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GEOGRAPHICAL DISTRIBUTION OF BLOOD GROUP VARIATION IN NAJAF GOVERNORATE (2023-2024)

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ABSTRACT

The research aims to show how blood groups are distributed in the Najaf Governorate and analyze them according to the main blood groups (A, B, AB, O). The expected results include a different distribution of blood groups across urban and rural areas and the potential effects of social and economic factors on this distribution. Therefore, the main focus of the research was to know the prevailing blood groups and the degree of diversity of those groups according to the administrative units in the study area.

This study has practical implications as it contributes to enhancing the understanding of the spatial distribution of blood groups. This understanding can be used to improve health emergency plans, blood donation strategies, and provide guidelines for health care planning in the governorate.

The research includes collecting blood sample data from different areas in the governorate and analyzing them using advanced geographic information systems maps. These maps are instrumental in identifying patterns and spatial distributions of common and rare blood groups, and the impact of demographic and environmental factors on these distributions.

The most essential results were that there are administrative units with repetitive values, i.e., stable areas where certain blood types prevail, unlike other regions where repetitive values are low or non-existent, i.e., unstable areas where the percentage of blood types changes.

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KEYWORDS

Blood groups, blood sample data, spatial distributions.

INTRODUCTION

Man, and the environment in which he lives are two variables that affect each other. Knowing the blood types in a place makes us aware of the diseases that spread because each blood type responds to a specific environmental influence according to the surrounding conditions and the genetic factors (genes) that are also affected by this and interact and develop over time.

1- Justifications for the study:

Our choice of the study is justified by its great importance in medical planning and health care, including predicting epidemics and diseases and avoiding the dangers resulting from differences in blood types.

2- The study problem:

The main problem of the study is "What are the prevalent blood types in Najaf Governorate?" To know this, it must be divided into sub-problems:

-Are there administrative units in which a specific blood type is concentrated?

-What are the administrative units with the most diversity in blood types?

3- Study hypothesis:

The central hypothesis is "The most prevalent blood group in the study area is A," while the sub-hypotheses are:

A - All administrative units are characterized by the diversity of blood groups with the presence of a specific type.

B - The center of Najaf district is one of the most diverse administrative units in blood groups.

4- Spatial and temporal boundaries:

The spatial boundaries are concerned with the administrative boundaries of Najaf Governorate, which ranks seventh in terms of area, amounting to 28,824 square kilometers, which constitutes 6% of the area of Iraq. According to Map (1), it is located between latitudes (29.30 and 33.32 north) and longitudes (43.44 and 46.45 east), meaning that it is located in the middle Euphrates region, where it is bordered by Karbala and Babylon Governorates to the north, Qadisiyah and Muthanna to the east, Anbar to the west, and the borders with the Kingdom of Saudi Arabia to the south (General Survey Establishment - Baghdad - 1995). It consists of Najaf District, which includes the center of Najaf District, Al-Haidariya District, and Al-Shabaka

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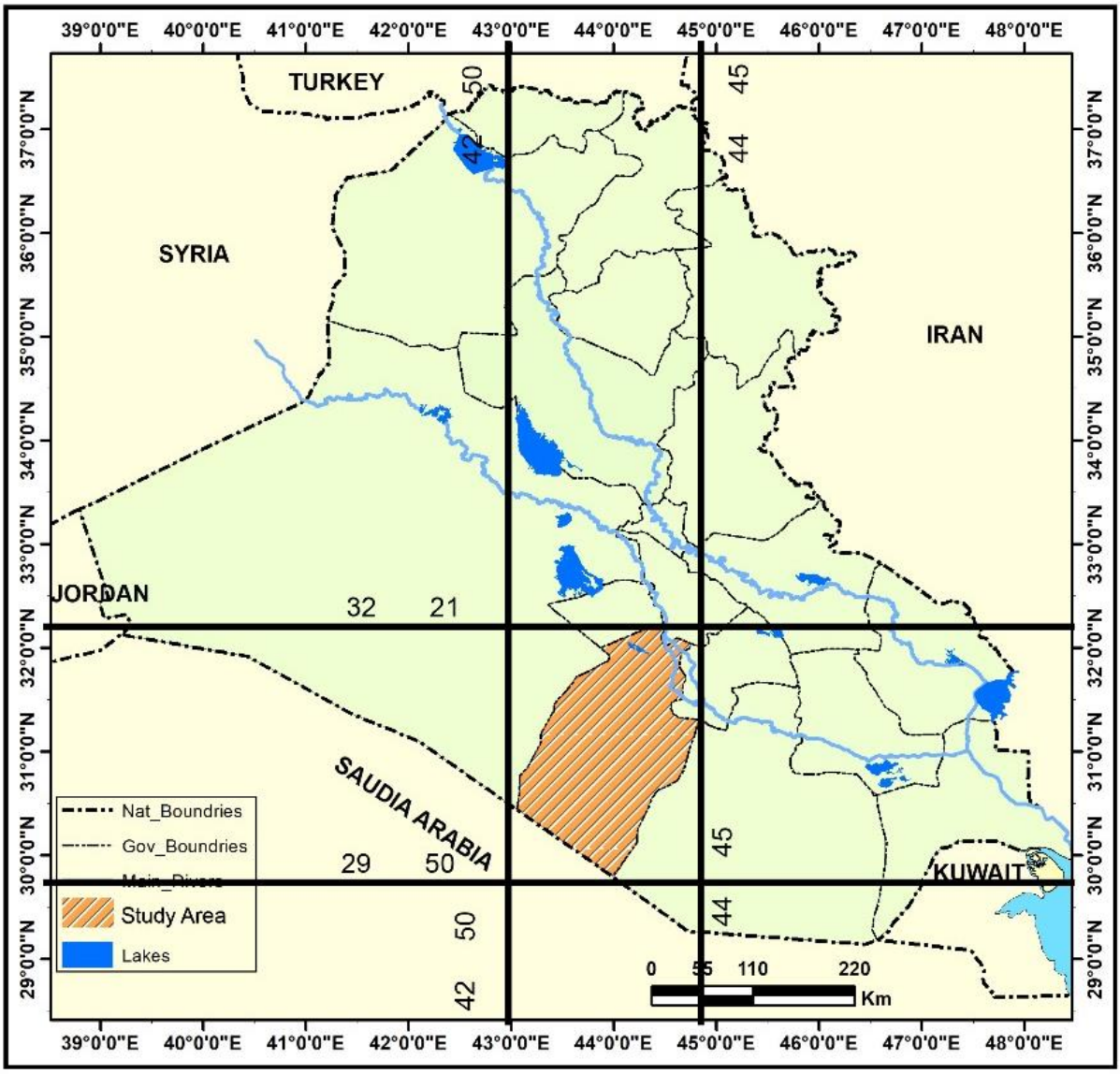
District, and Kufa District, which consists of the center of Kufa District, Al-Abbasiyah and Al-Hurriyah District, and Al-Mundhirah District, which includes the center of Al-Mundhirah and Al-Hirah District, and Al-Mashkhab District, which consists of the center of Al-Mashkhab and Al-Qadisiyah District. As for the temporal boundaries, they include (2023-2024).

Map (1): Astronomical location of the study area



Source: Republic of Iraq, Ministry of Water Resources, General Survey Establishment, Baghdad, 1995.

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5- Methodology and Approach:

The research relied on the methodology followed in the study, a fundamentalist approach that specializes in studying the phenomenon within a limited area. The method followed descriptive, statistical, and cartographic methods.

6- Concepts of the study:

A- Blood

It is a fluid found in all the bodies of animals and humans, and its function is to transport the necessary materials to the cells, such as nutrients and oxygen 'Free encyclopedia-2024'

B- Red cells Erythrocytes

They are disc-shaped cells devoid of nucleus and cytoplasm and are filled with hemoglobin, and their function is to transport gases to the body cells "Fatayer-2000-27."

C- Antigens

It is the substance that reacts in the human body and produces antibodies "Al-Zubaidi-1984-68" and may include plasma, vaccines, and viruses' Bakman-2024-1' and may also include plasma and the reaction of antigens appear in the case of inappropriate blood transfusion or marriage 'Laura-2005-4'

C- Antibodies

They are the bodies secreted by immune cells when foreign materials enter the human body "Khalifa-1995-99."

C- RH factor

It is the negative and positive system in blood types, and when they differ, it leads to the death of the fetus in the mother's womb Zakarya-2022-3.'

H- Agglutination

It is the clumping of blood particles when blood types differ. Free encyclopedia-2024'

K- Classification of blood

Blood is classified into four basic categories: (O - A - B - AB)

Diagram (1): Compatibility of the four basic blood types

Donor					
AB	B	A	O	The faction	

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Does not match	Not compatible	Not compatible	correspond	**O**	**Receiver**
Does not match	Not compatible	Compatible	correspond	**A**	
Does not match	Compatible	Not compatible	correspond	**B**	
Compatible	Compatible	Compatible	correspond	**AB**	

Source: Zakaria, 2022, blood groups and blood types, page 7

First: The numerical and relative distribution of the population of the study area according to blood types for the year 2023-2024:

Table (1) indicates the numerical and relative distribution of the population of the study area according to blood types for the year 2023-2024 as follows:

1- Blood type O ranked first, as the number of people carrying this type reached 484,970 people, representing 29% of the total population of the study area, which amounted to 1,672,312 people, according to estimates by the Central Bureau of Statistics for the year 2023.

2- Blood group b ranked second with 384631 people, representing 23%

3- Blood group A ranked third with 284123 people, representing 14%

4- Blood group AB ranked fourth with 150508 people, representing 9%

5- Blood group o ranked fifth with 160507 people, representing 9%

6- Blood group A ranked sixth with 84062 people, representing 7%

7- Blood group B ranked seventh with 83342 people, representing 7%

8- Blood group AB ranked last with 50169 people, representing 4%

Based on the above, the researcher chose the four blood groups (o.b.a.ab) as they are the most

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widespread blood groups in the study area, which he will discuss in the upcoming sections.

Table (1): Numerical and relative distribution of blood types in the study area

%	Number	Blood Type
29	484970	O
23	384631	B
14	284123	A
9	150508	Ab
9	150507	O-
7	84062	A-
7	83342	B-
4	50169	Ab-
100	1672312	Total

Source: Republic of Iraq, Ministry of Health, Najaf Governorate Health Directorate, Blood Center, unpublished data, 2023

Table (2) shows the numerical and relative distribution of the four blood types (study population) amounting to 1,304,319 people, which represents 77% of the population of the study area, as follows:

1- Group O ranked first, recording 484,970 people, representing 37%.

2- Group B ranked second, recording 384,631 people, representing 29%.

3- Group A ranked third, recording 284,210 people, representing 22%.

4- Group AB ranked last, recording 150,508 people, representing 12%.

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Table (2): Numerical and relative distribution of blood types (study population) in the study area

%	Number	Blood Type
37	484970	O
29	384631	B
22	284210	A
12	150508	Ab
100	1305319	Total

Source: Republic of Iraq, Ministry of Health, Najaf Governorate Health Directorate, Blood Center, unpublished data, 2023

It is evident from the data that the four blood groups are prevalent in the study area. Our research will focus on their geographical distribution and the variation of this distribution. This is crucial as the spread of two incompatible groups could lead to significant health risks among the population. Therefore, our work is vital in developing plans, programs, and health systems to prevent these dangerous possibilities.

Second: The numerical and relative distribution of blood types according to the qualitative composition of the population of the study area:

It is clear from Table (3) the numerical and relative distribution of blood types according to the qualitative composition of the study area population that the number of males was recorded at 665,203 people, constituting 51% of the study population of 1,304,319 people. As for the O type, the number of males was recorded at 247,335, comprising 37%, followed by the B type, which recorded 196,162 people, comprising 29%, then the A type, which recorded 144,947 people, constituting 22%, followed by the AB type, which recorded 76,759 people, constituting 11%. As for the number of females, it reached 639,116, representing 49% of the study population. As for blood type O, it recorded 237,635 people, representing 35%, followed by blood type B, which recorded 188,469 people, representing 30%, followed by blood type A, which recorded 139,263 people, representing 22%, and finally, blood type AB, which recorded 73,749 people, representing 12%.

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Table (3): Numerical and relative distribution of blood types according to the qualitative composition of the study area population for the year (2023-2024)

%	Female	%	Male	The faction
35	237635	37	247335	O
30	188469	29	196162	B
22	139263	22	144947	A
12	73749	11	76759	AB
100	639116	100	665203	Total

Source: Republic of Iraq, Ministry of Health, Najaf Governorate Health Directorate, Blood Center, unpublished data, 2023

From the above table, we conclude:

1- The number of males in all blood groups was more than the number of females.

2- Group O ranked first in the number of males and females, and this group is characterized by incompatibility with the rest of the groups in terms of receiving, i.e., blood cannot be transferred to it except for its group, unlike other groups that receive from group O in the case of blood donation.

Third: The numerical and relative distribution of blood type O according to administrative units:

In Table (4), which shows the numerical and relative distribution of blood type O according to administrative units in the study area, we find:

The center of Kufa district ranked first, recording 318,380 people, representing 64%, followed by Al-Abbasiya district, which recorded 72,796 people, representing 15%, then Al-Hurriya district, which recorded 29,098 people, representing 65%, then Al-Munathera district center, which recorded 24,548 people, representing 5%, then Al-Haidariya district, which recorded 19,398 people, representing 4%, then Al-Mashkhab district center, which recorded 14,386 people, representing 3%, then Al-Hirah district, which recorded 4,849 people, representing 15%, then Al-Najaf district center, which recorded 872 people, representing 0.008%, and finally Al-Qadisiyah, which recorded 193 people, representing 0.004%.

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Table (4): Numerical and relative distribution of blood type O according to administrative units in the study area

%	Number	Administrative Unit
64	318380	Kufa District Center
15	72796	Al-Abbasiya
6	29098	Al-Hurriya
5	24548	Al-Mundhiriya
4	19398	Al-Haidariya
3	14836	Al-Mashkhab
1	4849	Al-Hirah
0,008	872	Najaf District Center
0,004	193	Al-Qadisiya
100	484970	Total

Source: Republic of Iraq, Ministry of Health, Najaf Governorate Health Directorate, Blood Center, unpublished data, 2023

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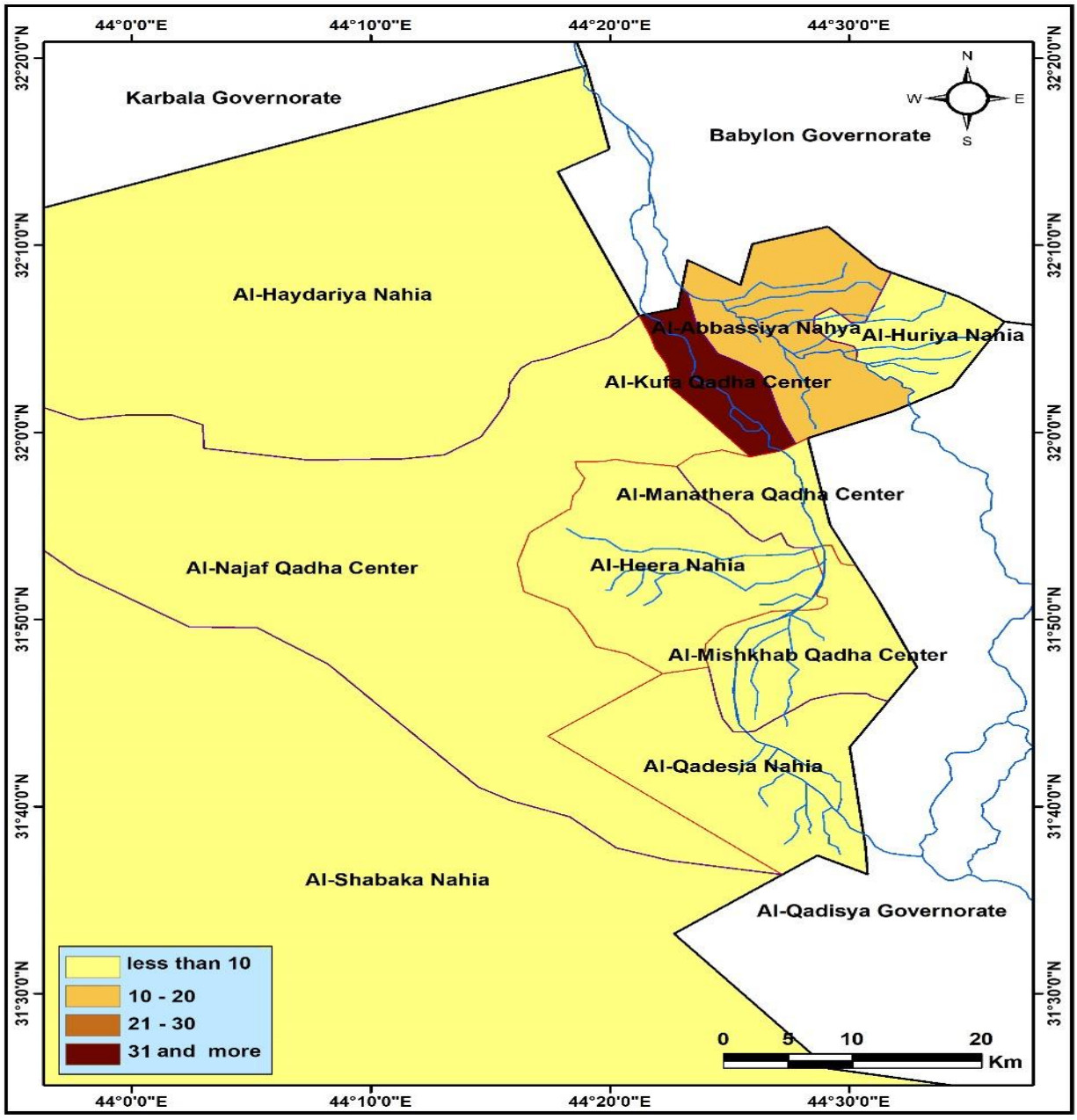
Map (2): Geographical distribution of blood type O according to administrative units



Source: Researcher's work based on Table (4)

Fourth: Numerical and relative distribution of blood type B according to administrative units:

It is clear from Table (5) the numerical and relative distribution of blood type B according to

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administrative units that the center of Kufa district once again occupied the first place, recording 242,317 people, representing 63%, followed once again by Al-Abbasiya district, which recorded 61,540 people, representing 16%, then the center of Al-Manathira Al-Haidariyah district, each of which recorded 19,231 people, representing 5%, then Al-Hurriya district, which recorded 15,385 people, representing 4%, then Al-Mashkhab, which recorded 11,538 people, representing 3%, followed by the center of Najaf district and Al-Hirah district, which recorded 7,592 people, representing 2%, and finally Al-Qadisiyah district, which recorded 205 people, representing 0.006%.

Table (5): Numerical and relative distribution of blood type B according to administrative units

%	Number	Administrative Unit
63	242317	Kufa District Center
16	61540	Al-Abbasiya
5	19231	Al-Mundhir District Center
5	19231	Al-Haidariyah
4	15385	Al-Hurriya
3	11538	Al-Mashkhab
2	7592	Najaf District Center
2	7592	Al-Hirah
0,006	205	Al-Qadisiyah
100	384631	Total

Source: Republic of Iraq, Ministry of Health, Najaf Governorate Health Directorate, Blood Center, unpublished data, 2023

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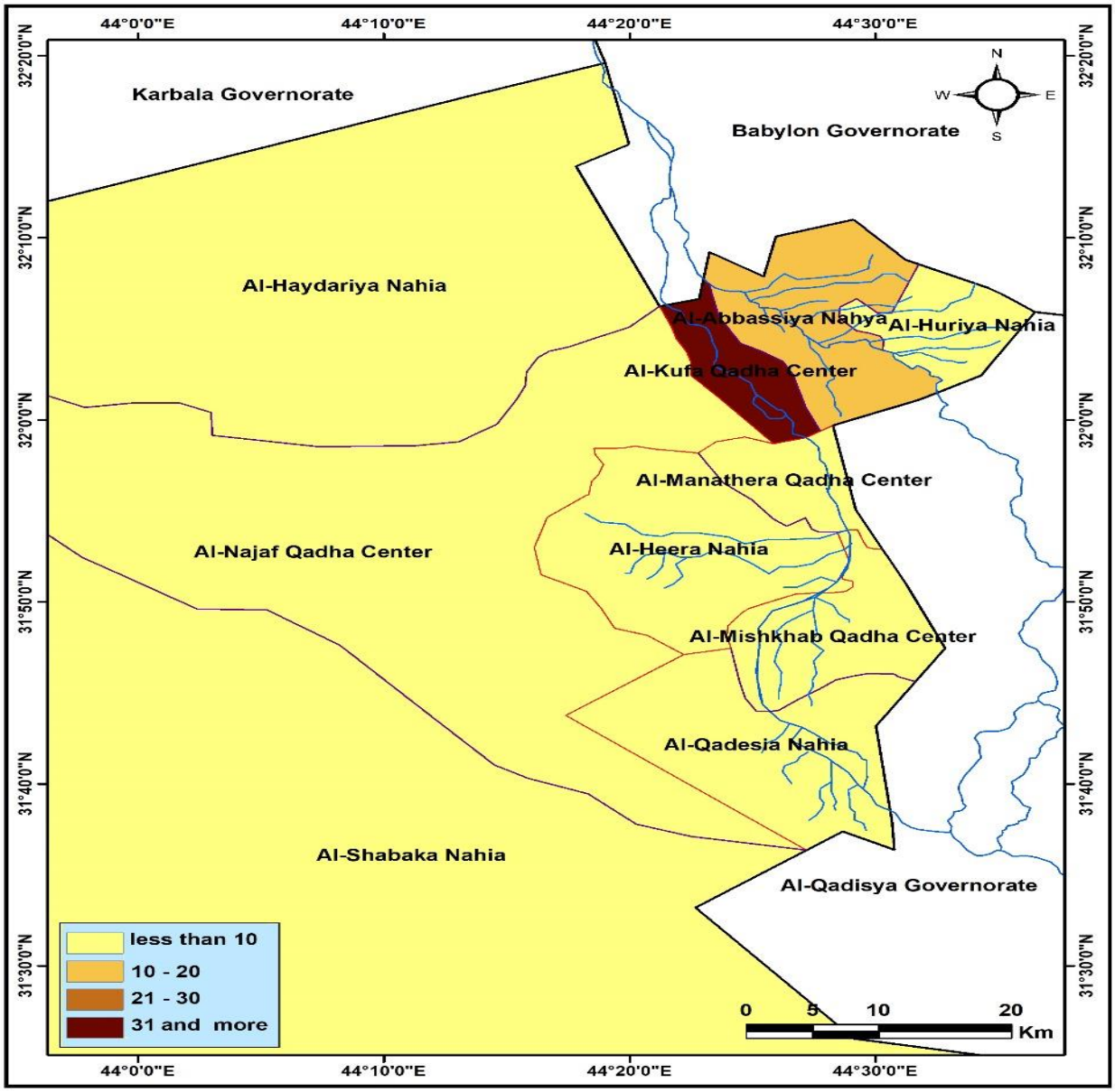
Map (3): Geographical distribution of blood group B according to administrative units



Source: Researcher's work based on Table (5)

Fifth: Numerical and relative distribution of blood type A according to administrative units

Table (6) shows the numerical and relative distribution of blood type A according to administrative units, Al-Hirah district ranked first, recording 93,789 people,

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representing 33%, followed by Al-Abbasiya, which recorded 73,894 people, representing 24%, followed by Al-Kufa district center, which recorded 31,263 people, representing 11%, then Al-Najaf district center, which recorded 25,014 people, representing 9%, followed by Al-Mundhirah district center, which recorded 22,736 people, representing 8%, then Al-Hurriya district, which recorded 19,894 people, representing 75%, then Al-Haidariya, which recorded 17,052, representing 6%, and finally Al-Qadisiyah district and Al-Mashkhab district center, which recorded 284 people, representing 1%.

Table (6): Numerical and relative distribution of blood type A according to administrative units

%	Number	Administrative Unit
33	93789	Al-Hirah
24	73894	Al-Abbasiyah
11	31263	Kufa District Center
9	25014	Najaf District Center
8	22736	Al-Mundhirah District Center
7	19894	Al-Hurriya
6	17052	Al-Haidariyah
1	284	Al-Qadisiyah
1	284	Al-Mashkhab
100	284210	Total

Source: Republic of Iraq, Ministry of Health, Najaf Governorate Health Directorate, Blood Center, unpublished data, 2023

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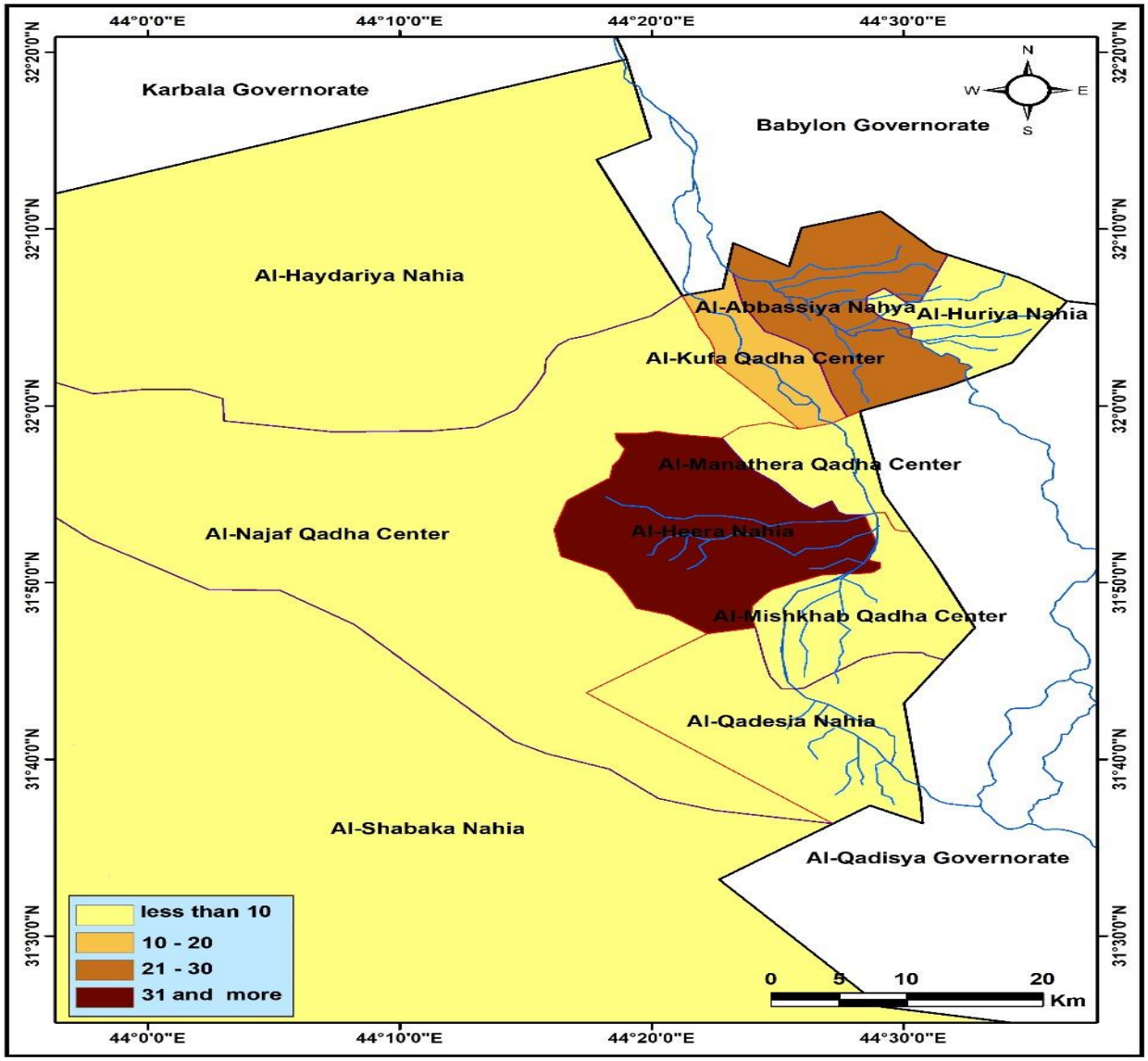
Map (4): Geographical distribution of blood group A according to administrative units



Source: Researcher's work based on Table (6)

Sixth: Numerical and relative distribution of blood type AB according to administrative units:

It is clear from Table (7) that the numerical and relative distribution of blood type AB according to administrative units is that the center of Kufa district ranked first, recording 100,840 people, representing 67%, followed by Abbasiya, recording 19,435 people, representing 12%, followed by the center of Najaf and

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Al-Mundhirah districts, recording 7,525 people, representing 5%, followed by Al-Haidariya and Al-Mashkhab districts, which recorded 4,515 people, representing 3%, then Al-Hirah and Al-Hurriya districts, which recorded 3,010 people, representing 2%, and finally Al-Qadisiyah, which recorded 120 people, representing 0.008%.

Table (7) Numerical and relative distribution of blood type AB according to administrative units

%	Number	Administrative Unit
67	100840	Kufa District Center
12	19435	Al-Abbasiya
5	7525	Najaf District Center
5	7625	Al-Mundhir District Center
3	4515	Al-Mashkhab District Center
3	4515	Al-Haidariyah
2	3010	Al-Hirah
2	3010	Al-Hurriya
%0,008	120	Al-Qadisiyah
100	150509	Total

Source: Republic of Iraq, Ministry of Health, Najaf Governorate Health Directorate, Blood Center, unpublished data, 2023

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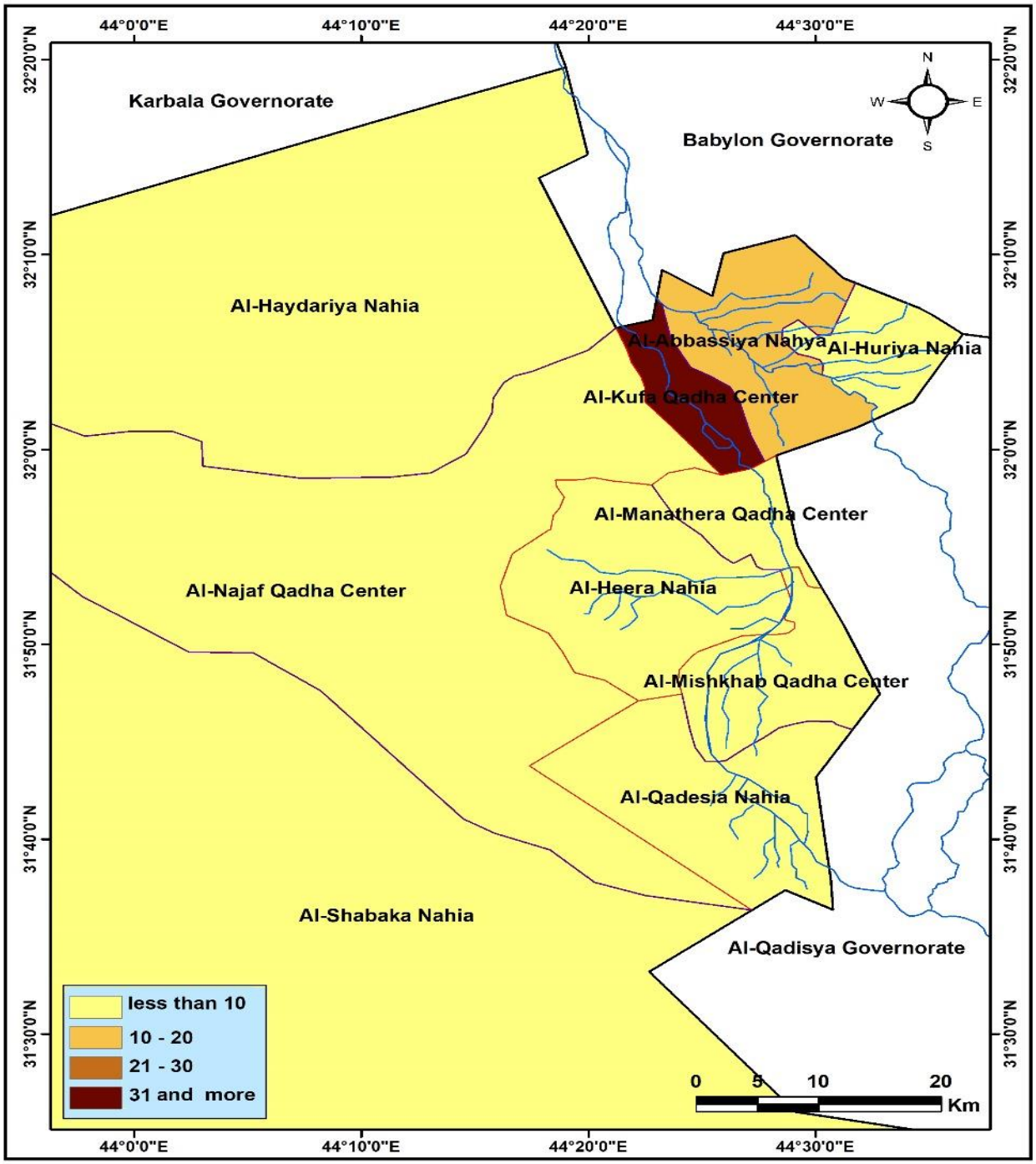
Map (5): Geographical distribution of AB blood group according to administrative units



Source: Researcher's work based on Table (7)

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We conclude from Table (4) (5) (6) (7) the following:

1- There are administrative units that occupied the same ranks in different blood groups, such as Abbasiya and Kufa District Center, meaning that they have repetitive values, unlike some units that did not have repetitive values, such as Al-Hurriya and Najaf District Center. This means that the administrative units in the first example are stable and specific factions prevail in them, unlike the second example, which is variable. On this basis, Table (8) was prepared.

Table (8): Repetitive values of administrative units of the same rank in the study area

Frequency values of the same rank	Administrative Unit
4	Al-Abbasiya
3	Kufa District Center
2	Al-Qadisiyah
2	Al-Mashkhab
2	Al-Hirah
2	Al-Manara District Center
2	Al-Haidariya
-	Najaf District Center
-	Al-Hurriya

Source: Based on Table (4)(5)(6)(7).

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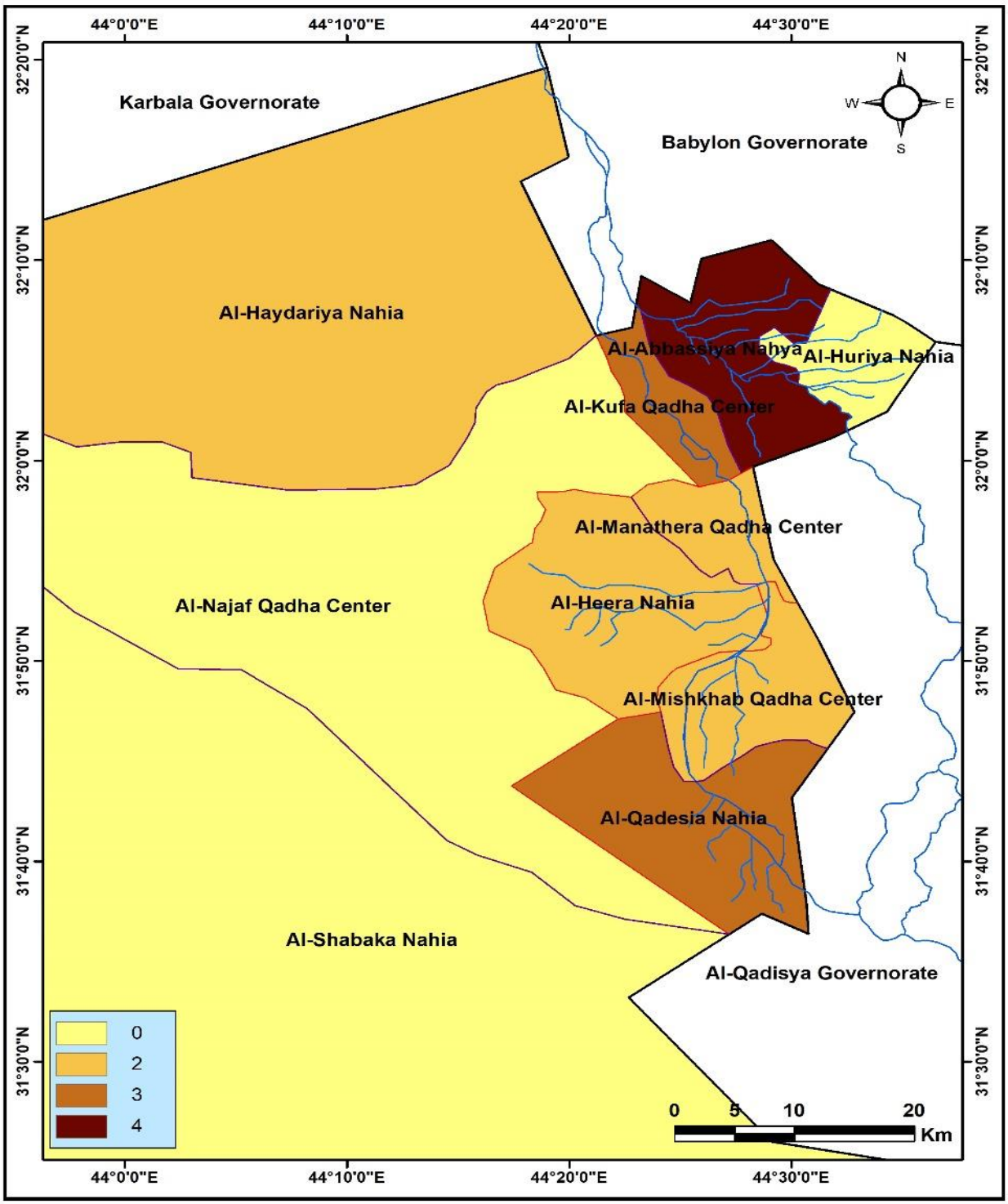
Map (6) Geographical distribution of frequency values according to administrative units



Source: Researcher's work based on Table (8)

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From the above, it is clear that there are stable administrative units and other unstable administrative units, and the reason for this is due to factors, the most important of which are demographic factors, and here we mean the factor (rural and urban). Table (9) shows the frequency values for each administrative unit, corresponding to the number of rural residents, and we find that the highest frequency value was recorded in the Al-Abbasiya district. The center of Kufa district, represented by 4 and 3, corresponds to 90,657 and 80,297 people. In contrast, we find that the center of Najaf district and Al-Hurriya district do not have any frequency value, so they came in last place regarding rural population numbers. In the center of Najaf district, the rural population reached 31,849 people, and in Al-Hurriya, 21,823 people. It must be noted that rural residents tend to what is known as (consanguineous marriage), so the genetic characteristics are similar, and this is what modern genetics and experimental embryology have confirmed (William-1975-310).

To test the strength of the relationship, the researcher employed Pearson's correlation coefficient, a widely accepted statistical measure. The result, a strong positive correlation of 74, indicates that as the rural population increases, so do the repetitive values of the administrative unit. This is further supported by table (9), which presents the repetitive values and number of rural population according to administrative units.

Rural Population	Recurring Values	Administrative Unit
90657	4	Al-Abbasiya
80297	3	Kufa District Center
45977	3	Al-Qadisiyah
71209	2	Al-Mashkhab
24873	2	Al-Hirah
68797	2	Al-Haidariyah
41571	2	Al-Mundhir District Center

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31849	-	Al-Najaf District Center
21823	-	Al-Hurriya

Source: Republic of Iraq, Ministry of Planning, Central Statistical Organization in Najaf, 2023.

CONCLUSIONS

The study concluded that;

1- There are stable administrative units, i.e., certain blood types prevail in them, so they came with higher frequency values than the rest of the other administrative units, for example (Al-Abbasiya District), which recorded (4) as a frequency value, followed by the center of Kufa District and Al-Qadisiyah District, where each of them recorded three as a frequency value, unlike the center of Najaf District and Al-Hurriya District, which had a frequency value of zero.

2- The more rural residents increase, the more the frequency values increase. For example, (Al-Abbasiya District), which recorded the highest frequency value of (4), ranked first in the number of rural residents, as it recorded (90,657 people) when compared to other administrative units.

3—The population of the study area is divided into rural and urban areas, and on this basis, the nature of social relations differed. So, we find that rural residents tend to marry relatives more than urban residents, which leads to their repetition of genetic traits.

4- The economic level of urban residents is generally higher than that of rural residents, which in turn led to an increase in the cultural level and an exit from the scope of prevailing social customs, and thus social relations expanded, which led to their areas being unstable in terms of blood types, for example, the Najaf District Center, which recorded a repetition value of zero, which was ranked second to last with the number of rural residents amounting to (31,849 people).

RECOMMENDATIONS

1- The study recommends that the competent authorities establish blood group centers according to the geographical area, depending on the type of administrative unit. Suppose it is one of the stable administrative units, as is the case (Kufa District Center and Al-Abbasiya and Al-Qadisiya districts). In that case, blood centers should be established by the prevailing blood groups. However, if it is one of the unstable units, for example (Najaf District Center and Al-Hurriya District), it is necessary to establish centers that provide different blood groups, considering them unstable areas.

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2- Providing injections and vice versa: The lower the repetition values of the administrative units, the more their requirements are because they are unstable administrative units and vice versa.

3- Spreading awareness among the residents of the administrative units of the study area due to its great importance through the media, communication, and periodic teams affiliated with health institutions.

4- Emphasizing the need to conduct a blood test upon marriage, whether in urban or rural areas.

5- Conducting periodic blood donation campaigns distributed among the administrative units to ensure the provision of blood types for critical cases.

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