



**The Hashemite Kingdom of  
Jordan Ministry of Health**

**Non-Communicable Diseases  
Directorate**

**National Registry of End Stage**

**Renal Disease(ESRD)**

**15<sup>th</sup> Annual Report**

**2023**

## **FOREWORD**

Approximately six thousand people in the Hashemite Kingdom of Jordan receive some forms of dialysis, which provide renal replacement therapy for end-stage renal disease (ESRD). The national registry of End Stage Renal Disease, which was established in 2007, collects case record data from patients with end stage renal disease treated in hospitals, which will enable calculating the incidence and prevalence rates for terminal renal disease and mortality rate for each governorate. The regional data are pooled to get national statistics for end stage renal disease in order to adapt prevention of the main causes of renal failure.

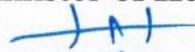
I am pleased to present to you the fifteenth edition of the annual report of End Stage Renal Disease (ESRD) in Jordan for the year 2023, issued by the Cardiovascular and Diabetes Surveillance Division. This report provides revised and updated data to support the development of evidence-based plans aimed at improving the quality of life for dialysis patients.

I hope that this report will assist health care providers, public health officers and NGOs in their work to prevent and control renal disease in Jordan.

On behalf of the National Registry of End Stage Renal Disease, I would like to acknowledge the tremendous contributions of all those who fulfilled this report. Sincere appreciation and gratitude are extended to the members of the working group at the Ministry of Health for their great efforts.

The Ministry of Health will continue to support the National Registry of End Stage Renal Disease with all available resources.

Thank you.

**Minister of Health**  
  
**Dr. Ibrahim Bdour**

## **ACKNOWLEDGMENT**

We acknowledge with deep appreciation and gratitude all people who helped make this report possible.

We would like to thank, IT department staff in MOH for their support and assistance in institutionalizing, development and solving technical problems for this program. We would like to thank all focal points in all renal dialysis centers, who contributed to the collection of renal data in the Kingdom for the timely collection and submission of ESRD patient's data.

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## **EXECUTIVE SUMMARY**

Chronic Kidney Disease (CKD) continues to pose a significant public health challenge worldwide, requiring early detection and effective management—especially by general practitioners. End-Stage Renal Disease (ESRD), the final stage of CKD, remains a critical concern due to its increasing prevalence. Comprehensive documentation of ESRD cases is essential to understand its burden and to design appropriate interventions.

In 2023, the total number of registered ESRD patients in Jordan reached 5,983, comprising 3,601 males (60%) and 2,382 females (40%), with a male-to-female ratio of 1.5:1 among this total 100 patients were on peritoneal dialysis and 5,883 were receiving hemodialysis. The majority (5,745 patients, 96%) were Jordanian nationals, while non-Jordanians accounted for 238 cases (4%), including Palestinians (130 patients, 2.2%), Syrians (100 patients, 1.7%), and other nationalities (0.1%).

In 2023, a total of 1,004 new End-Stage Renal Disease (ESRD) cases were reported in Jordan. Of these, 965 cases (96%) were among Jordanians and 39 cases (4%) were non-Jordanians. The cases included 371 females and 633 males, resulting in a male-to-female ratio of approximately 1.7:1. The mean age at diagnosis was 56 years. Based on the national population of 11,516,000, the overall weighted incidence rate was calculated at 8.71 per 100,000 population.

Jordan's healthcare system operates 86 hemodialysis units across various sectors: 48% (41 units) are private, 31% (27 units) governmental, 19% (16 units) military-affiliated, and 2% (2 units) university-affiliated. Geographically, the Middle region hosts the majority (57 units, 66%), followed by the North (17 units, 20%) and the South (12 units, 14%).

The leading causes of ESRD in Jordan reveal distinct patterns by etiology and sex. Hypertension (HTN) was the most common cause, accounting for 2,937 cases (49.7%), followed by Diabetes Mellitus (DM) with 1,341 cases (22.68%). Other causes included:

Glomerulonephritis – 368 cases (6.22%), Congenital and genetic conditions – 208 cases (3.52%), Polycystic kidney disease – 197 cases (3.33%), Vesicoureteral reflux – 100 cases (1.69%), Drug-induced nephropathy – 102 cases (1.72%), Infections – 75 cases (1.27%), Systemic Lupus Erythematosus (SLE) – 43 cases (0.73%), primarily affecting females, Other causes – 249 cases (4.21%), Unknown causes – 289 cases (4.89%).

These findings reaffirm hypertension and diabetes as the dominant contributors to ESRD, underscoring the urgent need for prevention and control strategies targeting non-communicable diseases (NCDs).

A total of 597 deaths related to End-Stage Renal Disease (ESRD) were reported across Jordan in 2023. Marked regional disparities were observed, with Amman accounting for the highest number of deaths (283 cases, 47%), followed by Irbid (116 cases, 19%) and Zarqa (68 cases, 11%). In contrast, certain governorates such as Tafeileh recorded minimal mortality, with only 2 reported deaths (0.3%).

## **INTRODUCTION**

The National Registry of End-Stage Renal Disease (ESRD) was established in 2007 under the Ministry of Health to systematically collect and manage data on patients with end stage renal disease “stage five”. The primary goal of the registry is to provide a comprehensive database that supports understanding the national burden of ESRD, facilitates healthcare planning, and informs policy decisions related to renal replacement therapy (RRT).

This report includes ESRD patients who have received RRT—including hemodialysis, peritoneal dialysis, or kidney transplantation—and have undergone at least **three consecutive months** of dialysis to distinguish chronic ESRD cases from acute kidney injury. The registry collects key data on patient demographics (age, gender, nationality, and governorate of residence), clinical characteristics (dialysis modality, start date of dialysis, ESRD Etiology, and comorbidities), laboratory screening results (hepatitis B, hepatitis C, HIV), and treatment updates such as modality changes, transplantation status, and mortality.

The information contained in this report aims to provide a clear picture of the ESRD situation in Jordan during 2023 and serve as a tool for monitoring trends, identifying gaps in care, and supporting evidence-based decision-making to improve patient outcomes.

## **METHODOLOGY**

The National Registry of End-Stage Renal Disease (ESRD) utilizes the Jordan Interactive Electronic Reporting System (JIERS), a centralized platform through which data are collected from all healthcare sectors providing Renal Replacement Therapy (RRT) services, including governmental, private, Royal medical services, and university-affiliated hospitals. Each participating facility designates a trained focal point responsible for data entry. These individuals are officially nominated by their institutions and receive structured training through national workshops to ensure accuracy and standardization of reporting.

### ➤ **Data Collection Methods**

Data were entered into JIERS through three structured electronic forms:

Dialysis Patient Registration Form – Captures demographic and clinical variables such as dialysis start date, insurance type, hepatitis and other viral screening results, comorbid conditions (e.g., hypertension, diabetes), and the primary cause of ESRD. The form is updated as needed to reflect changes in patient status, such as transplantation or a change in dialysis modality (e.g., from hemodialysis to peritoneal dialysis).

Mortality Form – Completed upon patient death, documenting cause and date of death.

Annual Dialysis Unit Form – Submitted once per year to document unit capacity, including total number of dialysis machines, reserved units, and isolation-designated machines.

To ensure that only chronic ESRD cases are included, patients are registered in the system only after completing at least three months of dialysis. Dialysis unit focal points can export aggregated data in Excel format to monitor completeness and validate patient lists.

### ➤ **Data Sources**

Data on hemodialysis and peritoneal dialysis were systematically collected from all healthcare sectors across the Kingdom including governmental, private, academic, and military hospitals through officially designated focal points within each sector, and in close coordination with the Ministry of Health, represented by the Directorate of Non-Communicable Diseases.

### ➤ **Statistical Analysis**

Descriptive statistical analysis was conducted using Microsoft Excel. Pivot tables were used to summarize and cross-tabulate variables such as age group, gender, nationality, governorate, dialysis modality, and etiology. Measures such as frequencies, percentages, means, and medians were used to describe patient characteristics and dialysis service trends across sectors and regions.

- **Data Management**

The ESRD registry captures all individuals residing in Jordan diagnosed with ESRD and undergoing RRT during the reporting period (January 1 – December 31, 2023). Cases not undergoing RRT or who died within 90 days of diagnosis were excluded to maintain clinical relevance.

- **Confidentiality**

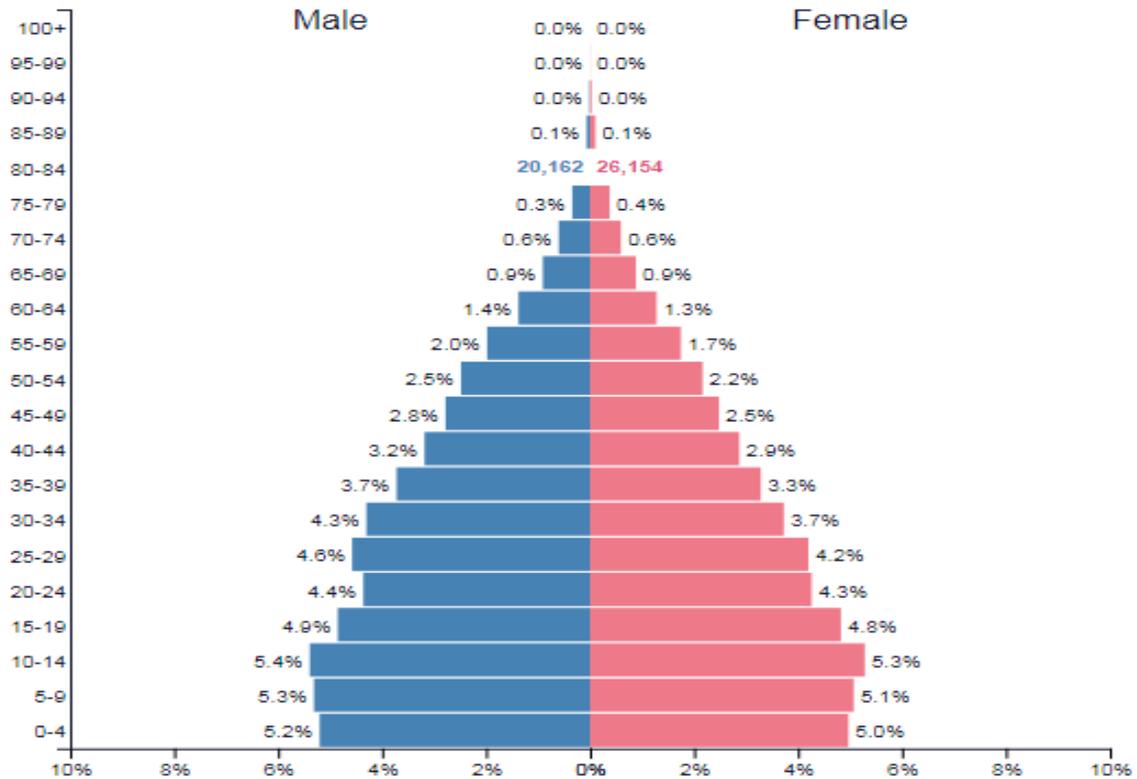
Patient confidentiality is safeguarded through secure, password-protected electronic systems; unique user credentials for data entry personnel; role-based access restricted to designated ESRD registry focal points; and formal approval processes for any external data requests. These measures ensure the integrity, security, and ethical management of sensitive patient data, supporting high-quality surveillance and policy development.

**Table 1: Population by Governorate and Sex.**

<b>Governorate</b>	<b>Total Female population</b>	<b>Total male population</b>	<b>Total population</b>
Ajloun	103,100	109,400	212,500
Amman	2,238,900	2,595,600	4,834,500
Aqaba	98,700	128,300	227,000
Balqa	321,400	342,000	663,400
Irbid	1,032,100	1,103,300	2,135,400
Jarash	137,300	148,700	286,000
Karak	182,400	199,500	381,900
Ma'an	107,600	120,600	228,200
Madaba	274,700	318,500	593,200
Mafraq	91,300	99,800	191,100
Tafeileh	55,400	60,800	116,200
Zarqa	776,100	870,500	1,646,600
<b>Total</b>	<b>5419000</b>	<b>6097000</b>	<b>11516000</b>

Source: Department of Statistics, Jordan, 2023.

**Figure 1: Jordan Population Pyramid by Age Group and Sex.**



## RESULTS

### ➤ Patient Demographics

The largest age group is 45–69 years, representing 53.2% of all patients. This age bracket also shows the highest dialysis burden for both sex.

The 18–44 age group accounts for 24.6% of cases, reflecting a notable burden among younger adults.

Patients aged 70 and above constitute nearly 20% of the total ESRD population. Interestingly, females are more represented in this age group (23.6%) than males (16.9%), suggesting increased survival or later-onset disease among women.

**Table 2: ESRD Patient Distribution by Age Group and Sex.**

Age Group	Male	% of Males	Female	% of Females	Total	% of Total
<18	85	2.36%	68	2.86%	153	2.56%
18–44	906	25.15%	567	23.80%	1,473	24.61%
45–69	2,000	55.56%	1,186	49.80%	3,186	53.24%
≥70	610	16.93%	561	23.55%	1,171	19.57%
Total	3,601	100%	2,382	100%	5,983	100%

Pediatric patients (<18 years) make up only 2.6% of cases, consistent with global trends of ESRD being primarily an adult condition.

These findings demonstrate that ESRD prevalence increases significantly with age, with the majority of patients aged 45 and older. There are also sex-specific patterns, with males outnumbering females in all age groups except the elderly group (≥70), where females show higher representation.

### ➤ **Patient Clinical and Behavioural Characteristics**

This section highlights key clinical and behavioral characteristics of the registered hemodialysis ESRD population, focusing on blood type distribution and smoking status.

#### ○ **Blood Group Distribution Among ESRD Patients**

This section presents the distribution of blood groups among end-stage renal disease (ESRD) patients in 2023, disaggregated by sex. Out of a total of 5,983 patients, 2,382 were female and 3,601 were male. Blood group O was the most common across both sexes, with 910 females and 1,378 males. This was followed by blood group A (687 females and 1,073 males), while B and AB were less frequently reported. Additionally, a considerable number of patients had unknown blood group data (341 females and 505 males), which may reflect incomplete or missing documentation. These findings highlight the

importance of complete clinical data, especially in the context of blood-type matching for potential kidney transplantation.

**Table 3: Distribution of Blood Groups Among ESRD Patients by Sex.**

Blood Group	Female	Male	Total
A	687	1,073	1,760
AB	117	187	304
B	326	458	784
O	910	1,378	2,288
Unknown	341	505	846
(Blank)	1	—	1
<b>Total</b>	<b>2,382</b>	<b>3,601</b>	<b>5,983</b>

○ **Smoking status**

Out of the total 5,983 registered ESRD patients, smoking status was recorded for 4,671 individuals (78%). The remaining 1,312 patients (22%) had no recorded data. Of those with recorded information, 3,781 were non-smokers (63%), and 890 were current smokers (15%). The highest prevalence of smoking was observed in the 45–69 age group, particularly among males.

**Table 4: Summary Table: Smoking Status Distribution**

Smoking Status	Count	% of Total (n = 5,983)
Non-smoker	3,781	63
Current smoker	890	15
Unknown	1,312	22
<b>Grand Total</b>	<b>5,983</b>	<b>100%</b>

➤ **Incidence and Prevalence**

○ **Incidence of ESRD**

A total of 1,004 new ESRD cases were reported in 2023, of which 965 cases (96%) were Jordanians and 39 cases (4%) were non-Jordanians. 371 were female and 633 were male, with a male-to-female ratio of approximately

1.7:1. The mean age at diagnosis was 56 years, and the national weighted incidence rate was calculated at 8.71 per 100,000 population based on the total population of 11,516,000 in Jordan.

The incidence rates of the disease per 100,000 population vary notably across Jordanian governorates and between sexes. Mafraq recorded the highest incidence rates, with 18.62 among females and 34.07 among males, indicating a significant disease burden. Ajloun and Aqaba also reported relatively elevated rates, with female incidence at 12.61 and 9.12, and male incidence at 14.63 and 11.69, respectively. In contrast, Balqa reported the lowest rates, with 3.73 among females and 4.97 among males.

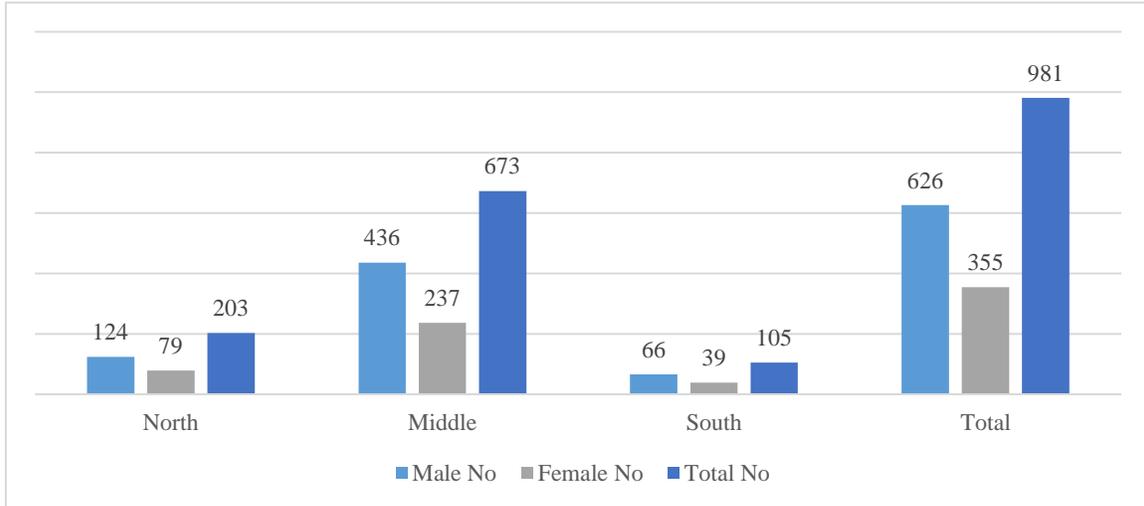
Most governorates demonstrated higher incidence rates among males, such as in Karak (12.03 vs. 7.13), Zarqa (10.00 vs. 6.83), and Amman (11.71 vs. 7.64). Notably, Tafeileh was the only governorate where the female incidence rate (12.63) exceeded that of males (9.87).

It is important to note that while individual governorate-level rates provide valuable insights, the national average incidence rate of 8.71 per 100,000 reflects a population-weighted estimate across all governorates. The official incidence rates by governorate and sex, based on national statistical data, are detailed in Table 5.

**Table 5: Distribution of ESRD new cases by governorate and sex**

<b>Governorate</b>	<b>FEMALE</b>	<b>MALE</b>	<b>Total</b>
Ajloun	13	16	29
Amman	171	304	475
Aqaba	9	15	24
Balqa	12	17	29
Irbid	58	81	139
Jarash	6	12	18
Karak	13	24	37
Ma'an	4	11	15
Madaba	8	26	34
Mafraq	17	34	51
Tafeileh	7	6	13
Zarqa	53	87	140
<b>TOTAL</b>	<b>371</b>	<b>633</b>	<b>1004</b>

**Figure 2: Distribution of New ESRD Cases by Region and Sex.**



**Table 6: Incidence Rates of ESRD by Governorate and Sex (per 100,000 population**

Governorate	Female Incidence (per 100,000)	Male Incidence (per 100,000)	Total incidence rate (per 100,000)
Ajloun	12.6	14.6	13.6
Amman	7.6	11.7	9.8
Aqaba	9.1	11.7	10.6
Balqa	3.7	5	4.4
Irbid	5.6	7.3	6.51
Jarash	4.3	8	6.3
Karak	7	12	9.7
Ma'an	3.7	9	6.6
Madaba	3	8	5.7
Mafraq	18.6	34	26.7
Tafeileh	12.6	9.8	11
Zarqa	6.8	10	8.5

### ○ **Period Prevalence of ESRD**

By the end of 2023, the total number of patients treated and registered in the ESRD Registry in Jordan was 5,983. Among them, 5,745 patients (96%) were Jordanian nationals, while 238 patients (4%) were non-Jordanians, including:

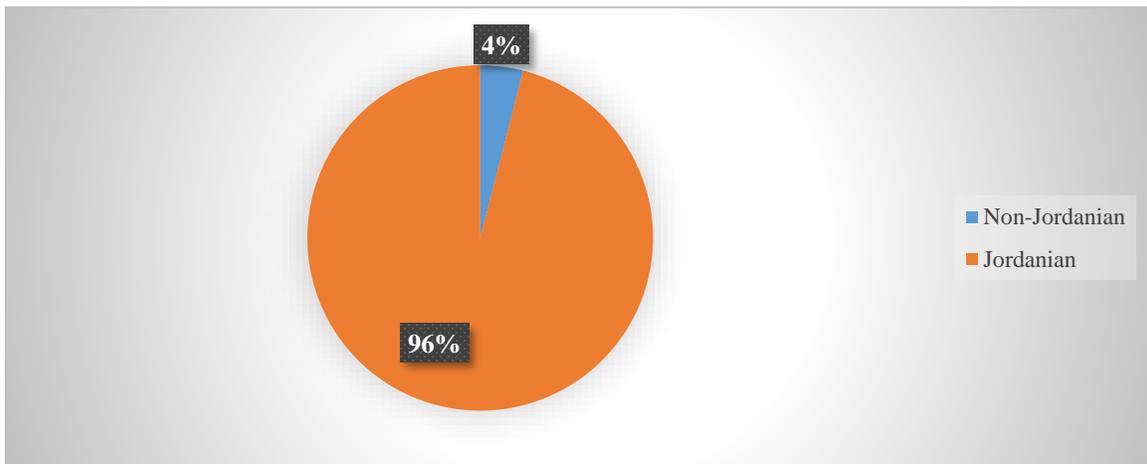
Palestinians – 130 patients (2%)

Syrians – 100 patients (1.7%)

Other nationalities – 8 patients (0.1%)

This distribution emphasizes that the burden of ESRD falls overwhelmingly on Jordanian citizens, with a relatively smaller share among expatriates and refugees residing in the country.

**Figure 3: Distribution of ESRD Cases by Nationality.**



Among a total population of approximately 11.5 million (5.42 million females and 6.10 million males), there were 5,983 ESRD patients, including 2,382 females and 3,601 males. This section highlights regional and sex-based differences in ESRD burden across Jordan.

Amman, the capital and most populous governorate, recorded the highest absolute number of patients with 2,632 cases (1,031 females and 1,601 males). However, its overall ESRD prevalence rate remains moderate at 54.45 cases per 100,000 population.

Mafrq showed the highest ESRD prevalence, with 155.97 cases per 100,000 populations (133.61 per 100,000 among females and 176.35 among males), indicating a disproportionately high disease burden relative to its population size.

Other governorates such as Ajloun and Karak also reported elevated prevalence rates above the national average (51.96 per 100,000), with Ajloun at 86.12 and Karak at 69.92 per 100,000 population.

Consistent sex disparities were observed across all regions. Nationally, males had higher ESRD prevalence (57.45 per 100,000) compared to females (45.79 per 100,000), a pattern that persisted in nearly all governorates.

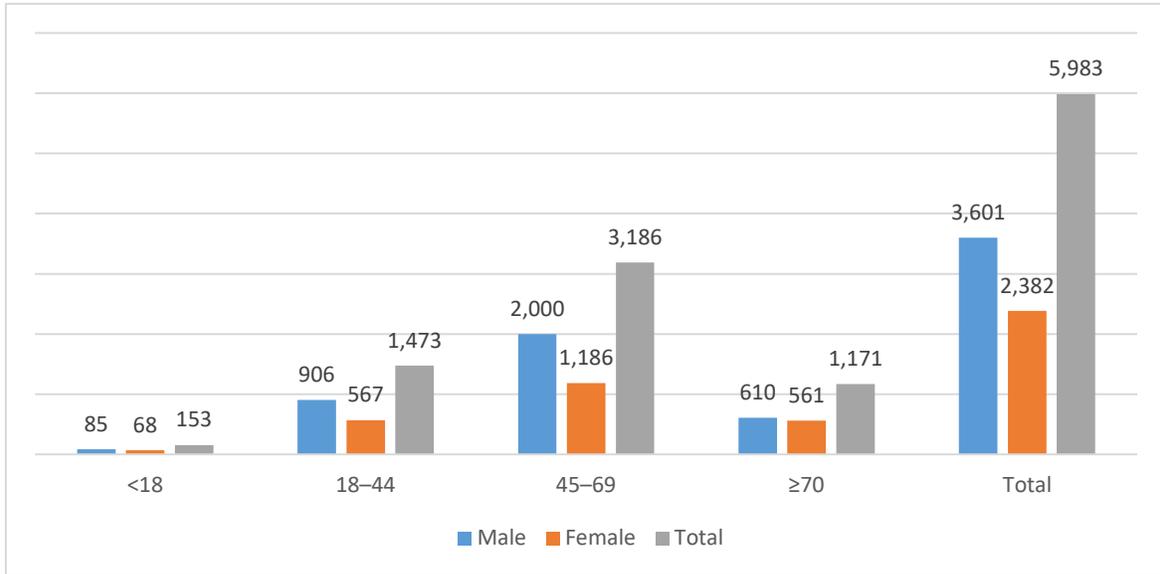
These findings underscore significant geographic and demographic variability in ESRD burden, highlighting the need for targeted interventions, region-specific planning, and more equitable distribution of renal health resources.

**Table 7: ESRD Period Prevalence per 100,000 Jordanians.**

Governorate	Population (Female)	Population (Male)	Patients (Female)	Patients (Male)	Total Patients	Rate (Female)	Rate (Male)	Total Rate
Ajloun	103,100	109,400	76	107	183	73.72	97.82	86.12
Amman	2,238,900	2,595,600	1,031	1,601	2,632	46.05	61.67	54.45
Aqaba	98,700	128,300	49	91	140	49.65	70.93	61.67
Balqa	321,400	342,000	82	109	191	25.51	31.88	28.8
Irbid	1,032,100	1,103,300	409	609	1,018	39.63	55.19	47.67
Jarash	137,300	148,700	31	59	90	22.58	39.68	31.47
Karak	182,400	199,500	108	159	267	59.2	79.7	69.92
Ma'an	107,600	120,600	30	68	98	27.89	56.37	42.94
Madaba	274,700	318,500	68	119	187	24.75	37.36	31.52
Mafrq	91,300	99,800	122	176	298	133.61	176.35	155.97
Tafeileh	55,400	60,800	37	32	69	66.78	52.63	59.38
Zarqa	776,100	870,500	339	471	810	43.68	54.11	49.18

<b>Total</b>	<b>5,419,000</b>	<b>6,097,000</b>	<b>2,482</b>	<b>3,501</b>	<b>5,983</b>	<b>45.79</b>	<b>57.45</b>	<b>51.96</b>
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**Figure 4: ESRD Patient Distribution by Age and Sex – Jordan, 2023.**



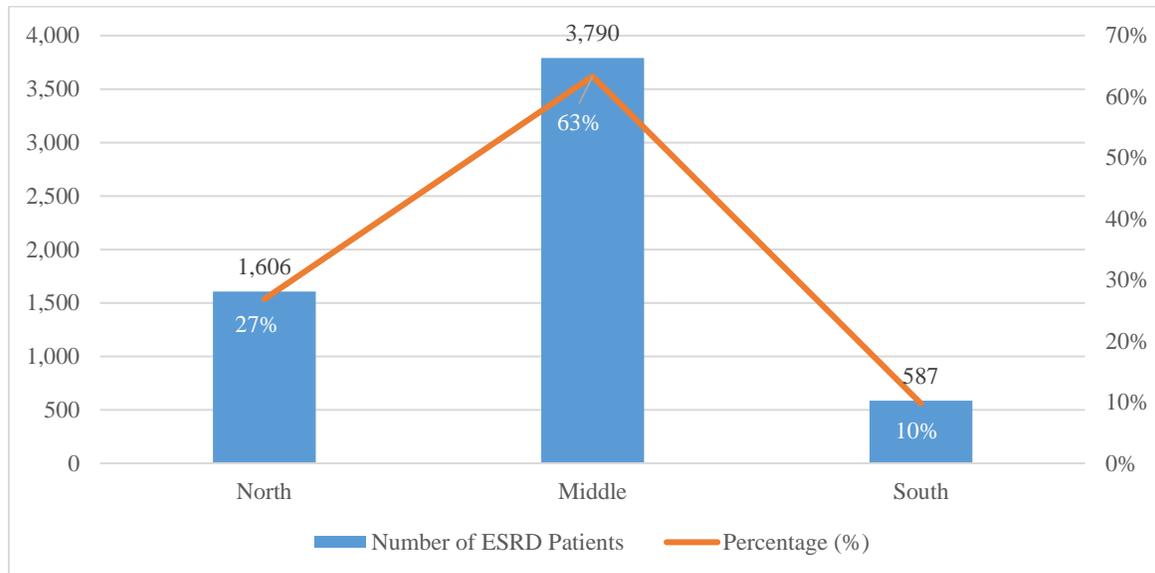
#### ➤ **Total Jordanian Cases of ESRD by Region**

As presented in Table 8, the data reveals the distribution of End-Stage Renal Disease (ESRD) cases across different regions in Jordan. The central region accounts for the majority of cases, representing 63.34% of the total ESRD population. The northern region follows with 26.84%, while the southern region reports the lowest proportion at 9.81%. This indicates a clear concentration of ESRD cases in the central part of the country.

**Table 8: Geographic Distribution of ESRD Patients by Region – Jordan, 2023.**

<b>Region</b>	<b>Number of ESRD Patients</b>	<b>Percentage (%)</b>
North	1,606	26.84%
Middle	3,790	63.34%
South	587	9.81%
<b>Total</b>	<b>5,983</b>	<b>100%</b>

**Figure 5: Number and Percentage of ESRD Cases by Region.**



In absolute numbers, the central region recorded 3,790 ESRD patients out of the total 5,983. This region includes densely populated governorates such as Amman, Balqa, Madaba, and Zarqa, which contributes to the higher patient count. The northern region registered 1,606 cases, covering governorates in Ajloun, Irbid, Jarash, and Mafraq. The southern region had the smallest number of patients, with 587 cases distributed across Aqaba, Karak, Ma'an, and Tafeileh. This geographic pattern highlights the correlation between ESRD prevalence, population density, and accessibility of healthcare services in different parts of Jordan.

➤ **Insurance coverage among ESRD patients**

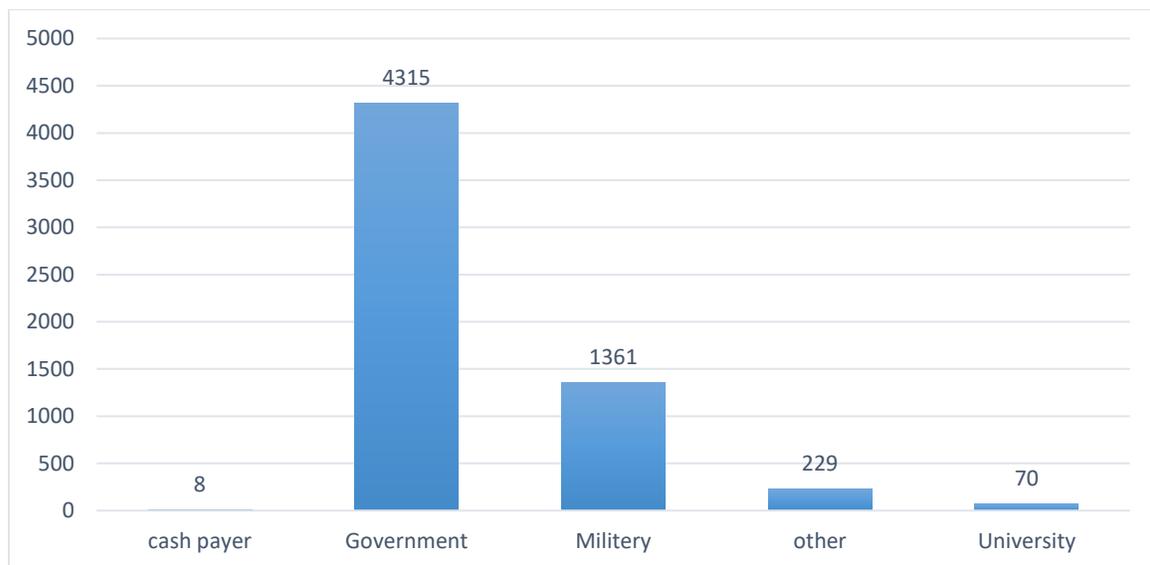
An analysis of the health insurance coverage among dialysis patients in 2023 reveals a significant dependence on government-provided insurance, which covers the vast majority of patients—approximately 72.1% of the total ESRD population.

The military sector is the second-largest provider, covering around 22.8% of patients. A small proportion of patients—approximately 3.8%—receive services through alternative or unspecified insurance categories, while university-affiliated insurance accounts for about 1.2% of the total.

Notably, only 0.1% of patients were classified as cash payers, indicating that nearly all ESRD patients in Jordan benefit from some form of organized healthcare coverage.

This distribution underscores the dominant role of public sector institutions, particularly the Ministry of Health and the military medical services, in ensuring equitable access to renal replacement therapy across the country.

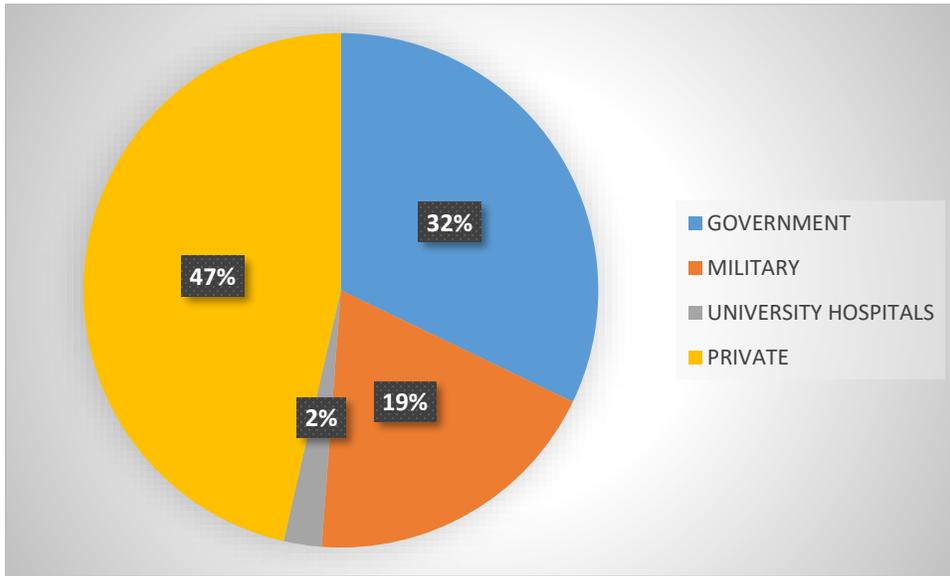
**Figure 6: Distribution of ESRD cases by Insurance Type.**



### ➤ Dialysis Facility Distribution

There are 86 working Dialysis Units distributed all over the country. 27 units (31.4%) administered by Ministry of Health (MOH), 16 units (18.6%) administered by Royal Medical Services (RMS), 2 units (2.3%) administered by university hospitals: one administered by Jordan University Hospital (JUH), one by King Abdullah University Hospital (KAUH) and 39 units (47.7%) administered by Private Sector (PS).

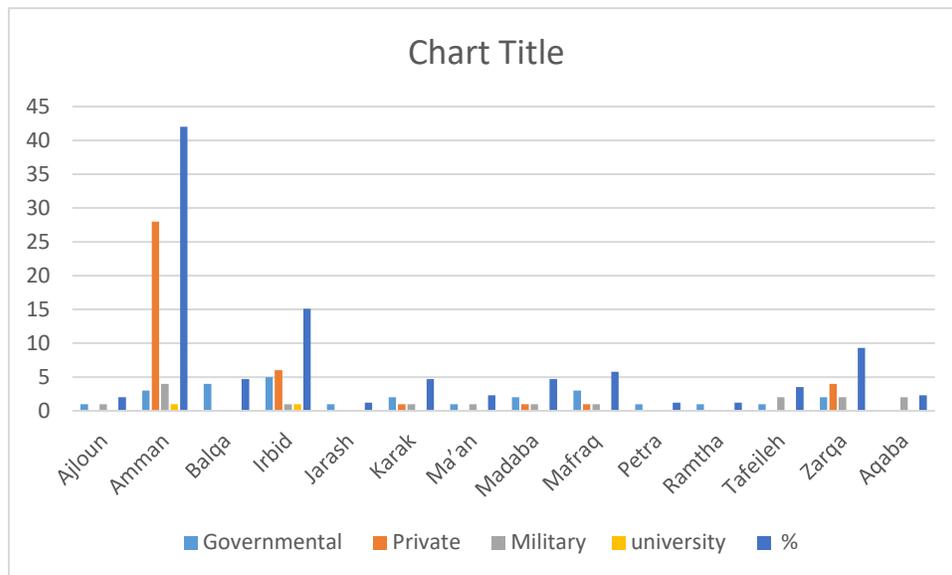
**Figure 7 :Distribution of Hemodialysis Units by Health Center type.**



**Table 9:Distribution of Hemodialysis Units by Health sector and Health Directorate.**

Directorate	Governmental	Private	Military	university	%
Ajloun	1	0	1	0	2
Amman	3	28	4	1	42
Balqa	4	0	0	0	4.7
Irbid	5	6	1	1	15.1
Jarash	1	0	0	0	1.2
Karak	2	1	1	0	4.7
Ma'an	1	0	1	0	2.3
Madaba	2	1	1	0	4.7
Mafraq	3	1	1	0	5.8
Petra	1	0	0	0	1.2
Ramtha	1	0	0	0	1.2
Tafeileh	1	0	2	0	3.5
Zarqa	2	4	2	0	9.3
Aqaba	0	0	2	0	2.3
<b>Total Grand</b>	<b>27</b>	<b>41</b>	<b>16</b>	<b>2</b>	<b>100</b>

**Figure 8: Distribution of Hemodialysis Units by Health sector and Health Directorate.**



As shown in Table 9, the majority of dialysis patients in Jordan received treatment in private dialysis centers, which served 42.4% of all patients (2,533 cases). This was followed by governmental centers (32.7%), military centers (23.1%), and education-affiliated centers (1.8%).

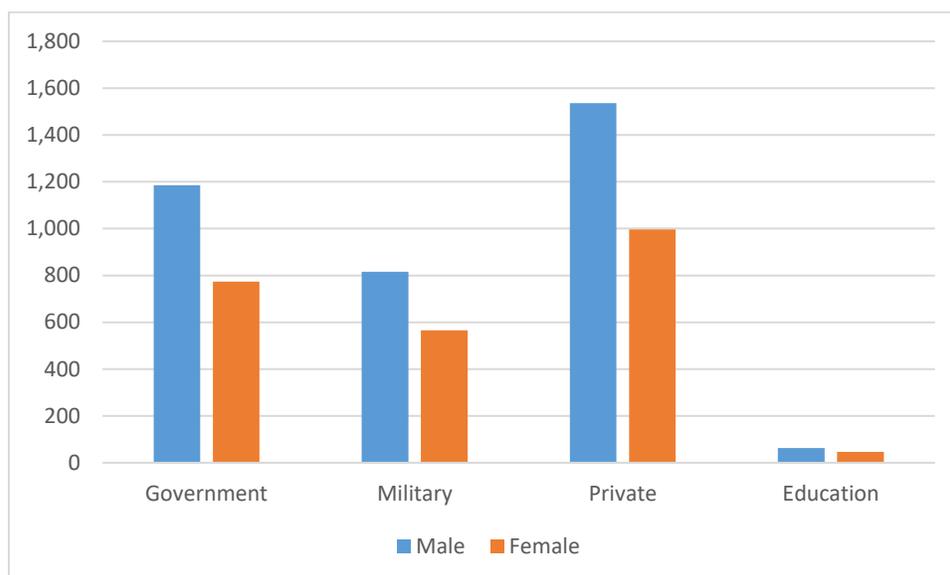
The sex distribution within each sector remained relatively consistent with the overall pattern, where females accounted for 39.8% and males 60.2% of the total dialysis population. The private sector hosted the largest number of both male and female patients, reflecting its central role in dialysis service delivery across the country. Table 10 illustrates this distribution in detail.

**Table 10: Distribution of ESRD Patients by dialysis Health Center Type and Sex – 2023.**

Dialysis Health Center	Male (n, %)	Female (n, %)	Total (n, %)
<b>Government</b>	1,186 (33.0%)	773 (32.5%)	1,959 (32.7%)

<b>Military</b>	816 (22.7%)	566 (23.8%)	1,382 (23.1%)
<b>Private</b>	1,536 (42.7%)	997 (41.9%)	2,533 (42.3%)
<b>Education</b>	63 (1.7%)	46 (1.9%)	109 (1.8%)
<b>Total</b>	3,601 (100%)	2,382 (100%)	5,983 (100%)

**Figure 9: Distribution of ESRD Patients by Dialysis health center and sex**



### ➤ **Dialysis Modality**

#### ○ **Hemodialysis**

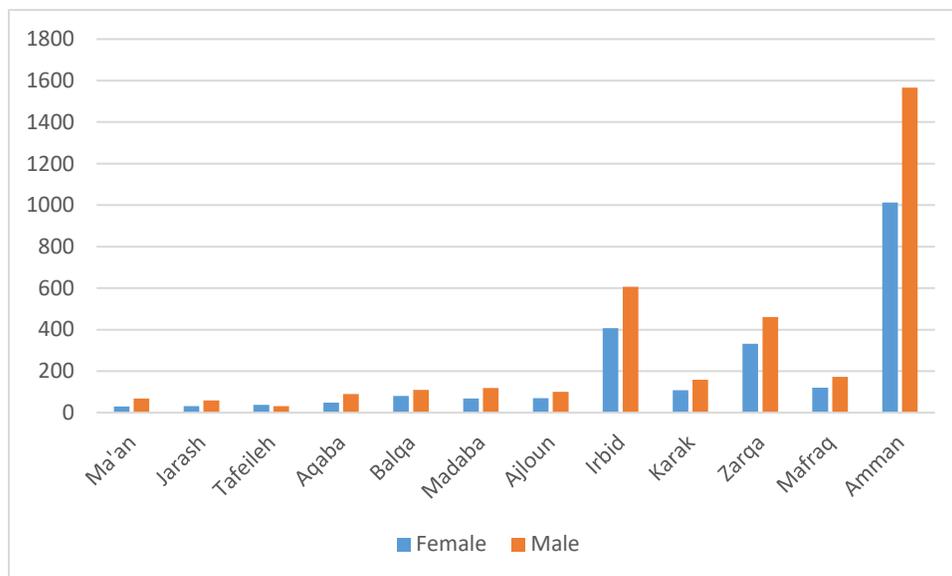
The total number of patients undergoing hemodialysis across Jordan reached 5,883, comprising 2,342 females (39.8%) and 3,541 males (60.2%). The highest number of patients was reported in Amman governorate, with 1,012 female and 1,567 male patients, followed by Irbid (407 females, 606 males) and Zarqa (332 females, 461 males). In contrast, the lowest numbers were recorded in Ma'an (30 females, 68 males), Tafilah (37 females, 32 males), and Jarash (31 females, 59 males).

By age group, the majority of hemodialysis patients were aged 45–69 years, totaling 3,149 individuals (53.5%). Patients aged 18–44 years accounted for

1,451 cases (24.7%), while 1,159 patients (19.7%) were 70 years or older. Additionally, 124 patients (2.1%) were under 18 years of age, indicating that most individuals undergoing hemodialysis are middle-aged or older.

Regarding dialysis frequency, most patients received three hemodialysis sessions per week, representing 66.6% of the total. Two sessions per week were reported for 18.7% of patients, while 0.5% underwent only one session weekly. A small proportion (0.4%) received four sessions per week, and the dialysis frequency was not documented for 13.9% of the patients.

**Figure 10: Distribution of Hemodialysis Patients by Sex and Governorate .**



**Table 11: Distribution of Hemodialysis Patients by age group.**

Hemodialysis	Total No of Patients
<18	124
>=70	1159
18-44	1451
45-69	3149

**Table 12: Weekly Hemodialysis Session Frequency Among Patients.**

Number of Sessions per Week	Number of Patients	Percentage (%)
1 session	27	0.50%

2 sessions	1,098	18.70%
3 sessions	3,917	66.60%
4 sessions	21	0.40%
Unspecified (blank)	820	13.90%

○ **Peritoneal dialysis**

In 2023, a total of 100 patients were receiving peritoneal dialysis. The majority of patients were in the 45–69 age group, accounting for 37 cases (16 females and 21 males). This was followed by the 18–44 age group with 22 patients (8 females and 14 males), and the <18 age group with 29 patients (10 females and 19 males). The smallest proportion of patients were aged  $\geq 70$ , with 12 cases equally distributed between males and females (6 each). Overall, males (60 patients) slightly outnumbered females (50 patients) across all age groups.

**Table 13: Peritoneal Dialysis Patient Distribution by Age group and Sex.**

Age Group	Female	Male
<18	10	19
$\geq 70$	6	6
18–44	8	14
45–69	16	21

➤ **Etiological Distribution of End-Stage Renal Disease (ESRD)**

The primary causes of renal failure leading to dialysis in Jordan by the end of 2023 are as follows (see Figure 11 for the distribution by number and Figure 12 for distribution by sex):

Hypertension (HTN) was the leading cause, accounting for 2,937 cases (1,206 females and 1,731 males), representing approximately 49.70% of the total. This indicates that nearly half of the dialysis patients are affected by hypertension-related kidney damage. Diabetes mellitus (DM) was the second most common cause, contributing to 1,341 cases (487 females and 854 males), or 22.68%, highlighting the significant burden of diabetic nephropathy in the country.

Glomerulonephritis accounted for 368 cases (146 females and 222 males), representing 6.22%, while polycystic kidney disease was responsible for 197 cases (72 females and 125 males), or 3.33%.

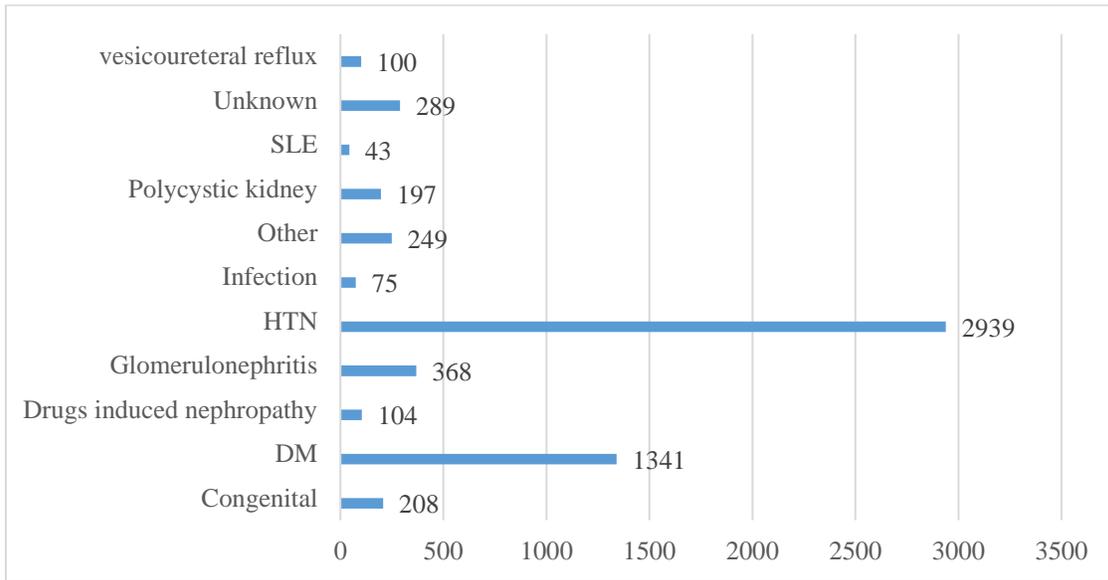
Congenital and genetic kidney conditions were identified in 208 cases (81 females and 127 males), comprising 3.52%, and vesicoureteral reflux accounted for 100 cases (45 females and 55 males), or 1.69%.

Drug-induced nephropathy contributed to 102 cases (36 females and 66 males), approximately 1.72%, and infections accounted for 75 cases (27 females and 48 males), or 1.27%. Systemic lupus erythematosus (SLE) was identified in 43 cases (30 females and 13 males), representing 0.73%.

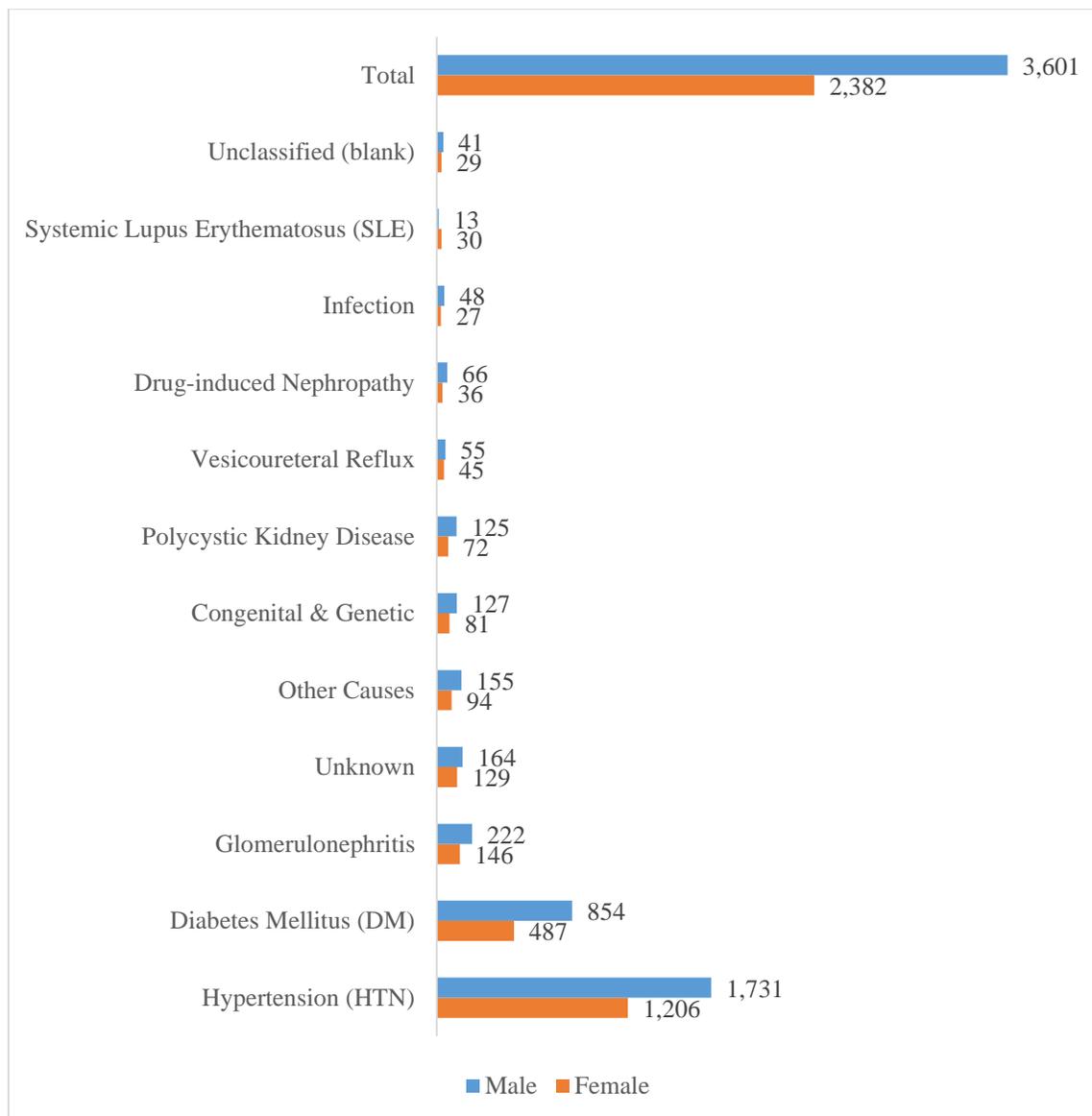
Additionally, there were 289 cases (129 females and 164 males) classified as unknown origin (4.89%), and 249 cases (94 females and 155 males) attributed to other causes (4.21%). Finally, 70 cases (29 females and 41 males) remained unclassified or blank in the diagnosis.

Overall, the data emphasizes the major role of hypertension and diabetes in the progression to ESRD, with other contributing factors such as glomerulonephritis, genetic conditions, and less common causes playing smaller, though still important, roles. This distribution of causes highlights the need for comprehensive management strategies targeting hypertension and diabetes, alongside specialized care for other contributing conditions.

**Figure 11: Distribution of ESRD Etiology BY Total Patient.**



**Figure 12: Distribution of ESRD Etiology BY Sex.**



➤ **Age-Related Patterns in ESRD Etiology**

The analysis of End-Stage Renal Disease (ESRD) etiology across different age groups reveals distinct trends that emphasize the importance of age-specific clinical approaches. In children under 18 years, congenital anomalies, glomerulonephritis, and hypertension are the most common causes, while diabetes is rarely observed. Among adults aged 18–44 years, hypertension

emerges as the leading cause, followed by diabetes, glomerulonephritis, and congenital abnormalities; autoimmune diseases such as Systemic Lupus Erythematosus (SLE) are also more prominent in this age group. In the 45–69 and  $\geq 70$ -year groups, hypertension and diabetes mellitus become increasingly prevalent, accounting for the majority of ESRD cases, whereas genetic, congenital, and autoimmune causes markedly decline. These patterns highlight the necessity for tailored preventive and therapeutic strategies that consider the patient’s age and the predominant etiological factors at each stage of life.

### ➤ **Mortality Distribution in ESRD Patients**

As shown in Table 14 and illustrated in Figure 13, a total of 597 ESRD-related deaths were recorded across Jordan in 2023, revealing clear regional disparities in mortality. The Middle region, with the largest ESRD population (3,820 patients), reported the highest number of deaths. Amman alone accounted for 283 deaths, followed by Zarqa with 68 deaths, both reflecting their high disease burden. In the North region, Irbid—which had 1,589 ESRD patients—recorded 116 deaths, again demonstrating a correlation between ESRD prevalence and mortality.

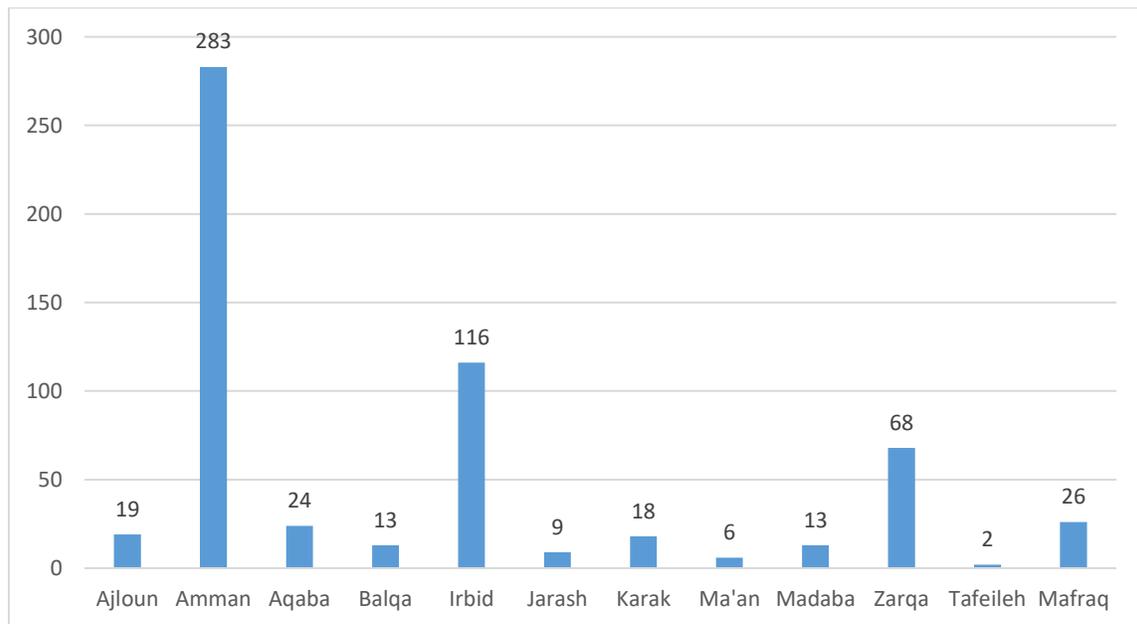
In contrast, lower numbers were reported in smaller or less densely populated directorates such as Ajloun (19 deaths), Aqaba (24 deaths), and Mafraq (26 deaths), with Tafeileh reporting the fewest at only 2 deaths.

These figures highlight the urgent need for targeted healthcare interventions in high-burden areas to reduce preventable deaths and improve health outcomes. Ensuring sustained improvements in patient care, timely treatment, and equitable access to dialysis and transplant services across all regions of Jordan remains essential.

**Table 14: Number and Percentage of Death Cases by Health Directorate.**

Directorate	Number of Death Cases	Percentage (%)
Ajloun	19	3.18%
Amman	283	47.40%
Aqaba	24	4.02%
Balqa	13	2.18%
Irbid	116	19.43%
Jarash	9	1.51%
Karak	18	3.02%
Ma'an	6	1.00%
Madaba	13	2.18%
Zarqa	68	11.39%
Tafeileh	2	0.34%
Mafraq	26	4.36%
<b>Total</b>	<b>597</b>	<b>100%</b>

**Figure 13: Number and Percentage of Death Cases by Health Directorate.**



## **DISCUSSION**

This report provides a comprehensive overview of the national burden of End-Stage Renal Disease (ESRD) in Jordan during 2023, highlighting key trends, challenges, and insights critical for public health policy and healthcare system planning. The data underscore the significant impact of ESRD on the Jordanian population and emphasize the urgent need for targeted interventions aimed at improving patient outcomes, slowing disease progression, and optimizing resources allocation.

### **➤ Epidemiology and Incidence Rates**

In 2023, the total number of ESRD patients in Jordan reached 5,983, with the vast majority (96%) being Jordanian nationals. The male-to-female ratio was 1.76:1, indicating a markedly higher prevalence of ESRD among males—consistent with global patterns in kidney disease. The incidence rate among Jordanians was 8.6 new cases per 100,000 populations, with males affected at a significantly higher rate (10.3 per 100,000) compared to females (6.6 per 100,000). This sex disparity may reflect differences in lifestyle, comorbidities, occupational exposures, or genetic susceptibility, warranting further investigation and the development of sex-sensitive prevention strategies.

By the year 2023, a significant advancement was achieved through the integration of kidney disease data into the Cardiovascular Disease and Diabetes Registry. This integration enhances understanding of the link between kidney disease, hypertension, and diabetes, and may help improve patient management, while supporting the development of evidence-based policies to strengthen national health outcomes.

### **➤ Leading Causes of ESRD**

Hypertension and diabetes mellitus were identified as the two leading causes of ESRD, together accounting for approximately 72% of cases. Hypertension was the most prevalent etiology, responsible for 49.9% of cases, while diabetes accounted for 22.6%.

These findings reinforce global evidence linking chronic non-communicable diseases to renal failure. They highlight the need for robust national strategies that promote early detection, effective management, and public education to reduce the incidence of hypertension and diabetes-related kidney damage. Primary care interventions and risk-factor control must be prioritized to mitigate progression to ESRD.

➤ **Regional Disparities in ESRD and Mortality**

The regional distribution of ESRD cases shows significant disparities, with the Middle region particularly Amman and Zarqa—reporting the highest concentrations. This pattern reflects the centralization of dialysis services and broader healthcare infrastructure in urban centers and highlights opportunities to expand services in the North and South, enhance access for all patients, and guide future healthcare planning and resource allocation.

Mortality data from 2023 showed a total of 597 deaths among ESRD patients, with Amman recording the highest number (283). Mortality rates may be influenced by regional variations in healthcare access, quality of treatment, and availability of specialized care. For example, while Amman reported 283 deaths, the Tafeileh governorate recorded only two, highlighting the wide disparity across regions.

➤ **Hemodialysis Resources and Access**

Jordan operates 86 hemodialysis units, nearly half (47.7%) of which are managed by the private sector, enhancing the national dialysis capacity. Health insurance coverage provided by the Ministry of Health supports a large portion of treatment costs, facilitating patient access regardless of financial status. While many dialysis centers are concentrated in the Middle region, there is an opportunity to bring services closer to patients in the North and South through expanding existing units or supporting transportation and insurance solutions to ensure convenient access for all patients.

➤ **Data Integrity and System Improvement**

The implementation of the Jordan Interactive Electronic Reporting System (JIERS) represents a major advancement in data collection and registry management. However, challenges remain in achieving full data accuracy and completeness, particularly when migrating from legacy systems. Inconsistent or incomplete data entries, especially related to older cases, may undermine the reliability of key indicators.

To enhance the integrity of the ESRD registry, regular audits, continuous staff training, and system updates are recommended. Maintaining high-quality data is essential for monitoring trends, evaluating interventions, and guiding evidence-based policy

## **RECOMMENDATIONS**

Based on the findings of the 2023 ESRD report, the following key recommendations are proposed to address the growing burden of end-stage renal disease in Jordan. These recommendations emphasize prevention, early detection, improved disease management, and enhanced health education and access.

### **➤ Enhance Prevention of Hypertension and Diabetes.**

Hypertension and diabetes remain the leading causes of ESRD. Strengthening national prevention programs is essential to reduce the incidence of kidney failure. Key actions include:

- Promoting regular screening for hypertension and diabetes, particularly among high-risk groups.
- Educating the public on lifestyle modifications, such as maintaining a healthy diet, regular physical activity, and adherence to medications to control blood pressure and glucose levels.

### **➤ Expand Dialysis Services in Underserved Areas**

The increasing number of patients with end-stage renal disease (ESRD) emphasizes the importance of expanding and strengthening dialysis services to ensure accessible, high-quality care across all regions.

Efforts should focus on increasing the number of dialysis beds within existing units to improve capacity and reduce waiting times, establishing additional dialysis units in areas requiring broader coverage, particularly in the North and South, strengthening and continuously training healthcare staff to enhance service quality, and coordinating with relevant stakeholders to arrange transportation for patients, especially in remote areas, to ease the burden on patients and their families.

➤ **Implement Education on Drug-Induced Nephropathy**

Medications are a preventable cause of kidney damage. Health education initiatives should focus on raising awareness among healthcare professionals and patients about the nephrotoxic risks of drugs such as NSAIDs and some antibiotics, encouraging routine kidney function monitoring for individuals on high-risk medications, and supporting continuous training for healthcare providers to safely prescribe and review medications in patients with compromised kidney function.

➤ **Strengthen Patient Education and Monitoring**

Empowering patients through education is key to long-term disease control. Recommended measures include:

- Providing clear, accessible information on ESRD management, including dialysis adherence, nutrition, and medication use.
- Promoting routine screening for at-risk populations to detect kidney disease at earlier stages.
- Integrating healthy lifestyle promotion (hydration, diet, exercise) into national awareness campaigns.

➤ **Promote Early Detection and Proactive Care**

Timely identification of kidney impairment can significantly improve patient outcomes. Key strategies include:

- Conducting routine kidney function assessments (e.g., creatinine, eGFR, urine analysis) for individuals with diabetes, hypertension, or exposure to nephrotoxic drugs.
- Developing care pathways that trigger early intervention based on clinical indicators.
- Establishing multidisciplinary teams, including nephrologists, primary care providers, nurses, and dietitians.
- Involving pharmacists in the safe monitoring of drug therapies to reduce the risk of medication-related kidney damage.