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Application Of Spatial Analysis To Detect The Focal Density Of Drug Users In The Rusafa Side Of Baghdad City

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Abstract The research aims to identify and analyze the concentration of drug users, pinpoint areas with high levels of criminal activities, understand the work environments of criminals, and determine their motivations. The study focused on the city of Baghdad, covering both the Karkh and Rusafa sides of the Tigris River, with a particular emphasis on the Rusafa side. Data from the ten months of 2022 was used to analyze drug dealers and users. The study utilized Global Positioning System (GPS) devices to geographically locate the samples, and the GIS V10.4 software was employed for data storage, processing, and analysis, along with various statistical analysis tools. The research identified hotspots of drug user prevalence based on statistical methods and theories, distinguishing the most influential hotspots and the least influential cold spots. Notable hotspots included Sadr City, Al-Shaab, Al-Kifah, Al-Fadl, New Baghdad, Municipalities, and Al-Obeidi, predominantly in the Rusafa side, encompassing slum areas and transgressions. An important aspect of the study was the creation of various spatial analysis maps, aiding decision-makers in implementing suitable measures for controlling and detecting drug users early.

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Keywords: *Area of Hotspots; Cold spot Points; Geographic Information Systems (GIS); Global Positioning System Device (GPS); Spatial Analysis.*

1. INTRODUCTION

The fact that there is no distinction between users and traffickers, as well as legal maneuvering by some lawyers and traders by turning traffickers into users to lessen punishment, as well as the introduction of corruption and uncontrolled weapons on the line of care for traders and the diversion of drugs, all contribute to Iraq's drug law being a contributing factor to the spread of drugs [1; 2].Hot spot detection and analysis methods have recently been categorized in study by the National Institute of Justice's Crime Mapping Research Center [3]. Cluster analysis, spatial autocorrelation, grid cell analysis, and choropleth mapping have all been classified as visual interpretation categories. [4]. What was developed and what does a hot spot in fact necessary identification differ in a number of ways. Crime hotspots are typically spatial phenomena. Therefore, it is crucial to use tools that properly handle space to spot areas where crime is particularly prevalent. Second, current cluster analysis techniques are not always the most effective when used with geographically referenced data. The relatively low price makes this very obvious [5]. The main objective of hot spot research is to generate insightful data that will help decision-makers develop effective policies to lessen and avoid urban violence. To assist with the spatial distribution of crimes, the spatial correlation between the crime site and their relationship at that time was used [6]. geographic patterns of crime concentrate on coordinates of an event, for example the places where crimes occur, and may also include the times when crimes occur [7].The point pattern can be plotted entirely or in parts on the map [8]. To ascertain whether a point pattern is such, spatial crime point trends are examined dispersed haphazardly, in groups, or repeatedly [9]. Often, cluster analysis is used to interpret the geographical crime point patterns [10]. A raster map is typically used to depict the spatial distribution of crime points. This technique is effective for analyzing crime occurrence clusters in identified areas where relationship between time and space analysis is needed [11]. With regard to the spatial attribute relationship between crimes, the approaches must create distance matrices. Crime hotspots are areas of high crime density on a map that researchers and analysts want to explore in relation to the crime [12]. Batter A good way to visualize high-density crime mapping areas is with hotspot maps [13]. Additionally, it has been demonstrated that the implied relationship between events can be successfully identified when using Spatial and temporal analysis using GIS tools [14]. Instead of processing data at the event level, crime analysis often tackles data on a large scale, such as the frequency of crimes occurring on a certain region [15]. It is advised to use the aggregation (clustering) technique employing mixed

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equivalents measurements to determine related instances [16]. At the incident level, crime data is produced utilizing a variety of applications. A geographic information system is a type of database well-liked application (GIS). Without using a known structure in identical data, aggregate is a means to data clusters where each collection of attributes is the same [17]. By examining criminal patterns and regular activity queries, a variety of techniques can be employed to examine trends [18]. To comprehend spatial and temporal patterns of criminality, it was discovered using data on various crimes that hubs for crime swiftly change in reaction to life's structure [19]. Both the both geographical and temporal components of criminal episodes must be considered in order to develop effective police strategies and input [20]. Criminal event maps only reflect a limited portion of the context of an area. Images obtained by remote sensing (aerial photos and satellite images), when integrated with criminal event maps in a geographic information system, provide context in a more meaningful way. Spatial proximity analysis is the process of connecting map elements to a dependent variable (in this example, criminal activity) . We have taken two slightly different approaches to apply data from remotely sensed imagery to crime analysis: (1) a general classification scheme to take advantage of pixels for spatial resolution and convert them into discernible patterns in the form of a Shape-file [21]. A pixel spatial image with high spatial resolution can be taken as a suitable background for visualization [22].The study area such as Sentinel 2b images, and (2) the projection of the study events, which are specific spatial points that are relevant to the crime, have a significant relationship with the outputs of the analysis of these points .The aim of research is to reveal the focal density of drug abusers and pushers, through the spatial distribution of the spread of organized crime, identify the hot and cold spots of intensive criminal activities, and reveal the type of social environment, its causes and motives.

2. STUDY AREA

Baghdad, the capital province of Iraq, is nearly in the middle of the country and has latitude and longitude readings of 33.452°N, 33.184°N, and 44.189°E, 44.58°E, respectively. Baghdad, the capital of Iraq, is home to around 8,126,755 people (as of 2018). There are 14 administrative units in all, eight of which are in Rusafa (east of the Tigris River) and six of which are in Karkh (west of the Tigris River). The research region is located in the plane state metric's Universal Transverse Mercator (UTM) coordinate system, between the top left and bottom right corners (498088.487 3630828.327 m) [23].

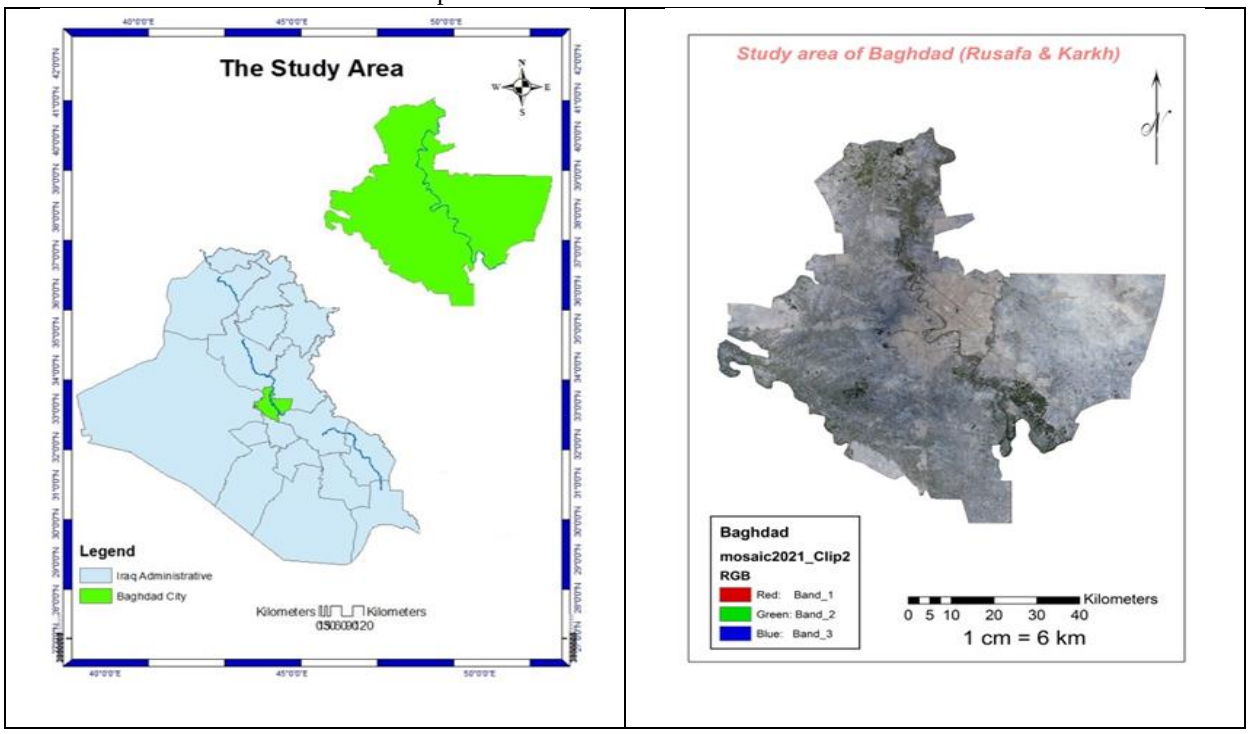

Figure (1). *Illustration, Study Area is Administrative Iraq, Baghdad Region and Center of Baghdad.*

3. METHODOLOGY AND MATERIAL

Our study is based on real data, affected by the spread of abusers and dealers of different types of drugs in continuous periods, and these data on drugs are taken from the Ministries of the Interior and Planning responsible for the statistics recorded in Iraq. Data locations are determined by a GPS device for the research field, which is Baghdad's side (Rusafa and Karkh). Analyzing research samples using statistical methods and theories managing GIS package software, and remote sensing technology. In our study, we use sentinel 2B satellite images to obtain data on terrorist operations, and the images are processed, analyzed, and classified in ArcMap V 10.4. Tools were used to analyze hot spots, cold spots, mean

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center, standard distance, mean feature, direction distance, and nearest neighbor average. Sentinel-2b Level-1c multispectral data obtained via the Explorer of the Earth (EE) user interface, which is kept up to date by the US Geological Survey, is the dataset examined in this work (USGS). Sentinel-2B Level-1C Granule ID cloud free data product: S2B_MSIL1C_20220905T073619_N0400_R092_T38SMB _20220905T082541.SAF Eacquired on 5/9/2022 was selected for this study. Orthographic images in the UTM/WGS84 projection made up the 100 km2 tiles that make up the Level 1C product, as shown Fig 2.

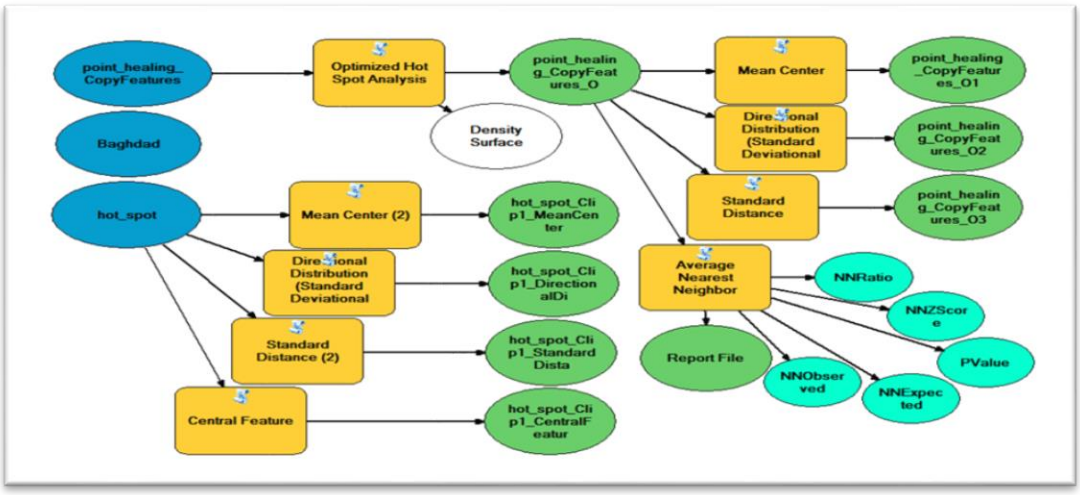

Figure (2). *Model builder in Arc map v10.4 Illustration Methodology and Material .*

4. DATA ACQUISITION

The Ministry of the Interior has been addressed to combat drugs. The data was obtained from the Narcotics Department, the Special Investigations Department, the Statistics Department, and the Narcotics and Psychotropic Substances Affairs Department (Al-Karkh / Al-Rusafa). As in the table (1), in which all data related to drug suspects are mentioned. This data contains the defendants' ages, occupations, and criminal classification Accused. The Sentinel 2B satellite image was downloaded from the USGS website.

Table (1). *Distribution and classification of persons accused of drug crimes in Baghdad governorate by gender, professions and age groups for the year 2022.*

Defendants by ages						Defendants by professions				Defendants by gender				Criminal classification of the accused				he total number of defendants	categories	ON
										Feminine		male							section	
and mor61	50 to 60	41 to 50	30 to 40	18 To 30	18 Less than	Gainer	Student	Soldier	officer	adult	minor	adult	minor	trade	abuse	promotion	Transfer			
0	0	6	31	45	1	68	0	12	3	3	1	79	0	8	65	10	0	83	Al-Karkh	1
0	2	23	44	69	4	119	0	18	5	1	2	137	2	15	127	0	0	142	Al-Rusafa	2

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Table (2). *Represent the location of the abusers and merchant in different areas in Baghdad governorate.*

ID	X	Y	Region	Neighborhood	Alley	House
1	44.400898	33.336494	Baghdad / struggle	Near Al Wathba Square /		
2	44.410013	33.339403	Baghdad	Check door		
3	44.389086	33.401555	Baghdad	The people / Sumer neighborhood		
4	44.449226	33.395578	Baghdad	M Al -Sadr / Sector 28 / near the Haider Al -Karar Mosque		
5	44.453931	33.39637	Baghdad	M, Al -Sadr, Sector 31 / opposite the Al -Hikma Mosque		
6	44.427673	33.399568	Baghdad / Ur District /	Umm Al -Kabar and deer / near the gas factory		
7	44.427578	33.399642	Baghdad / Ur neighborhood	Umm Al -Kabar and deer / near the gas factory		
8	44.488801	33.346131	Baghdad / municipalities	Agricultural / near the power station		
9	44.545394	33.378998	Baghdad/ Al -Batoul neighborhood	Near the power station		
10	44.452694	33.381347	Baghdad / m Sadr /	M. 21	15	6
11	44.460813	33.389889	Baghdad / Exploration Zone	Walid's control near		
12	44.381614	33.447108	Baghdad / Al – Thalabah	Six thousand region behind the fuel station		
TO 123						
123	44.4518711	33.3731166	Baghdad / m Sadr	S 12 / opposite the Al -Wahilat Market		
124	44.4886583	33.4016327	Baghdad / m Sadr	Tariq neighborhood / near liquidation water		

4.1 Sentinel-2B

The second Sentinel-2 generation satellite, Sentinel-2B, was launched by the European Space Agency on March 7, 2017, as part of the Copernicus space program. It is a European Earth imaging satellite. Compared to the 2015-launched Sentinel-2 satellite, its orbit will rotate in phases of 180°. This satellite is unique in that it has scientific tools that can scan a large area of the earth, resulting in high-resolution images thanks to multi-spectral imaging, which uses 13 spectral bands. Its goal is to scan the earth from different angles and to film every location on it once every five days so that researchers can track climatic and natural changes [24].

Figure (3). *It represents the image of the Sentinel 2B Earth observation satellite, with a high resolution of 10 meters (European Space Agency).*

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4.2.1. superior spatial resolution

Visible, near-infrared, and short-wave infrared wavelengths spectrum, the MSI captures optical imaging with exceptional spatial resolution from 13 bands (bands 2-4, band 8, at 10 meter; band 5-7, band 8A, band 11, band 12, at 20 meter; band 1, band 9, and band 10, at 60 meter) [25]. The target size is taken into consideration when doing the field calibration, which uses bands 2, 3, 4, and 8 with a resolution of 10m. Figure 4 demonstrates the spectral response function of Sentinel-2B/four MSI bands.

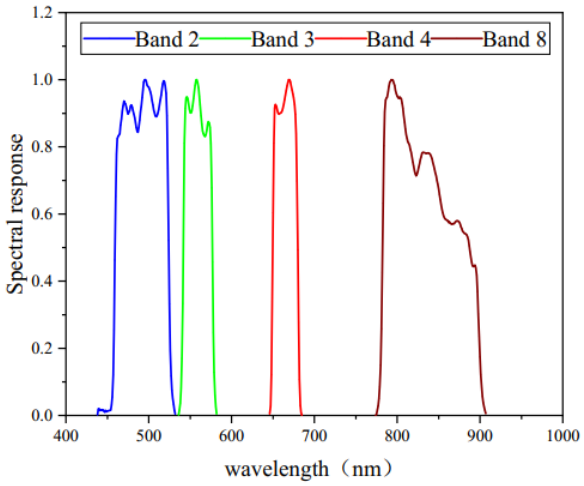

Figure (4). *The ship's Multispectral Instrument (MSI) Sentinel-2B satellite has a spectral response function [26].*

4.2.2. Kinds Of Drugs

There are different types of drugs that have spread recently in Iraq, especially in the Baghdad governorate. These types have different effects on people, so that each type of type has a different effect from the other type. Crystal anesthetic, there are more than fourteen types of anesthesia Captagon (zero and one), Opium (morphine, pethidine, heroin, antidote), Hemp (Panko, Hashish, Marijuana), Cough syrups that contain codeine, Tramadol, Artin, Kemadrine, Benzodiazepam (Valium, Xanax, Atvan, Rivotril), hallucinogens (thinner, cicotin, benzene), sumadril, cocaine, khat, Alcohol of all kinds, Multiple materials. These types have spread widely in recent years in Iraq, especially the Baghdad governorate, which led to an increase in drug users and an increase in organized crime in these areas, which witnessed large and frightening numbers of drug users [27].

5. THE SPREAD OF DRUGS IN IRAQ

Drug offenses and drug trafficking are considered to be major criminal offenses and part of "organized crime". The majority of the time, drug trafficking takes the shape of a network or syndicate, making it impossible for drug traffickers to act alone. Because of this, this crime is referred to as organized crime, and it originates with the makers, dealers, brokers, and users. More than 80% of working and street youngsters, according to the majority of the key informants, use drugs. They felt that alcohol use and the use of narcotics like crystal, opium, cannabis, and pills start young, usually around the ages of 10 or 11, and are highly prevalent among working and street children. Additionally, they thought that using drugs, particularly crystal, and even drinking alcohol were linked to violent behaviors, raised libidos, and decreased sexual inhibition. Children who participated in the discussion groups said they were familiar with addiction and drug use and frequently saw people using crystal and injection drugs in public spaces and on the streets. They discussed how some kids were getting drugs for their families, other addicts, or occasionally even getting advice from dealers to start selling drugs themselves [28].

6. RESULTS AND DISCUSSIONS

Data was used users and dealers in Baghdad Governorate, which contains drug users and dealers, their locations, ages and genders. Using remote sensing technology, geographic information systems, Sentinel 2B satellite image, and using the Global Positioning System (GPS), their gathering places were identified and classified into dense aggregation centers and less aggregation areas, and their angle of spread was determined.

6.1 Results

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Figure(5). *Illustration, (a)is represent the distribution of the number of people drug Addiction and classify them into hotspot and cold spot. (b) represent the hotspot. (c) represent cold spot.(d) represent distribution of merchant*

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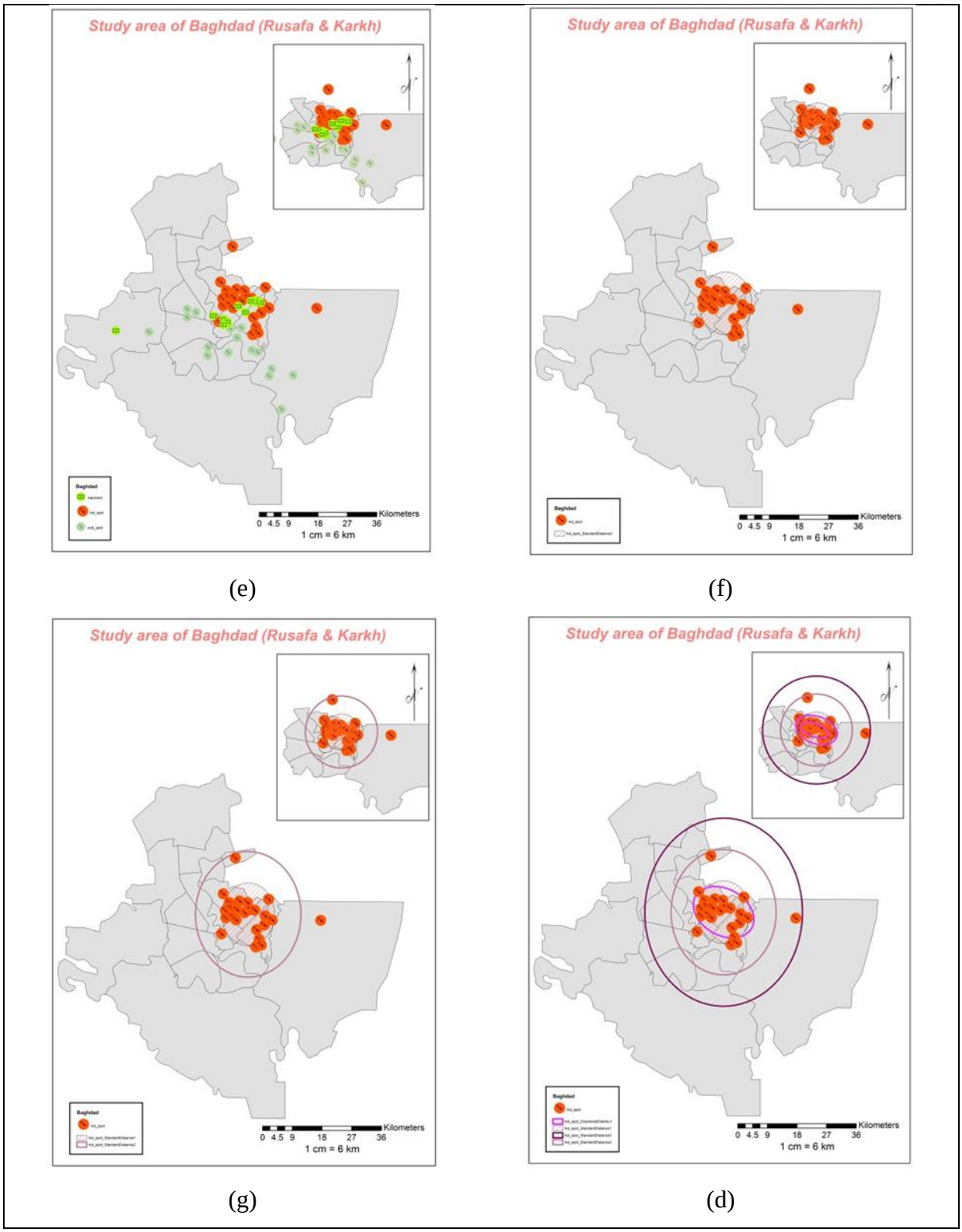

Figure (6). *Illustration, (e) represent distribution of merchant with abusers. (f) represent the standard distance(1) of the hot spot of abusers.(g) represent the standard distance(2) of the hot spot of abusers. (h) represent the standard distance(3) of the hot spot of abusers.*

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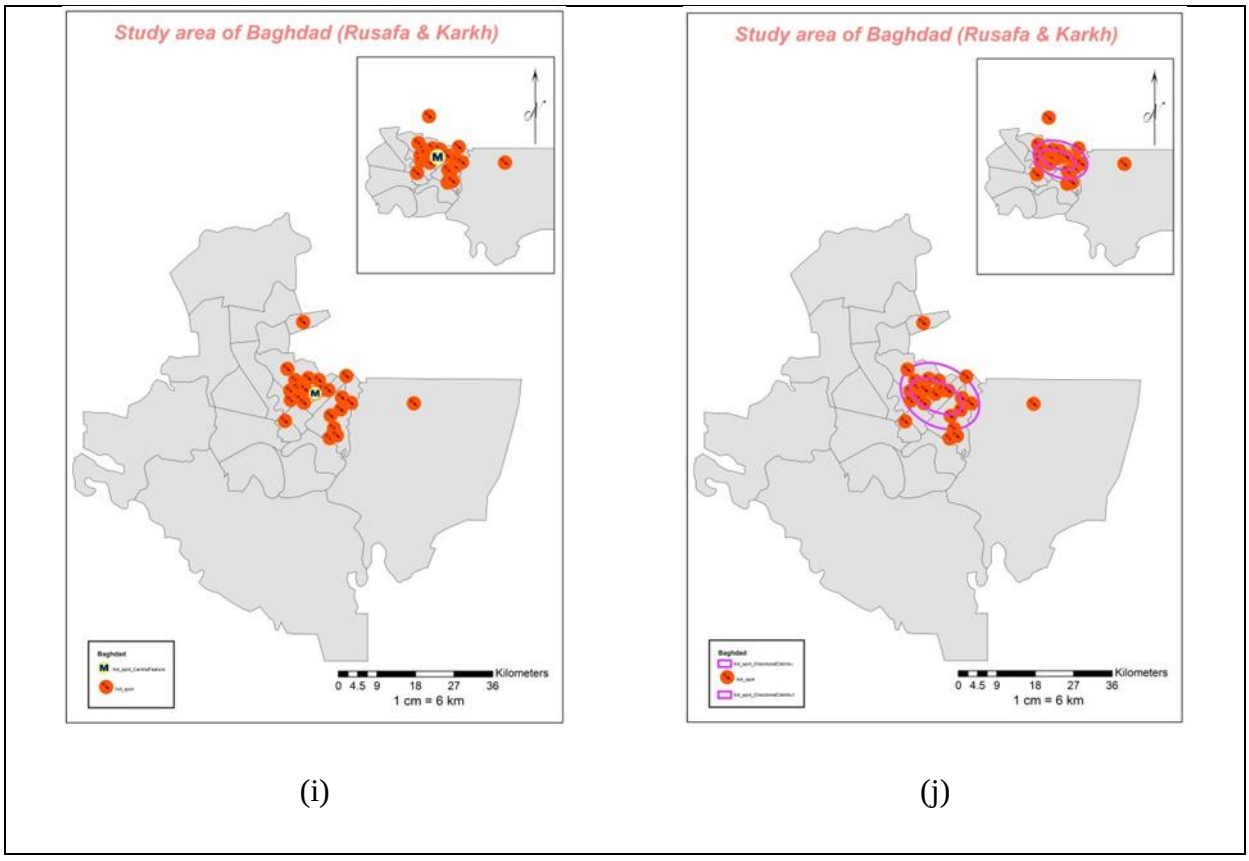

(i) (j)

Figure (7). *(i) represent mean center feature. (j) represent the direction distribution of the hotspot.*

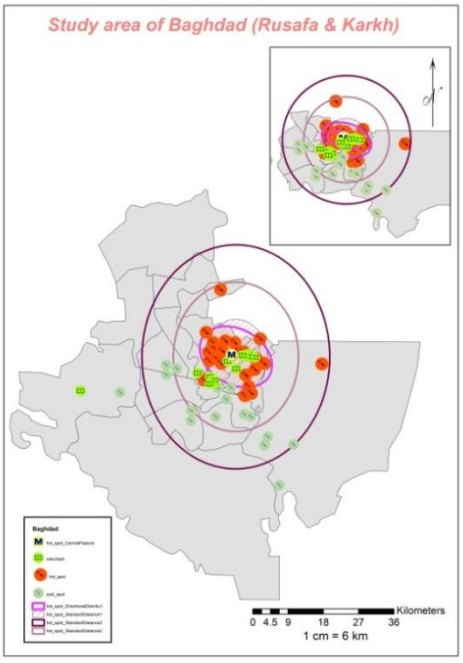

Figure (8). *Represent the tools available in the analysis of organized crime represent drugs and the wide extent of their spread, as well as the direction taken by drug users from one region to another.*

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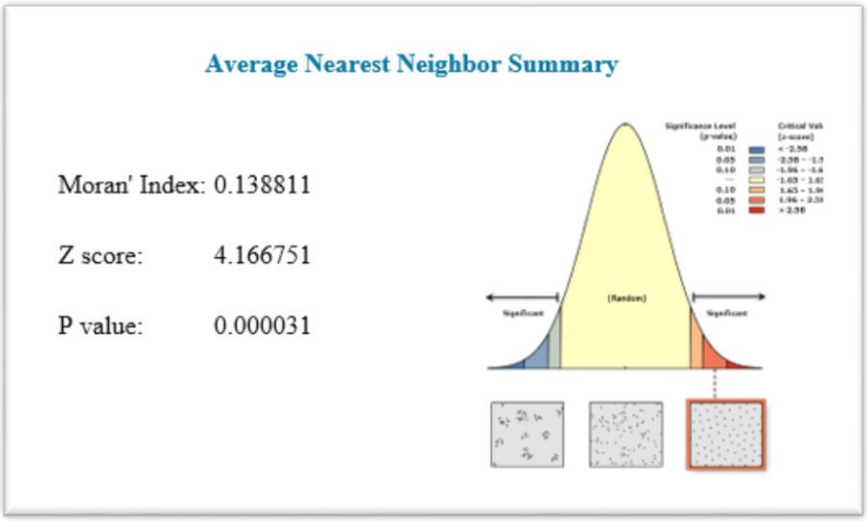

Figure (9).*Summary of the measured average distance, predicted mean distance, and nearest neighbor ratio neighbors is called the average nearest neighbor.*

With a z-score of 2.07399464372, the probability that this distributed pattern is the result of chance is less than 5%.

Table (3). *Represent the average nearest neighbor summary and dataset information .*

Observed mean distance	3243.1570 meters
Expected mean distance	2655.5072meters
Nearest neighbor ratio	1.221295
z-score	2.073995
p-value	0.038080

Table (4). *General description of the type of influential distribution according to numerical statistics.*

Input feature class	Hot–spot
Distance method	Euclidean
Study area	676964983.729775
Selection set	Fuls

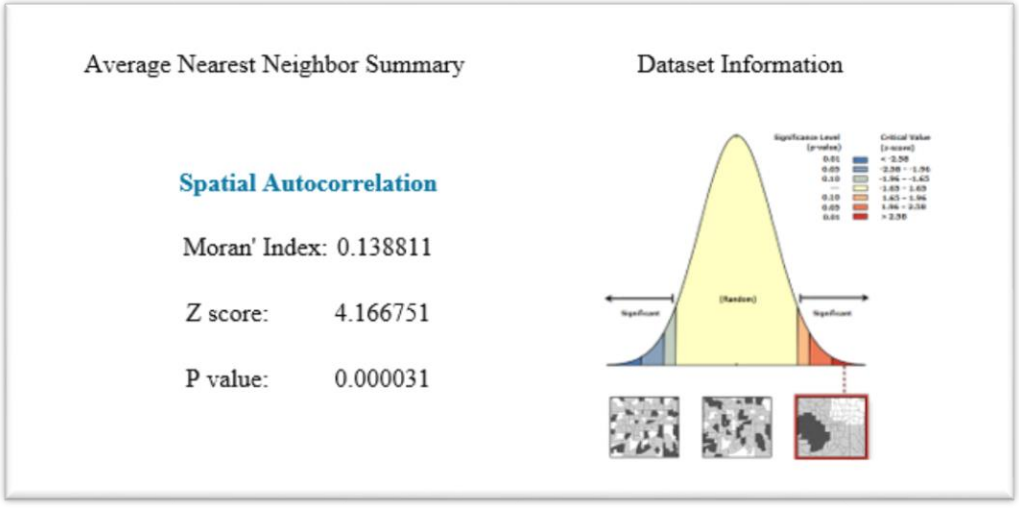

Figure (10). *Represent the Spatial Autocorrelation for feature Hot Spot.*

** With a z-score of 4.16675139925, the probability that this clustered pattern is the result of chance is less than 1%.*

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6.2. Discussions

a) The number of drug abusers and dealers was reached during the month of 10 for the year 2022, and their total number is 225 between the drug abuser and the dealer, and for both sides, Karkh and Rusafa, where the number for the Karkh side was 83, and for the Rusafa side, 142, the total number of accused.

b) These numbers were classified into two parts, the first part is the abuse department (Al-Karkh 65 and Al-Rusafa 127) and the second part is the trading department (Al-Karkh 8 and Al-Rusafa 15). These numbers included different ages, both sexes, and different professions.

c) Al-Rusafa areas witnessed the most prevalent side for drug dealers and drug users, as the Sadr City region witnessed the largest share of the number of drug users, followed by Al-Shaab, Al-Kifah, Al-Fadl, Al-Obeidi, Al-Amin, New Baghdad, municipalities, slum areas, and bypassing hotbeds for the spread of drugs and psychotropic substances. Hamidiyah hotbeds of drug abuse.

d) The areas of Al-Mansour, Al-Kadhimiya, Al-Adhamiya, Al-Amel neighborhood, Al-Shula, Al-Hurriya, Al-Salihiya, and other areas, including slums, and Al-Taqfiyah, are considered a wasteland for the spread of drugs and psychotropic substances on the Karkh side.

7. CONCLUSIONS

Through the data obtained from the Ministry of Interior, the Narcotics Department (Statistics), the Narcotics and Psychotropic Substances Affairs Department (Al-Karkh / Al-Rusafa) , and the Special Investigations Department within the Ministry. Like other social issues, drug abuse and addiction are caused by a variety of significant and influencing societal factors that differ from community to community and from person to person, The study concluded the following:

a) The highest distribution of drug abusers and promoters was in the right side of Baghdad, which is Al-Rusafa.

b) It became clear from the nature of the area that it is a high residential activity characterized by regular and irregular spaces, and the majority of low income.

c) The transportation network played a significant part in the movement of drug dealers, including the secondary and main roads.

d) Through the information of Table No. 2, it became clear that most of the drug users are from all age groups from 18-60 years, and the age group of 18-30 years was the highest in the Rusafa side.

e) With regard to professions, Gainer's profession was the highest, and 119 cases were on the Rusafa side.

f) As for gender, the category of males had the highest percentage, which is 137 adults in the Rusafa side, more than the Karkh side, which is 79 adults.

g) Through these statistics, we conclude that the low social status played a role in the spread of drug abusers and promoters, as well as the population density also played a major role as well.

h) Lack of monitoring by law enforcement agencies and lack of experience had a major role in spreading the phenomenon.

Recommendations

a) Tightening up oversight of pharmacies and retail establishments to stop the spread of drugs and chemical precursors to narcotics.

b) Establishing a network of institutions and research hubs to explore issues like violence, addiction, and mental illness that pose a danger to economic stability.

c) Coordinating and collaborating with Iraqi universities to assess the severity of drug addiction using sociology and therapy.

d) Having officers with experience in drug control conduct instructional seminars on the issue of drug dissemination in schools, institutes, and universities.

e) Using gadgets and drug-sniffing dogs to assist border crossings and controls.

f) Establishing a Care hospital for people who have been accused of drug addiction and putting them through a thorough reformation process.

g) To coordinate efforts to combat drug trafficking, the Anti-Narcotics Directorate, the Intelligence Agency, and the National Security Agency formed an operations room.

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