A Service District Analysis on Health Care Facilities in a Local City of Korea

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ABSTRACT:

This study analyzed the medical service levels of pediatrics, gynecology, and oriental clinic in Jeju-si, which is a local city of Korea. As a result of the density analysis and the nearest neighbor analysis, it was found that all three medical treatments showed the clustered aspects and the deviation of areas was severe because medical facilities were concentrated in the commercial centers. In addition, it analyzed LQ coefficient in consideration of population number and doctor number in different districts (dongs) to conduct a level analysis of medical services in dongs. Therefore, the level analysis of medical services can provide crucial data for setting up measures to solve the regional deviation of medical services which occurs in small and medium-sized cities in South Korea.

1. Research Background and Purpose

The market size of the Korea Health Industry (2009) reached 143.9 trillion won. Especially the medical service industry accounts for 51% of the entire market with 73.7 trillion won (Kim,2011). Generally, the accessibility to medical services brought about the accessibility to medical services, convenience, continuity, and the increase in satisfaction, leading to the improvement in the equity and function of medical services (Myers, 1969; Andersen et al,1981). In the case of medical services in Korea, the gap of areas was significant in the spatial distribution and the gap between economic center and surrounding areas was great (Lee, 1998). Jinju-si is a local city of approximately 34 million people in population and most medical service facilities in this city are concentrated in commercial centers. In particular, in case of pediatrics, gynecology, and oriental clinic, the distribution of the age group that uses services should be considered in location factors because there is a particular age group to use the particular medical facilities such as pediatrics, gynecology, and oriental clinic.

This study analyzed the spatial distribution of medical facilities in Jinju-si to reduce the gap of areas by identifying vulnerable areas and concentration areas and the sphere of medical service was analyzed for the purpose of providing the equal medical services.

2.Research Scope

The temporal scope of this study was on a basis of 2013 data and the spatial scope was confined to the medical service facilities of 16dongs targeting Jinju-si, located in the southern province of South Korea. Among several fields of medical treatment, the zones of age group were set with the targets of pediatrics, gynecology, and oriental clinics in which accessibility is considered important. The standard of age zone was between 0~20 based on the medical standard law, and the age zone of women of childbearing age was set between ages 18~49 in gynecology.
According to the survey on the use of oriental medical clinics and oriental medicine consumption, over 90% of elderly people over 65 in their age preferred oriental medical clinic. Therefore, on a basis of the survey on the actual condition (Jo et al., 2011), the age group of elderly people over 65 was selected for the research.

3. Analysis Theory of Medical Service

To identify the actual distribution condition and distribution characteristics of medical facilities, it utilized the analysis of the spatial pattern of data among the GIS analysis techniques. In this study, the medical facilities of Jinju-si were visualized by expressing pediatrics, gynecology, and oriental clinic with points in Jinju-si based on the geological information, acquired through the Open API. The density analysis was conducted to show the relationships between the numbers of medical facilities and the numbers of the population, and the nearest neighbor analysis was conducted to analyze the presence and absence of the spatial clustering of medical facilities. In addition, to analyze the population density, blind spot areas in services were extracted by conducting a comparative analysis of medical service levels according to districts(dongs) of Jinju-si, which were identified by the locality or zone coefficient of areas, where those who belong to particular age groups in using pediatrics, gynecology, and oriental clinics were

highly distributed by classifying population of 16 dongs in Jinju-si based on the data of 2013 population statistics presented by Jinju-si.

4.The Result Analysis

4.1 The Actual Condition of the Distribution of the Medical Facilities in Jinju-si

Jinju-si is a small and medium-sized local city, which holds an area of 4.692㎢ (areas called myeon are excluded) (Fig.1). Fig.2 is the current administrative districts (dongs). A total of 21 pediatrics, a total of 18 gynecologies, and 74 oriental clinics were distributed. To identify the effect of the particular age group on the location distribution of medical services, the population of particular groups according to dongs was investigated. While the particular age group of children and youth accounted for 15% and 12% of the total population in Pyeonggeo-dong and Cheonjeon-dong respectively, the particular age group of women of childbearing age accounted for 13% and 12% in Pyeonggeo-dong and Cheonjeon-dong respectively. The particular age group of elderly people ages over 65 accounted for 17% and 10% in Cheonjeon-dong and Jungang-dong respectively.

Figure 1. Location of Jinju, Korea   Figure 2. Administrative district (dong) in Jinju-si

4.2 The Distribution Characteristics of Medical Facilities in Jinju-si

The Kernel density analysis was conducted to examine the distribution characteristics of medical facilities. This study set up a 500m radius of the Kernel density. As a result, pediatrics were concentrated in Jungang-dong, which is a commercial center, and Shinan-dong, which is a residential area. The population of children and youth was the highest in Cheonjeon-dong (8,025) and Pyeonggeo-dong(9,462) (Fig.3). There was a difference in the high location area of pediatrics and residential area of the actual age group in using medical services.

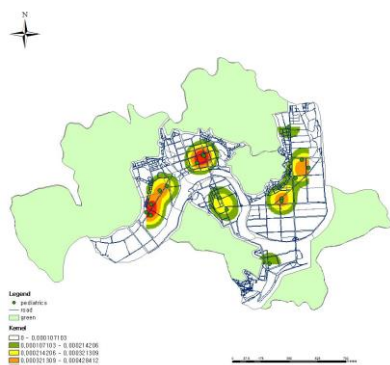

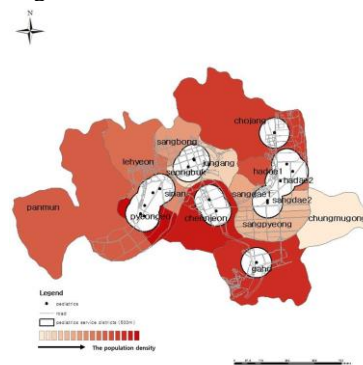Figure 2. Density analysis of pediatrics   Figure 3. The Population density of
                                                    the youth and service districts

While the hot spots of gynecology were shown in a commercial area (Jungang-dong) and residential area (Shinan-dong), and the highest population of women of the childbearing age resided in Cheonjeon-dong (7,596) and Pyeonggeo-dong (7,972) (Fig. 4.5). In addition, districts (dongs) which have no medical facilities accounted for 41%, so that women of childbearing age (18,450) had to go other districts by using transportation to receive medical services.
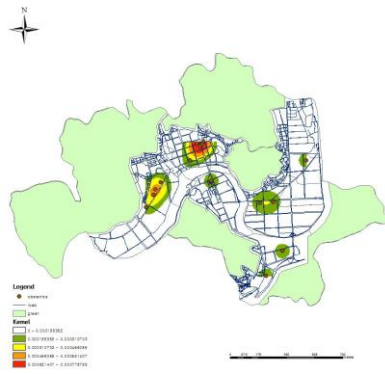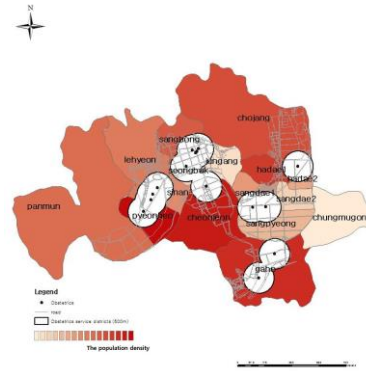
Figure 4. Density analysis of gynecology

Figure 5. The Population density of women in their childbearing age and service districts

Meanwhile, oriental medical clinics were far more distributed than other clinics as many as 27% of the entire medical facilities in Jinju-si. As shown in Fig.6, oriental medical clinics were the highest in distribution in Jungang-dong, which is a commercial area. As shown in Fig. 7, the elderly population over 65 in their age was the highest in Cheonjeon-dong(4,791) and Jungang-dong(3,021). The density of elderly population over 65 and the actual locations of oriental clinics were not consistent like the cases of pediatrics and gynecology.
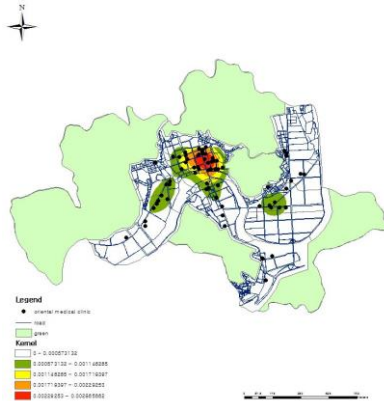

Figure 6. Density analysis of oriental medical clinic
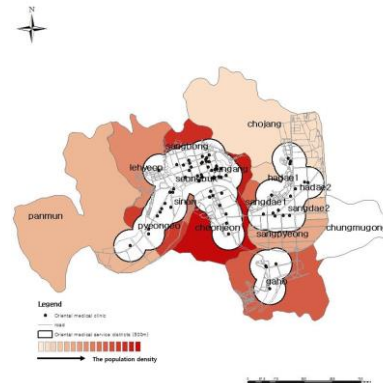

Figure 7. The Population density of elderly people ages over 65 and service sphere

The presence and absence of clustering in medical facilities were visualized through the density analysis. For a better research, the distribution pattern of medical facilities was analyzed by applying the nearest neighbor analysis. As the nearest neighbor index R was smaller than 1, the clustering became larger, showing 0.54, in gynecology 0.47 in pediatrics, and 0.38 in oriental medical clinics. This demonstrates that clustering became bigger in the sequence of oriental medical clinics > pediatrics > gynecology. To identify the blind spots of medical facilities, the service districts of medical facilities based on the population density were identified. The service sphere of medical institutions was set on a basis of the facility standards, according to living spaces presented by Hwang (1996) and Yang (1985). Most pediatrics and gynecologies were the primary medical institutions, which are subject to the required treatments, so that the scope was set with the standard of 500m. Even though oriental clinics belong to non-required treatment subjects, the sphere of these clinics were set within the range of 500m in view of the accessibility of elderly people over 65 in their age. The study results show that districts (dongs)without medical facilities at all were 7, although pediatrics were located in a highly populated area in the population density (Fig.3). While gynecologies were highly located in Seongbuk-dong, which was low in the population density of women of childbearing age, only one gynecology was located in Cheonjeon-dong where the population of women of childbearing age was the highest (Fig.5). In the case of oriental medical clinics, the blind spots appeared lower compared to gynecology and pediatrics due to the large volume of medical facilities, but oriental medical clinics were highly distributed in Seongbuk-dong, Hadae 1dong, and Chochang-dong, which were the least in the density of elderly population (Fig.7).

4.3 The Level Analysis of Medical Services according to Dongs in Jinju-si

The accessibility was analyzed based on the location of medical facilities in the density analysis and the nearest neighbor analysis. However, the services according to dongs cannot be compared objectively. Accordingly, to identify how much medical services according to dongs are provided, LQ coefficient was analyzed. The formula (1) in this is as follows:

$$LQ_a = \frac{Q_{ab}}{Q_b} \Big/ \frac{Q_{cd}}{Q_d} \qquad (1)$$

In this, Q_{ab}: Number of doctors according to treatment parts in each dong Q_b: Number of total doctors according to dongs Q_{cd}: Number of doctors according to treatment parts in Jinju-si

Q_d: Number of doctors in Jinju-si\

Table 1. LQ Values by Dong in JinJu

Dong-name	Oriental medical clinic	Pediatrics	Obstetrics	Dong-name	Oriental medical clinic	Pediatrics	Obstetrics
Cheonjeon	0.39	0.81	0.67	Sangpyeong	0	0.00	0.00
Seongbuk	0.23	0.00	0.18	Chojang	0.1	0.07	0.00
Jungang	0.77	0.07	0.24	Pyeongeo	0.08	0.47	0.43
Sangbong	0.03	0.00	0.00	Sinan	0.21	0.41	0.43
Sangdae1	0.13	0.00	0.12	Iehyeon	0.08	0.00	0.00
Sangdae2	0	0.07	0.00	Panmun	0.05	0.00	0.00
Hadae1	0.15	0.27	0.06	Gaho	0.05	0.14	0.24
Hadae2	0	0.07	0.00	Chungmugong	0.1	0.00	0.00

As shown in Table 1, pediatrics were the highest in Cheonjeon-dong with 0.81, which was followed by Pyeonggeo-dong and Shinan-dong in the second and third place with 0.47 and 0.41 respectively. The service levels of other dongs were very low (Fig. 8). In the case of gynecology, Cheonjeon-dong was the highest with 0.67 and Pyeonggeo-dong was ranked second with 0.43 (Fig. 9).

In the case of pediatrics and gynecology, there were differences in hot spots and LQ value, drawn through the density analysis. The facilities of pediatrics were 4 (in number) in Hadae 1dong and 4 (in number) in Shinan-dong, which are residential areas, but LQ value under the standard of the number of doctors in Cheonjeon-dong, which is a residential area, was high. Since gynecologies were condensed in Jungang-dong, which is a commercial center, they have the value of high density. However, the LQ value on a basis of the number of doctors was the highest in the service level of Cheonjeon-dong. The service level of Oriental medical clinics was the highest in Jungang-dong, which is a commercial center with 0.77, which was followed by Cheonjeon-dong (0.39), and the service level of other districts(dongs) was very low(Fig. 10).
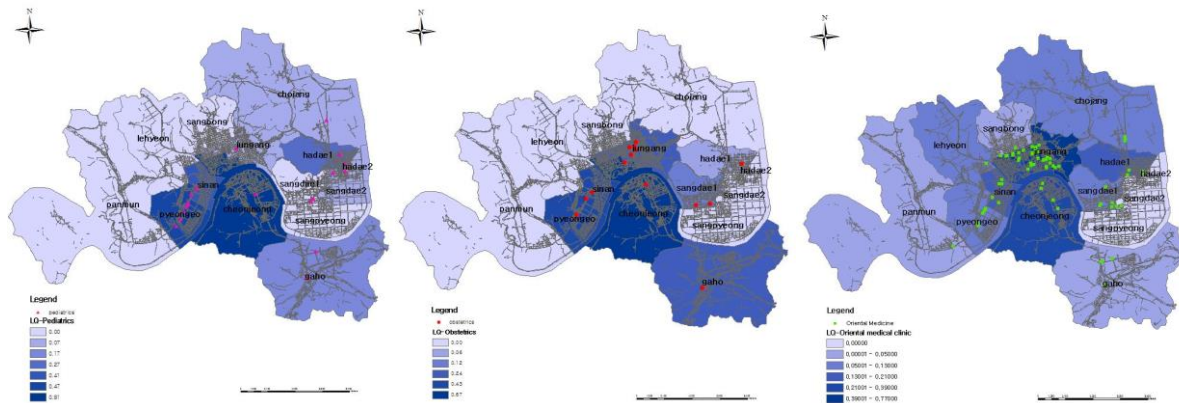
Figure 8. LQ values of pediatrics   Figure 9. LQ values of gynecology   Figure 10.LQ values of oriental medical clinic

5.Conclusion

The study results of the service levels in medical services obtained through analyzing the actual condition and the spatial distribution of medical facilities with the target of Jinju-si, Gyeongsangnam-do are as follows:

First, there were a total of 21pediatrics, a total of 17 gynecologies, and a total of 74 oriental medical clinics in Junju-si. The results of the density analysis and the nearest neighbor analysis illuminate that these three clinic divisions showed the clustered aspects, revealing that there was a severe deviation of areas because medical facilities were condensed in a commercial center. In addition, the analysis results of service sphere based on the population density, pediatrics were located in the areas which were comparatively high in population density, and gynecologies were concentrated in a commercial area regardless of population density. However, despite the large number of oriental hospitals, there were a lot of blind spots in oriental medical clinics found.

Second, to analyze the levels of medical services according to districts (dongs), LQ coefficient was analyzed in view of the number of dongs and the number of doctors. As a result, the qualitative levels of medical services, which were not seen in the density analysis and the nearest index analysis, could be evaluated. Accordingly, this study will provide essential data for setting up the measures to solve the regional deviation of medical services, which have occurred in small and medium-sized local cities by analyzing the density and accessibility to medical facilities and evaluating the qualitative levels of medical services by using LQ coefficient.

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