 0.619), as well as eating fast food (M = 1.54), (SD = 0.644), while the results recorded moderate levels of consumption of natural oils and fiber intake.

Discussion and Conclusion

This section presents a discussion and interpretation of the findings in relation to the study's objectives, supported by relevant references and studies. This study aimed to screen for type II diabetes among administrative employees.

The findings showed that the average age of administrative employees in Mosul was 37.8 ± 11 years. About half were male and half female. Concerning the marital status, 68.3% were married. As for education level, the highest percentage was among diploma holders. The residency revealed that 67.5% of employees were urban residents. The body mass index showed that 56.7% of administrative employees were overweight. In Khoushabi et al.'s (2017) study, the participants' mean age and body mass index were 53.8 and 26.6, respectively (Khoushabi et al., 2017). In their study, Sedaghati Kasabkhi showed that the majority of diabetics were in the age range of 40-49 years, 42.7% were illiterate, and the majority of diabetic patients (34.3%) had a degree below diploma (Fahimeh et al., 2017; SEDAGHATI et al., 2008). Izadi et al. (2017) reported a mean age of 54.92±10.84 years, with an age range of 21 to 93 years. 61.00% were female, and the rest were male (sex ratio: 1.6 females per male). 57.63% of the participants had a family history of diabetes, whereas 41.0% had no family history. The mean and standard deviation of the participants' body mass index were 28.69±7.49 kg/m2 in men and 42.29±4.87 kg/m2 in women (Izadi et al., 2017).

A major finding was that 53.5% of administrative employees had a proactive lifestyle and a moderate awareness of physical activity, sleep patterns, stress management, and nutrition. In comparison, 44.2% showed a preventive lifestyle and high awareness. In another study, most patients reported having no regular plan for exercise and daily activities. Insufficient daytime sleep was another risk factor, as most people reported not getting enough sleep during the day (Alirezaei

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Shahraki, 2019). Inadequate nutritional intake, insufficient meals, and nonadherence to recommended nutrient intake were observed among most participants in the present study. Most Participants did not pay sufficient attention to food labels and ingredients. They failed to participate in educational programs on personal health, both of which were among the areas most people did not attend to adequately (Garshasbi et al., 2009).

The present study highlights a diabetes prevalence of 13.58% among the sampled administrative employees, presenting a substantial burden within this occupational community. In Saeedi et al.'s (2020) study, DM was estimated to affect 9.3% (n=463 million) of the global population, with projections indicating an increase to 10.2% (n=578 million) by 2030 (Saeedi et al., 2020). According to the World Health Organization (2003) (WHO) statistics, the prevalence of diabetes in adults worldwide is 8.8%, of which about 90% is type II diabetes (Cho et al., 2018). The prevalence of diabetes in Iraq's adult population is 14.2%, which is higher than the global average and consistent with our study (Abusaib et al., 2020).

The results also show that employees with a moderate lifestyle score had a higher mean HbA1c than those with a high lifestyle score. Studies on diabetes control show that lifestyle interventions, including increasing physical activity, improving diet, and reducing weight, can lower the risk of diabetes by 30-60% (Edwardson et al., 2014). Behnam Rad et al. (2015) also showed, in a study of lifestyle and diabetes modification, that diabetes was not related to excessive sugar consumption and that the sugar cycle of proteins occurred with greater power than sugar through oxidants and free radicals (Behnam Rad et al., 2015). Knowler et al. also showed that lifestyle changes and dietary supplements both reduce the incidence of diabetes, but that lifestyle changes for controlling type II diabetes were more effective than taking blood sugar-lowering drugs (Knowler et al., 2002).

Another primary finding of the present study was the significant associations among age, sex, and body mass index (BMI), showing that employees in higher BMI categories tend to have higher glycated hemoglobin levels than those in normal BMI categories. However, marital status, education level, and residence were not significantly associated with the prevalence of diabetes. Results from other studies also showed a significant difference in the incidence of diabetes by gender. Several studies reported that the prevalence of diabetes in women was slightly higher than that of men. In another study by Lee et al., the ratio of women to men with diabetes was 4.1 (Lee et al., 2000). Najafipour et al. also showed that women were significantly more likely to have diabetes than men (Najafipour et al., 2018). However, in another study by Ramachandran et al., no differences were observed between men and women with diabetes (Ramachandran et al., 2000). A significant association was also found between age and diabetes incidence in the study by Ahmadi et al. (2016), consistent with other relevant studies (De Boer et al., 2017). Significant correlations were found between body mass index (BMI), triglycerides, total cholesterol, and high- and low-density lipoproteins; thus, BMI was higher in individuals with diabetes (Ambigapathy et al., 2003).

Considering that the level of education was a risk factor for diabetes, as well as the effect of age and body mass index on the occurrence of diabetes, education and adherence to the principles of prevention in overweight and obese individuals, older age can significantly affect the lower incidence or the slower onset of diabetes complications. To prevent type II diabetes or for those at risk of developing the disease, lifestyle interventions are suitable because they are easy and inexpensive. Therefore, exercise and physical activity, along with changes in eating habits, are recommended for treating or preventing diabetes.

Acknowledgments

The authors express their gratitude and appreciation to all participants.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. An ethical consideration in this study was that participation was entirely optional.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was conducted independently, with personal funding and without financial support from any governmental or private institution or organization.

Authors' Contributions

All authors equally contribute to this study.

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