# Chapter 5 - Incidence

# حالات الزرع الجديدة

The number of incident kidney transplant patients in Iraq was ascertained separately from the registry records due to inconsistency in reporting transplant dates. The registry field team independently contacted transplant patients with data entered into the registry in 2018 and 2019 to confirm the date of their procedure. Only data from confirmed patients were included in incidence calculations; hence, incidence data presented in this chapter is only preliminary. However, we suggest that data for this cohort is quite representative of Iraq's total incident cohort since it constitutes 40-50% of that total. Over the two-year period, there were 407 verified incident kidney transplant patients, averaged to 203.5 per year.

***Obstacles to determining national incidence***

1. The surgery is generally performed in main city hospitals, after which patients return to their home province where they receive their immunosuppressive medications. Some transplant centers entered registry records for all patients who had transplant surgery there, regardless whether their follow up was at their center or elsewhere; while other transplant centers entered registry records only for transplanted patients who had their follow up at the same center.

2. The registry modules for donor-recipient organ matching and surgery parameters were largely under-reported. As a result, patient records were obtained at the site where they received the government sponsored medications post-surgery.

3. More than half of transplant surgeries are performed in the Kurdistan region hospitals in Erbil, Sulaymaneya, and Duhok; where registry reporting faced difficulties and did not exceed 40% of expected patient numbers.

The ascertainment of incidence data was complete for 9 of Iraq's 18 provinces, while only partial incidence was available for Baghdad, Nineweh, Erbil and Duhok, and no incidence data could be obtained for Al-Anbar, Kirkuk, Thiqar, Salaheddeen, and Sulaymaneya. Thus, national incidence could not be accurately determined. However, incidence rates for provinces with complete IRTR records could be ascertained. These provinces, which represent about 40% of the national population, had an incident rate of 7.5 per million population. Table 10 reports national incidence data by province. Incidence rates are only reported for provinces with

*Table 10 - Iraqi national verified incidence data by provinces.*

| Province | Estimated Population | Incident Patients (2018-19) | 1-Year Incidence | Incidence Rate (per million) |
|---|---|---|---|---|
| VERIFIED COMPLETE INCIDENCE DATA | | | | |
| Diyala* | 1,709,825 | 38 | 19 | 11.1 |
| Najaf | 1,545,022 | 20 | 10 | 6.5 |
| Diwaneya | 1,350,349 | 5 | 2.5 | 1.9 |
| Babil | 2,155,821 | 69 | 34.5 | 16.0 |
| Karbala | 1,278,248 | 24 | 12 | 9.4 |
| Wassit | 1,443,051 | 3 | 1.5 | 1.0 |
| Basra | 3,061,204 | 44 | 22 | 7.2 |
| Maysan | 1,168,037 | 8 | 4 | 3.4 |
| Al Muthanna | 848,732 | 8 | 4 | 4.7 |
| Total Completed | 14,560,290 | 219 | 109.5 | 7.5 |
| VERIFIED PARTIAL INCIDENCE DATA | | | | |
| Baghdad | 8,567,663 | 150 | 75 | N/A |
| Nineweh | 3,906,846 | 22 | 11 | N/A |
| Erbil | 1,952,908 | 3 | 1.5 | N/A |
| Duhok | 1,357,560 | 13 | 6.5 | N/A |
| Total Partial | 15,784,977 | 188 | 94 | N/A |
| NO INCIDENCE DATA | | | | |
| Thiqar | 2,195,992 | N/A | N/A | N/A |
| Sulaymaneya | 2,278,393 | N/A | N/A | N/A |
| Kirkuk* | 1,674,804 | N/A | N/A | N/A |
| Salaheddeen* | 1,663,474 | N/A | N/A | N/A |
| Al-Anbar | 1,607,853 | N/A | N/A | N/A |
| Total No Data | 9,420,516 | N/A | N/A | N/A |

As with Iraq's prevalence rate, incidence reporting varied greatly by province. Among provinces with completed registry data, incidence rates ranged between 1.0/1,000,000 in Wassit province to 16.0/1,000,000 in Babil province.

Among the provinces with partial data, the most incident cases were reported in Baghdad. However, total incidence or an incidence rate were difficult to determine. For one, there are private hospitals in Baghdad that did not participate in the IRTR, potentially contributing to underreporting. Further, the Specialty Surgery hospital excluded over 160 incident cases from reporting because the patients did not have their follow up visit on site. Without further investigation, it cannot be determined if these patients were residents of Baghdad or other provinces.

***Projected Incidence***

Projections of expected incidence were made to estimate national incidence based on available data. Incidence projections were made utilizing national prevalence, incidence, and population data. These projections rely on the use of an "incidence multiplier", which calculates the quotient of provincial prevalence rates and the national average. The incidence multiplier was determined utilizing the following formula:

$$\text{Incidence Multiplier} = \frac{\text{Provincial Prevalence Rate}}{\text{119.2/1,000,000 (the National Prevalence Rate)}}$$

Prevalence rates were used with the rationale that prevalence is more stable and consistent than incidence. Prevalence rates should be somewhat reflected by incidence rates, such that provinces with higher prevalence rates are likely to have higher incidence rates, while the opposite is likely true for provinces with lower prevalence rates. In instances where provincial prevalence data was unavailable, the national prevalence rate was used as a dummy variable.

A projected incidence rate was calculated using the product of the incidence multiplier and the average incident rate for provinces with complete incidence data. The formula for this calculation is

as follows:

| Expected Incidence Rate | = | Incidence Multiplier | x | Average Incidence Rate of Provinces with Complete Data |
|---|---|---|---|---|

As an example, here is the calculation for the expected incidence rate of Baghdad:

| 9.7/1,000,000 | = | 1.39 | x | 7.5/1,000,000 |
|---|---|---|---|---|

An expected 1-year incidence was also calculated by multiplying the expected incidence rate for a province by its total population.

| Expected 1-year Incidence | = | Expected Incidence Rate | x | Provincial Population Estimates |
|---|---|---|---|---|

Using the example of Baghdad once again, the expected 1-year incidence was 89.3:

| 89.3 | = | 9.7/1,000,000 | x | 8,567,663 |
|---|---|---|---|---|

The reported 1-year incidence in Baghdad of 75 cases was about 16% below the expected incidence for the province, suggesting that there may be an underreporting of recent cases. Table 11 (on the following page) contains calculations of expected incidence and incidence rates for each province. The projected annual incidence number was 154 cases higher than reported to the registry, or 357 annual cases. This number translates to a projected national incidence rate of 9/1,000,000.

Utilizing projected incidence rates, provinces with the greatest declines in incidence compared to provincial prevalence data were found in Wassit, Najaf, and Maysan provinces. These provinces' reported incidence rates that were below projected incidence rates by 1.8/1,000,000, 2.3/1,000,000, and 4.3/1,000,000, respectively. Meanwhile, both Diyala and Babil provinces had significantly higher incidence rates than would be expected based on their prevalence data, with Diyala outpacing its projections by 5.3 incident patients per million population and Babil doing so by 8.9 cases per million.

*Table 11 - Projected expected incidence by province.*

| Province | Reported 1-Year Incidence | Incidence Rate (per million) | Prevalence Multiplier | Expected 1-Year Incidence | Expected Incidence Rate (per million) | Incidence Rate Differential |
|---|---|---|---|---|---|---|
| Wassit | 1.5 | 1.0 | 0.76 | 8.2 | 5.7 | -4.7 |
| Najaf | 10 | 6.5 | 1.25 | 14.5 | 9.4 | -2.9 |
| Maysan | 4 | 3.4 | 0.74 | 6.5 | 5.5 | -2.1 |
| Al-Qadisiyyah | 2.5 | 1.9 | 0.40 | 4.1 | 3.0 | -1.1 |
| Al Muthanna | 4 | 4.7 | 0.77 | 4.9 | 5.8 | -1.1 |
| Karbala | 12 | 9.4 | 1.16 | 11.1 | 8.7 | 0.7 |
| Basra | 22 | 7.2 | 0.81 | 18.5 | 6.0 | 1.2 |
| Diyala | 19 | 11.1 | 0.82 | 10.6 | 6.2 | 4.9 |
| Babil | 34.5 | 16 | 1.02 | 16.5 | 7.6 | 8.4 |
| Baghdad | 75 | N/A | 1.39 | 89.3 | 10.4 | N/A |
| Nineweh | 11 | N/A | 0.56 | 16.4 | 4.2 | N/A |
| Sulaymaneya | 0 | N/A | 2.23 | 38.1 | 16.7 | N/A |
| Erbil | 1.5 | N/A | 3.15 | 46.2 | 23.6 | N/A |
| Duhok | 6.5 | N/A | 2.85 | 29.0 | 21.4 | N/A |
| Al-Anbar | 0 | N/A | 1 | 12.1 | 7.5 | N/A |
| Kirkuk | 0 | N/A | 1 | 12.6 | 7.5 | N/A |
| Salaheddeen | 0 | N/A | 1 | 12.5 | 7.5 | N/A |
| Thiqar | 0 | N/A | 1 | 6.5 | 3.0 | N/A |
| All Iraq | 203.5 | N/A | 1 | 357.3 | 9.0 | N/A |

*This technique was used to fill missing incident data with projected numbers based on population numbers and prevalence. It should not be necessary in the next phase of the registry where primary emphasis will address accurate reporting of new surgeries and registry records for incident cohort patients.*

### *Gender*

Incidence data by gender was only available for transplant records confirmed by the registry, with results aggregated by region. Table 12 reports female kidney transplant incidence data for Iraqi regions with available data. There were 79 incident female transplant patients in all Iraqi regions excluding the North. The Baghdad region had the highest proportion of female incident patients

*Table 12 – Female kidney transplant incidence adjusted for national prevalence data.*

| Region | Estimated Population | 2018-19 Incidence | Female Incidence | Incident % Female | Incident Rate (Female) |
|---|---|---|---|---|---|
| Baghdad | 10,277,488 | 188 | 35 | 28.2 | 1.70 |
| Central | 7,772,492 | 121 | 30 | 24.8 | 1.93 |
| South | 7,273,965 | 60 | 14 | 23.3 | 0.96 |

(28.2%), while the Central region had the highest incident rate of female patients (1.93/1,000,000). Each region showed modest declines in the proportion of female patients compared to before 2018, with Baghdad (-0.4%), Central (-1.2%), and South (-1.0%) (data not presented in table).

### *National incidence reflection*

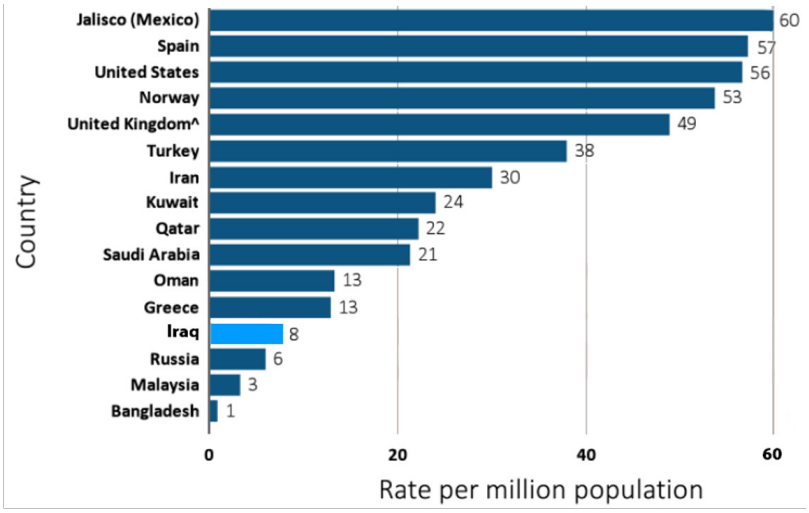
The incidence data included in this chapter has helped identify potential points of interest for Iraqi nephrologists and national health policymakers. Importantly, the data suggests that some provinces may be experiencing declining incidence while others have experienced a surge in cases. These data are worth investigating and should continue to be monitored in coming years. Similarly, data on female patient incidence suggests that patterns of a low female prevalence seen in national IRTR data have remained consistent in the last two years. These and other observations will be explored in greater detail in forthcoming chapters, which will focus on other aspects of MKTP patient characteristics and ESRD care.

### *International Comparisons*

According to data published in the 2016 USRDS Annual Report, Iraq has a transplant incidence rate below many regional countries.[1] Iraq's incidence rate of 7.5 per million (rounded to 8 in the figure below) was below that of Oman (13/1,000,000), Kuwait (24/1,000,000), Iran (30/1,000,000), and Turkey (38/1,000,000). Figure 6 (on the following page) offers an illustrated comparison of transplant rates found regionally and globally.

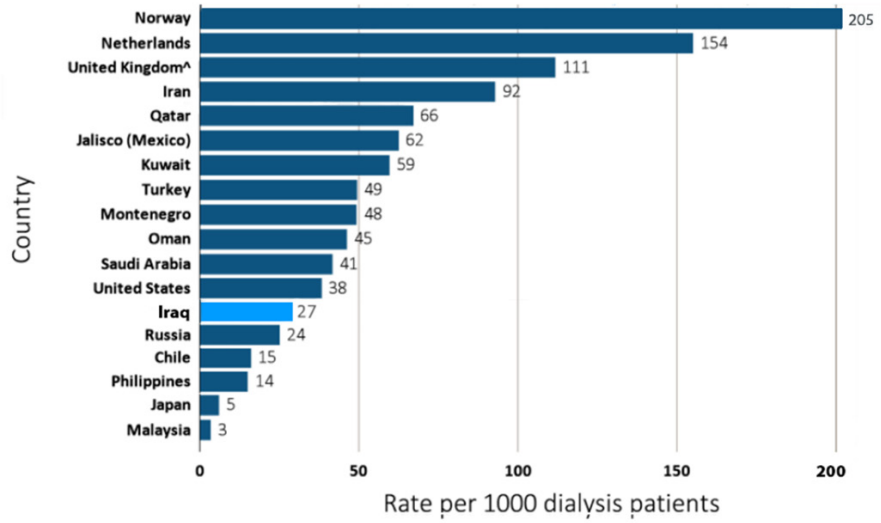
[1] United States Renal Data System (2016). USRDS annual data report: Epidemiology of kidney disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases: Bethesda, MD.

*Figure 6 – International comparison of incidence rate per million population.*[1]




Another indicator of incidence is the number of incident transplants per 1,000 dialysis patients. Using this indicator, Iraq reported 21 incident patients per 1,000 hemodialysis patients, which is relatively low compared to regional rates, such as those found in Iran (92/1,000), Qatar (66/1,000), and Kuwait (59/1,000). Figure 7 below compares Iraq's incidence to dialysis rate to regional and international rates.[3]

*Figure 7 – Rate of incident transplant patients per 1,000 dialysis patients.*




[2] Figure adapted from USRDS annual data report. All reported figures represent latest available data from 2016, excluding Iraq, which is updated to late 2019. Ibid.

[3] According to data from 2012, there are approximately ESRD 5,500 Iraqi dialysis patients. Ali, A. (2018). Renal services in Iraq: Editorial for the Iraqi New Medical Journal. Iraqi New Medical Journal. 4 (8), p. 82-83.

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