The spatial pattern of the spread of diabetes in Basra Governorate and strategic planning to reduce its spread Study in medical geography

إعـــداد

Prof Dr. Amal Saleh Abboud Alkabi
Basrah University College of Arts -Department of Geography and Geographic Information Systems
E-mail: amal.abood@uobasrah.edu.iq
Prof Dr.Hanan Sobhi Abdullah Obaid
Head of the Department of Graduate Studies and Scientific Deputy Dean at the American University of Minnesota USA
E-mail: HANANOBAID328@YAHOO.COM
Doha Jasim Mohsin
E-mail: Doha97jasm@gmail.com

الجامعة الإسلامية بمنيسوتا
Islamic University of Minnesota
IUM المركز الرئيسي
المركز الرئيسي

Abstract:

The research aims to identify the spatial pattern of the spread of diabetes in Basra Governorate and strategic planning to limit its spread (a study in medical geography), and to identify the pattern of spatial distribution of diabetes in Basra Governorate by covering some aspects that include the distribution of the disease in administrative units and the most important geographic factors affecting it., which are environmental risk factors that help to get it. In order to reach a pattern of geographical distribution of the disease in Basra Governorate, the data of the recorded cases in the health departments for the period from 2015 to 2022 were used. With the use of some statistical methods to process the mentioned data, the study reached some results, including Diabetes mellitus has spread in all parts of Basra Governorate, as cases were recorded in all the administrative units that Basra consists from. The number of cases and the prevalence rates among the population increase in the urban environments of the governorate represented by the main city centers, such as Basra city, the center of the governorate. The disease is also spread in its two types, type 1 and type 2, in the governorate, and the cases of both types tend to concentrate in the major cities, including Basra city. A number of environmental factors, such as the urbanization rate, the economic situation, and the occupancy rate of the housing unit, have affected the pattern of disease spread to a certain extent, as confirmed by the statistical analysis. Personal factors such as obesity and heredity also play a role in determining the pattern of disease spread.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Keywords: Diabetes, Prevalence Pattern, Strategic Planning, Risk Factors.

Introduction

Medical geography is a branch of human geography, as general concept seeks to pay attention to human health problems in different environments, trying to determine the geographical dimensions of those problems and analyzing their relationships with the environmental fabric(1). Such relationships lead to patterns, which is a major goal of medical geography, especially disease geography, which studies various diseases, including chronic diseases. Diabetes is one of four major types of chronic diseases, along with cardiovascular disease, cancer, and chronic respiratory diseases. It is a chronic disease that occurs when the body is unable to produce enough insulin or cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar levels, which is derived from the foods a person eats. As a result, diabetes raises blood sugar levels, and if left uncontrolled, it will lead to serious damage to many organs over time. The study of the spatial distribution of diabetes cases provides a deeper understanding of the spread of the disease, its patterns, and its impact on the population in any area. It also helps to identify areas with higher rates of diabetes cases. These are the goals that medical studies seek to achieve and to come up with results that confirm the role of the environment in the onset of the disease and its spread among the population.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Research Problem

The research problem is defined by the following questions:

A. Does the incidence of diabetes form a specific spatial pattern in the Basra governorate?

B. What is the most common type of diabetes?

C. Are there geographic factors that affect the spatial pattern of diabetes?

Research Hypothesis

A hypothesis is defined as an inference or a conjecture that the researcher assumes to find solutions to the research problem. Based on this, we can formulate the research hypothesis as follows:

A. There is a spatial variation in the distribution of diabetes, both type 1 and type 2, at the level of administrative units, resulting in a specific pattern.

B. A set of geographic factors control the pattern of diabetes prevalence in Basra governorate.

Research objective

The study aims to identify the spatial pattern of diabetes prevalence in Basra governorate by addressing some aspects that include the distribution of the disease in administrative units and the most important factors affecting the disease that are considered predisposing factors for its infection.

Sources Research

Geography has followed many scientific methods, but it adheres to the general geographic method in terms of classification,

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

distribution, and analysis. Therefore, the following methods have been adopted to overcome the shortcomings of a single method:

A. Descriptive method: This method relies on collecting facts and data about the phenomenon under study and determining its characteristics. It also describes the phenomenon in a precise manner, meaning that it identifies its descriptions.

B. Quantitative analytical method: The geographic researcher does not only describe the phenomenon or problem but also seeks to explain and analyze it. This is done by following the quantitative and analytical methods because it is characterized by analyzing temporal and spatial differences in the spatial distribution of diabetes cases.

Temporal and Spatial limits of research

The spatial boundaries of the study area are represented by Basrah Governorate, which is located in the southeasternmost part of Iraq, between latitude (°31.40 –°29.5) north and longitude (°48.30 –°46.40) east. It is bordered by Maysan and Dhi-Qar governorates to the north and northwest, Al-Muthanna governorate to the west, the Islamic Republic of Iran to the east, and Kuwait and the Arabian Gulf to the south (Map 1). It has an area of (19070) km2, which is (%4.4) of Iraq›s total area of (435052) km2. It consists of 10 districts (Map 2). The temporal boundaries are represented by the duration of the study, which extended from 2015 to 2022.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Map (1) Location of the study area from Iraq

Source: Republic of Iraq, General Survey Authority Administrative Map of Iraq, scale 2023 ,1:100,000.

Map (2) Administrative units of Basrah Governorate

Source: Republic of Iraq, General Survey Authority, Basrah Governorate Map, scale 2023 ,1:100,000.

First: The spatial distribution of diabetes cases in Basra governorate

Medical geography studies are based on the elements of time and space, and space represents the fundamental intellectual organizing principle of geographic work, including the study of disease phenomena.

From the data presented in Table (1) and Map (3), which show the spatial distribution of diabetes in Basra governorate, the following can be observed:

1. Diabetes is prevalent in all administrative units of the study area without exception, but there is a variation in the rates of

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

its spread, calculated per 10000 inhabitants, which is reflected in its spatial value measured in standard deviations.

2. The highest rate of spread was recorded in the Basra district, at (53.6) cases per 10000 inhabitants, and it ranked first with a very high spatial value of (2.4) standard deviations above the general average. Relatively high rates of spread were also recorded in Al-Harithah and Shatt Al-Arab districts, at (29.9) and (24.8) cases per 10000 inhabitants, respectively, and they ranked second with spatial values of (0.6) and (0.2) standard deviations above the average. The rate of disease spread in Abu Al-Khasib district was (21.3) cases per 10000 inhabitants, and it ranked third with a negative spatial value of (0.1-) standard deviation. Similarly, the rates of spread in Fao, Zubair, Qarna, and Dair districts were (15.7) (16.5) (18.2) and (14.0) cases per 10000 inhabitants, respectively, with negative spatial values of (0.5-) (0.5-) (0.3-) and (0.7-) standard deviations, respectively. The lowest rate of spread was recorded in Al-Madinah district, at (10.2) cases per 10000 inhabitants, in fourth place with a negative spatial value of (1-) standard deviation. Based on the spatial distribution of diabetes, it appears that the disease pattern tends to be concentrated in the center of the governorate, as Basra district had the highest rate of spread, with a high spatial value, while the other districts had varying rates of spread, from high to low, as indicated by their spatial values.

Table 1: Spatial distribution of the number of diabetes cases, their prevalence rates, and their standard deviation by administrative units of Basra governorate, 2022-2015

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

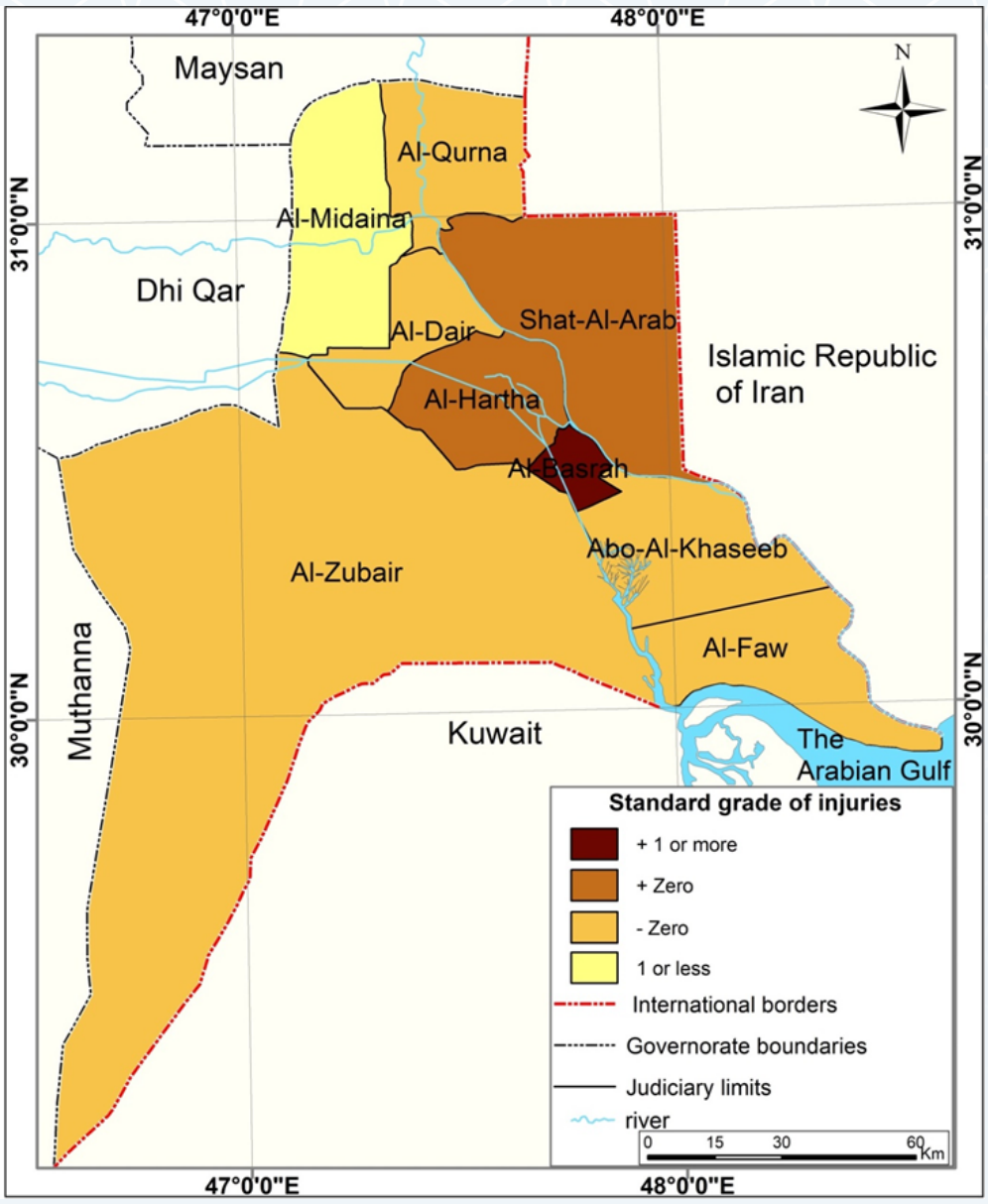
Administrative unit	Number of cases	Prevalence rate (per 10,000 inhabitants)	Standard deviation	Rank
Basra	56,320	53.6	2.4	1
Abu Al-Khasib	3,942	21.3	0.1-	3
Zubair	6,925	16.5	0.5-	3
Fao	635	18.2	0.3-	3
Shatt Al-Arab	3574	24.8	0.2	2
Al-Harithah	4021	29.9	0.6	2
Dair	1233	14.0	0.7-	3
Qarna	2342	15.7	0.5-	3
Al-Madinah	1900	10.2	1.0-	4
Total	80892	204.2		
Average	8988			
Standard deviation	13.0			

Source: Based on data from the following sources:

- Ministry of Health, Basra Health Directorate, Al-Fayhaa Specialized Center for Diabetes and Endocrine Diseases (unpublished official data).
- Ministry of Health, Basra Health Directorate, Primary Health Care Center (unpublished official data).
- Ministry of Health, Basra Health Directorate, Al-Sadir Teaching Hospital, Statistics Unit (unpublished official data).
- Ministry of Health, Basra Health Directorate, Al-Moawen Teaching Hospital, Statistics Unit (unpublished official data).
- Ministry of Health, Basra Health Directorate, Basra Teaching Hospital, Statistics Unit (unpublished official data).

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Map 3: Spatial distribution of diabetes in Basra governorate, 2022-2015



Source: Based on the researcher›s work using data from Table 1.

Second: Spatial distribution of diabetes based on type of infection Diabetes is a chronic disease that can be caused by environmental or genetic factors. It means a deficiency in the absolute and relative secretion of the hormone insulin from the pancreas. There are two main types of diabetes.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Table 2 shows the number of cases by type of infection according to the sample. It shows the following:

1. The appearance and registration of cases for both types in all the administrative units of the governorate.
2. The number of cases of type 1 in Basra governorate exceeded the number of cases of type 2. The number of cases of type 1 was (632) which represented (59.5%), The number of cases of type 2 was (429) which represented (40.4%) of the total sample of 1,061 cases. The sample included cases from all age groups and both sexes.
3. At the level of administrative units, according to Table 3, it is observed that the highest number of cases of both types 1 and 2 was recorded in Basra district, with (300) and (249) cases, respectively, representing (%47.5) and (%58) of the total sample, respectively. This means that the Basra district also ranked first. The lowest number of cases of both types 1 and 2 were recorded in Fao district, with (20) and (11) cases, respectively, representing (%3.2) and (%2.6) of the total sample, respectively. This means that Al-Faw district ranked last. The rest of the districts had the following numbers of cases of both types: Abu Al-Khasib: (45) and (21) with percentages of (%7.1) and (%4.9) respectively. Zubair: (50) and (23) with percentages of (%7.9) and (%5.4) respectively. Shatt Al-Arab: (64) and (16) with percentages of (%10.1) and (%3.7) respectively. Al-Harithah: (50) and (46) with percentages of (%7.9) and (%10.7) respectively. Dair: (42) and (30) with percentages of (%6.6) and (%7) respectively. Qarna: (33) and (18) with percentages of (%5.2) and (%4.2) respectively. Al-Madinah: (33) and (18) with percentages of (%5.2) and (%4.2) respectively. As Shown

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

In Map (4).

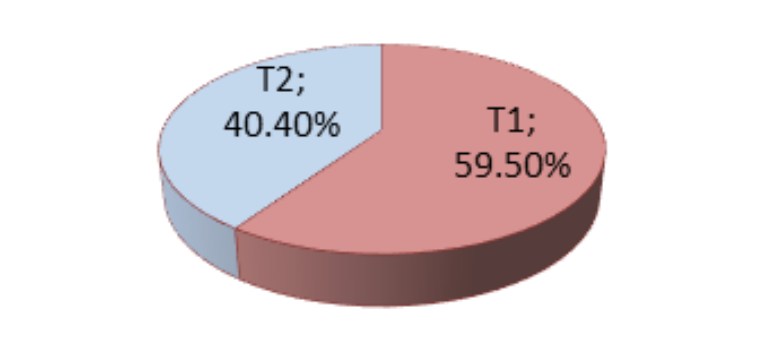
4. The spatial variation in the distribution of diabetes cases by type is related to the general distribution of the disease. It tends to be concentrated in the center of the governorate, which is associated with the high population density and the concentration of health services.

Table 2: Number of cases by type of infection according to the sample

Type of infection	Number	Percentage
Type 1	632	%59.5
Type 2	429	%40.4
Total	1061	%100

Source: Field study.

Figure (1) Number of cases by type of incidence according to sample



Source: Based on the researchers work table (2)

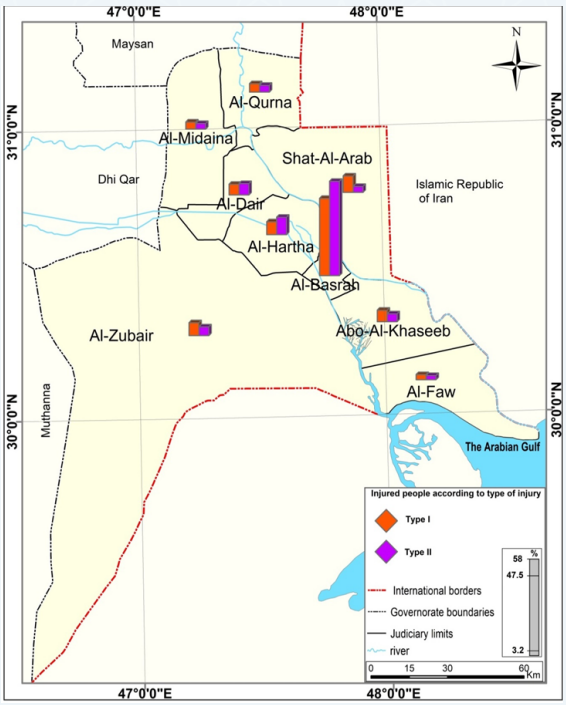
Table 3: Number of cases by type of infection according to the sample, for each administrative unit in Basra governorate

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

District	Type 1	Percentage (%)	Type 2	Percentage (%)
Basra	300	47.5	249	58
Abu Al-Khasib	45	7.1	21	4.9
Zubair	50	7.9	23	5.4
Fao	20	3.2	11	2.6
Shatt Al-Arab	64	10.1	16	3.7
Al-Harithah	50	7.9	46	10.7
Dair	42	6.6	30	7
Qarna	33	5.2	18	4.2
Al-Madinah	28	4.4	15	3.5
Total	632	100	429	100

Source: Field study

Map (4) The Spatial distribution of the incidence according to the type of injury according to the sample for each administrative unit in Basra Governorate



ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Source: Based on the researcher›s work using data from Table 3.

Third: Some factors affecting the pattern of diabetes spread

Diabetes, like any chronic disease, is controlled by a number of risk factors with environmental and personal dimensions. Some of these factors may have a direct impact on the spatial pattern of diabetes, while others may have an indirect impact. In order to fill the data gap, the researcher relied on the data of the selected sample in order to obtain some information that may contain some risk factors. This can be discussed as follows:

1- Demographic composition of the population and urbanization rate

The purpose of the environmental structure is to classify the population into urban and rural. Researchers have differed in establishing criteria for classifying the population into urban and rural, including statistical, administrative, historical, functional, and population density(2). In Iraq, the government administration is the basis for classification. In this way, urban centers become the centers of administrative units that have municipal councils, while the areas outside these centers are considered rural(3).

The prevalence of chronic diseases, including diabetes, is higher in urban environments than in rural environments. This is attributed to urban lifestyles, which contain many risk factors for these diseases, such as urban lifestyle, pollution, and psychological stress. Global epidemiological studies have confirmed this fact. Table (4) shows that the number of urban residents in Basra governorate reached (2,567,119) people, representing (%82.13)

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

of the total population. This indicates an increase in the urbanization rate based on the number of urban residents in the study area. This rate varies between the administrative units of the governorate, with the highest urbanization rate in Basra district, the governorate›s center, at (%96). It also increased in Abu Al-Khasib district, reaching (%93.3). In Zubair district, it reached (%73.6). The urbanization rate in Fao district was (%84.8). In Shatt Al-Arab district, it reached (%78). In Al-Harithah district, it reached (%72.2). It declined in Al-Dair district to record the lowest rate of (%29.4). In Qarna district, it reached (%72.1). It decreased in Al-Madinah district to reach (%40.8).

The increase in the number of urban residents and the rise in urbanization rates in Basra governorate is attributed to a number of economic, social, and political factors that have led to the migration of residents to urban environments in search of employment opportunities. This has led to the expansion of cities at the expense of rural areas, where much agricultural land has been converted to residential use. This has been followed by a change in lifestyles, which can have an impact on the health of residents living in cities. The spatial variation in urbanization rates in administrative units affects the spatial patterns of diabetes. This has been proven by statistical analysis, as indicated by the value of the significant positive correlation coefficient of (0.5).

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Table 4: Population structure and urbanization rate in Basra governorate in 2022

Administrative unit	Total population	Urban population	Rural population	Urbanization rate
Basra	1,411,417	1,355,639	55,778	%96
Abu Al-Khasib	247,875	228,816	19,059	%92.3
Zubair	566,533	417,037	149,496	%73.6
Fao	46,825	39,714	7,111	%84.8
Shatt Al-Arab	193,237	150,867	42,370	%78
Al-Harithah	180,226	130,254	49,972	%72.2
Al-Dair	117,585	34,570	83,015	%29.4
Qarna	199,439	143,857	55,582	%72.1
Al-Madinah	162,655	66,365	96,290	%40.8
Total	3,125,792	2,567,119	558,673	-

Source: Republic of Iraq, Ministry of Planning, Basra Governorate Planning Directorate, Statistics Section, Population Estimates, (Unpublished official data), 2022.

2-The pattern of the residential environment

Housing is the beginning of human settlement in his environment, and it is the basic function of human settlements and it is one of the forms of interaction between humans and their environment(4). The residential density is one of the most important factors affecting human health. Some indicators express the residential density and the likelihood of its direct and indirect relationship with the disease, including the number of family members who occupy residential units, or the occupancy rate and the degree

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

of crowding(5).

For the study area, the expression of residential environment variables was limited to the number of residential units and the number of households within the administrative units. It is clear from the data in Table (5) that there is a variation in the number of residential units and households in the governorate, as the highest was in Basra district, the center of the governorate, and the lowest in Al-Faw district, reaching (6195 ,186737) units, respectively. On the other hand, the number of households was high in Basra district and low in Al-Faw district (6689 ,201631) households, respectively. The occupancy rate varies between the administrative units of the governorate as follows:

A. The high occupancy rate ranges from (2.5 to 3.7) households/ units as in Zubair and Al-Madinah districts.
B. Moderate occupancy rate ranges from (1.05 to 1.6) households/units represented in Shatt Al-Arab, Basra, Qarna, Abu Al-Khasib, and Al-Harithah districts.
C. Low occupancy rate ranges between (0.09, and 0.5) households/unit in Fao and Al-Dair districts.

The analysis shows that there is a variation in residential density at the level of administrative units. This causes pressure on housing facilities, deterioration of the urban condition, and the emergence of social problems in densely populated residential environments. However, the impact of this indicator on the spatial pattern of diabetes in the study area is indirect. This is indicated by the results of the statistical test of the correlation coefficient, which was (0.258-). This indicates a very weak and insignificant inverse relationship between the variables of occupancy rate and diabetes prevalence rates. Therefore, this indicator may not

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

have a significant impact on the spatial pattern of the disease in the governorate in light of the data used in the analysis.

Table 5: Distribution of population, number of residential units, households, and occupancy rate by administrative unit

Administrative unit	Population	Number of residential units	Number of households	Occupancy rate (households/ unit)	Prevalence
Basra	1,411,417	186737	201,631	01.08	%41.3
Abu Al-Khasib	247,875	32795	35,41	1.5	%17.9
Zubair	566,533	74955	80,933	2.5	%11.1
Fao	46,825	6195	6,689	0.09	%17.5
Shatt Al-Arab	193,237	25566	27,605	01.05	%26.9
Al-Harithah	180,226	23845	25,746	1.6	%40.1
Al-Dair	117,585	15557	16,797	0.5	%11.7
Qarna	199,439	26,386	28,491	1.1	%10.6
Al-Madinah	162,655	34,402	23,236	3.7	%11.3
Total	3,125,792	426,438	446,541	01.04	%188.9

Source: Author›s work based on: Republic of Iraq, Ministry of Planning, Basra Governorate Planning Directorate, Statistics Section, Population Estimates, (unpublished official data), 2022. Ministry of Trade, Main Supply Center in Basra Governorate, Population and Household Data (unpublished official data), 2022.

3- Economic status of people with diabetes in Basra governorate

Income is a major indicator of living standards, as well as a direct

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

economic indicator for identifying the living standards of families and their social and economic conditions in general(6). Many studies have shown that the (living standard) of an individual is related to the incidence of diabetes, as a decrease in monthly income leads to malnutrition in the body, which in turn reduces resistance and causes the disease. This leads to a decrease in human activity due to the disease, a decrease in productivity, and then a decrease in income, which becomes a linked loop that ends with a decrease in the economic level and the occurrence of the disease(7). Other scientific studies have confirmed that diabetes may be associated with high-income populations, and it is one of the diseases of sedentary malnutrition resulting from the excessive and unbalanced consumption of saturated fats and sugars(8). In the study area, according to the sample and in light of the data in Table (6), it was found that there is a relative convergence between the number of cases according to their monthly incomes. The highest number of cases was recorded among those with a monthly income ranging from (700-500) thousand dinars, reaching (345) cases, which constituted (%34.5) of the total sample members. While the number of cases whose monthly incomes range from (less than 500) thousand dinars reached (280) cases, forming a percentage of (%28) of the total sample members. The rest of the income levels decreased, starting from the monthly income that ranges from (1000-700) thousand dinars, with the number of cases reaching (220) cases, forming a percentage of (%22). While the number of cases whose monthly income is (one million or more) reached (155) cases, forming a percentage of (%15.5) of the total sample members. The results of the statistical test using the chi-square formula

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

showed that there is no significant or substantial difference between the number of cases of the disease according to the economic status, with the calculated value of (4.96) decreasing from the tabulated value of (7.81) at the significance level of (0.05) and a degree of freedom of (3). Here, other factors may intervene in controlling the pattern and behavior of this disease. In other words, all populations may be exposed to the disease regardless of their living standards and economic status in the study area.

Table 6: Number of cases according to income level

Income level	Number	Percentage (%)
Less than 500 thousand ID	280	%28
700-500 thousand ID	345	%34.5
1000-700 thousand ID	220	%22
One million or more	155	%15.5
Total	1000	%100
Calculated chi-square value	4.96	
Tabulated chi-square value	7.81	
Significance level	0.05	
Degrees of freedom	3	

Source: Field study.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Fourth: Personal factors

A. Obesity

Obesity is a major factor in increasing the risk of developing diabetes, especially type 2. In this disease, the body secretes insulin at normal levels, but the body›s cells become resistant to insulin. It has been scientifically proven that there is a close relationship between obesity and diabetes. It was observed that this disease affects obese people more than thin people due to the occurrence of insulin resistance in the body of people with obesity. In fact, (%80) of people with type 2 diabetes suffer from obesity(9). Older obese females are more at risk of developing diabetes than males. Obesity means that the body is unable to effectively deal with the carbohydrates and sugars that a person consumes in their daily diet. This deficiency leads to the development of diabetes and its progression in the body due to the consumption of large amounts of food that contains more calories than the body needs. These excess calories are stored in the form of fat, which increases weight(10). The field study and the data in Table (7) show that the number of males who were obese before being diagnosed with diabetes was 369 cases, which constituted (%37) of the total sample members. The number of females who were obese before being diagnosed with the disease was 631 cases, which constituted (%63) of the total sample members. This indicates the impact of obesity as a personal factor in increasing the risk of developing diabetes. The statistical analysis using the chi-square formula proved the existence of this relationship with the significance of the calculated value of (6.76), which exceeded the tabulated value

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

of (3.84) at a significance level of (0.05) and a degree of freedom of (1). The table also shows an increase in the proportions of females with obesity compared to males due to the increase in the percentage of fat in the female body by (%10) compared to its percentage in the male. In fact, the percentage of fat constitutes about (%15) of the male›s weight(11). This is attributed to the increase in insulin resistance, which resulted in increased insulin secretion. This, in turn, leads to the promotion of anabolic processes in the body(12). This comes with the effect of female hormones as one of the factors that contribute to increasing obesity, such as estrogen. Medical studies have confirmed that the cause of (%45) of women›s obesity is due to an imbalance in estrogen levels in the blood. High levels of estrogen work to increase fat storage(13).

Table (7) The effect of obesity on people with diabetes according to the sample

Males who were obese before the disease	369	%37
Females who were obese before the disease	631	%63
Total	1000	100
Calculated chi-square value	6.76	
Tabulated chi-square value	3.84	
Significance level	0.05	
Degrees of freedom	1	

Source: Field study.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

B. Genetics

Studies have shown that genetics plays a role in the transmission of the disease from generation to generation, especially in those who eat a lot of sugary foods and live a sedentary lifestyle. However, genetics alone is not enough to cause diabetes, there must be environmental factors that contribute to the disease(14). It is believed that type 1 diabetes is triggered by some type of infection (viral) or other narrow-scale triggers such as stress or stress and exposure to environmental influences such as exposure to some chemicals or drugs. Some genetic elements play a role in the individual›s response to these triggers. It also affects type 2 diabetes, especially those who have first-degree relatives, and the risk of their infection increases with the increase in the number of infected relatives. In addition, there are several different genes that play a role in the development of diabetes, whether type 1 or type 2 diabetes, through the influence of genes on the level of metabolism and insulin secretion(15). Genetic factors can also affect how a person responds to treatment. Some people may be more responsive to certain types of drugs or treatments based on their inherited genetic information. According to the field study, according to the sample, and the data in Table (8), the number of diabetics who had a family history of diabetes was (521) cases, constituting a percentage of (%52.1) of the total sample members. While the number of diabetics who did not have a family history of diabetes was (479) cases, constituting a percentage of (%47.9) of the total number of cases. Through statistical analysis using the chi-square formula, it was clear that there is an insignificant relationship between the factor of heredity and the incidence of diabetes, with the significance of

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

the calculated value of (0.16), which was less than the tabulated value of (3.84) at the significance level (0.05) and a degree of freedom (1). This result reinforces the role of environmental and behavioral factors in the likelihood of a person being exposed to the disease in addition to the genetic factor.

Table (8) The effect of the heredity factor on people with diabetes according to the sample

Classification	Number	Percentage (%)
Yes	521	52.1
No	479	47.9
Total	1000	100
Calculated chi-square value	0.16	
Tabulated chi-square value	3.84	
Significance level	0.05	
Degrees of freedom	1	

Source: Field study.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Conclusions

The study reached the following conclusions:

1. Diabetes is prevalent in all administrative units in the study area, with varying rates of prevalence.
2. The spatial distribution pattern of diabetes tends to be concentrated in the center of the governorate, reflecting the relationship between high population density and the availability of health services.
3. The spatial variation in urbanization rates in administrative units affects the spatial patterns of diabetes.
4. Obesity has a greater impact on females and increases the chances of developing diabetes.
5. Genetics plays an important role in the likelihood of developing diabetes.

Suggested strategies to reduce the spread of diabetes:

1. The need to have a strategic plan on the prevention and control of noncommunicable diseases for the period "-2017 2030" aimed at reducing premature deaths due to diabetes, cardiovascular diseases, and chronic diseases by %25 by 2025.
2. Cooperation between organizations and the International Agency for Diabetes Research with other United Nations institutions within the framework of the United Nations Interagency Task Force concerned with the prevention and control of non-chronic diseases.
3. Increase political commitment to diabetes prevention, coordinate and conduct research that addresses the causes of diabetes in humans, and identify priority strategies for its

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

prevention.

4. Developing standards and tools to guide the planning and implementation of interventions implemented in the fields of preventing diabetes, detecting it in the early stages, providing treatment services for it, and providing its patients with palliative care that keeps them alive.(obaid.2024).
5. Facilitating the establishment of broad networks between partners and experts in the field of diabetes control at the global, regional and national levels and providing strategic plans in addition to providing technical assistance to support governments and their partners in developing relevant programs to provide high-quality services in the field of diabetes control in a rapid and effective manner Providing the necessary technical assistance to transfer best practices in the field of implementing diabetes control interventions quickly and effectively.(Obaid,2021).

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

References:

- Amal Saleh Aboud Al Kaabi, Medical geography: Topical approaches and methodological intersections, International Journal of Medical Sciences, May 2023.
- Kaide Othman Abu Sobeh, Geography of Cities, Third Edition, Dar Wael for Publishing, Amman, 2010.
- Abbas Fadel Al-Saadi, Studies in Population Geography, Alexandria›s House of Knowledge, X Press, Cairo, 1980.
- Amal Saleh Abood Al-Kaabi and Ali Mustafa Muhous Al-Sabeeh, Analysis of the reality of residential patterns in the urban environment of the city of Qurna, Alhadatha journal , A Refereed Academic Quarteriy, Vol.200-199.
- Hussein Abdul Hamid Ahmed Rashwan, The Role of Social Variables in Medicine and Diseases, A Study in Medical Sociology, Modern University Library, Alexandria, 1983.
- Mohsen Mansour Sarih, Geographical Analysis of Cousin Marriage in the Urban Governorate of Wasit, A Study in Population Geography, Master›s Thesis, College of Education, University of Wasit, 2013.
- Mohsen Abdul Sahib Al-Muzaffar, Medical Geography: Content, Methodology, and Spatial Analyses, First Edition, Dar Shamoua Al-Thaqafa, Libyan Republic, 2002.
- Amal Saleh Abdo Al-Kaabi, Medical Geography, Second Edition, Dar Al-Maarif, Iraq, 2022.
- Huda Taher Faisal, To study the relationship between genotype and diabetic nephropathy in Dhi Qar province, Thesis Submitted to the College of Science, Dhi Qar University, 2014.
- Obaid, Hanan. (2021). Strategic Planning, Wael Publishing

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

House, University of Jordan, Amman: Jordan.

- Rehab Khammat Hashish Al-Rakkabi, Geographical Analysis of Diabetes in Nasiriyah City for the period (2014-2003), Master›s Thesis, College of Arts, University of Thi Qar, 2016.
- Amaar Abdul Rahman Qaye, Sports Medicine, Dar Al-Kotob, Mosul, 1989.
- Personal interview with Dr. Imad Skran, a specialist in diabetes and endocrine glands, on 2023/9/1.
- Ahmed Tawfiq Hajazi, Encyclopedia of Nutrition, First Edition, Dar Osama, Amman, 2002.
- Ghada Naji, F, Factors influencing Onset and Metabolic Control in Children and adolescents with type 1 Diabetes Mellitus, Iraqi J. Comm. Med, VOL. 20, No.2007 ,2.
- Personal interview with Dr. Imad Skran, the source cited above.
- Republic of Iraq, Ministry of Planning, Basra Governorate Planning Directorate, Statistics Division, Population Estimates, (unpublished official data), 2022.
- Ministry of Trade, Main Supply Center in Basra Governorate, Population and Household Data (unpublished official data), 2022.
- Ministry of Health, Basra Health Directorate, Al-Fayhaa Specialized Center for Diabetes and Endocrine Glands (unpublished official data).
- Ministry of Health, Basra Health Directorate, Primary Healthcare Center (unpublished official data).
- Ministry of Health, Basra Health Directorate, Sadr Teaching Hospital, Statistics Unit (unpublished official data).
- Ministry of Health, Basra Health Directorate, Ports Teaching

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Hospital, Statistics Unit (unpublished official data).

- Ministry of Health, Basra Health Directorate, Basra Teaching Hospital, Statistics Unit (unpublished official data).
- Al-Kaab, Amal Saleh Abood and Ali Mustafa Muhous Al-Sabeeh, Analysis of the reality of residential patterns in the urban environment of the city of Qurna, Alhadatha journal , A Refereed Academic Quarteriy, Vol.200-199.
- Al-Kaabi, Amal Saleh Abdo. «Medical Geography.» Second edition, Dar Al-Maarif, Iraq, 2022.
- Al-Kaabi,Amal Saleh Aboud, Medical geography: Topical approaches and methodological intersections, International Journal of Medical Sciences, May 2023.
- Al-Muzaffar, Mohsen Abdul Sahib. «Medical Geography: Content, Methodology, and Spatial Analyses.» First edition, Dar Shamoua Al-Thaqafa, Libyan Republic, 2002.
- Al-Rakkabi, Rehab Khammat Hashish. «A Geographic Analysis of Diabetes in Nasiriyah City for the period (2014-2003).» Master›s thesis, College of Arts, University of Thi Qar, 2016.
- Al-Saadi, Abbas Fadel. «Studies in Population Geography.» Alexandria›s House of Knowledge, X Press, Cairo, 1980.
- Faisal, Huda Taher, To study the relationship between genotype and diabetic nephropathy in Dhi Qar province, Thesis Submitted to the College of Science, Dhi Qar University, 2014.
- Hagazi, Ahmed Tawfiq. «Encyclopedia of Nutrition.» First edition, Dar Osama, Amman, 2002.
- Ministry of Trade, Main Supply Center in Basra Governorate, Population and Household Data. (Unpublished official data), 2022.
- Ministry of Health, Basra Health Directorate, Al-Fayhaa

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Specialized Center for Diabetes and Endocrine Glands. (Unpublished official data).

- Ministry of Health, Basra Health Directorate, Primary Healthcare Center. (Unpublished official data).
- Ministry of Health, Basra Health Directorate, Sadr Teaching Hospital, Statistics Unit. (Unpublished official data).
- Ministry of Health, Basra Health Directorate, Ports Teaching Hospital, Statistics Unit. (Unpublished official data).
- Ministry of Health, Basra Health Directorate, Basra Teaching Hospital, Statistics Unit. (Unpublished official data).
- Obaid S Hanan. (2021). Strategic planning for medical education and its impact on medical health care, BOHOUTH MAGAZINE, (ISSUE:37), Pp:57-51.
- Obaid S Hanan. Almusawi A Mohammed, Mohammad R, Husam M, (2024), Strategic planning to strength the role of media and suitable development in science Intellectual Centers to serve the tourism sector, INTERNATIONAL MINNESOTA JOURNAL OF ACADEMIC STUDIES, (ISSUE:2), (VOL: 5), Pp:32-15.
- Naji, Ghada. F, Factors influencing Onset and Metabolic Control in Children and adolescents with type 1 Diabetes Mellitus, Iraqi J. Comm. Med, VOL. 20, No.2007 ,2.
- Personal interview with Dr. Imad Skran, a specialist in diabetes and endocrine glands, on 2023/9/1.
- Qiey, Amaar Abdul Rahman. «Sports Medicine.» Dar Al-Kotob, Mosul, 1989.
- Rashwan, Hussein Abdul Hamid Ahmed. «The Role of Social Variables in Medicine and Diseases: A Study in Medical Sociology.» Modern University Library, Alexandria, 1983.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

- Republic of Iraq, Ministry of Planning, Basra Governorate Planning Directorate, Statistics Division, Population Estimates. (Unpublished official data), 2022.
- Sarih, Mohsen Mansour. «A Geographic Analysis of Cousin Marriage in the Urban Governorate of Wasit: A Study in Population Geography.» Master›s thesis, College of Education, University of Wasit, 2013.

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

Appendix (1) Questionnaire

This questionnaire contains questions for the research titled «Spatial Distribution Pattern of Diabetes in Basra Governorate.» Please fill out the questionnaire. Your answers will be kept confidential and used for research purposes only. Thank you for your cooperation.

1. Type of Diabetes:
   - Type 1 ( )
   - Type 2 ( )
2. Household Income:
   - Less than 500,000 ( )
   - 700,000-500,000 ( )
   - 1,000,000-700,000 ( )
   - 1,000,000 or more ( )
3. Did you experience sudden weight gain before being diagnosed with diabetes?
   - Yes ( )
   - No ( )
4. Is diabetes caused by a genetic factor?
   - Yes ( )
   - No ( )

ium.usa.online@gmail.com www.ium.edu.so
+ 967 730053135 http://ium.usa.online

الجامعة الإسلامية بمنيسوتا

Islamic University of Minnesota

المركز الرئيسي IUM