



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

**Non-Communicable Diseases
Directorate**

**National Registry of End Stage Renal
Disease(ESRD)**

13th, 14th Annual Report

2021-2022

FOREWORD

More than three 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 enables 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 to main causes of renal failure.

I am pleased to present to you the thirteenth and fourteenth edition of the annual report on End Stage Renal Disease (ESRD) in Jordan for the year 2021-2022, 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.

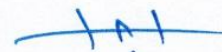
I hope that this report will assist health care providers, public health officers and NGOs in their work to prevent and control renal disease in Jordan.

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.

**Head. Cardiovascular
and Diabetes
Surveillance Division**

Nahida Al Sharif

**Head. Cardio-vascular
and diabetes prevention
Department**

Dr Saif Alfakhoury

**Director of NCDs
Directorate**

Dr. Anas Almohtaseb

LIST OF PARTICIPANTS

Serial	Names	Central Team - Ministry of Health
1	Dr. Anas Almohtaseb	Results discussion, report revision and editing.
2	Dr. Saif Alfakhoury	Field visits, report revision and editing.
3	Nahida Al Sharif	Responsible for registry, including data collection, cleaning, analysis and report writing
4	Dr.Saja Al-Harasees	Registry road map from data collection to report writing, Data cleaning ,Field visit and focal point training ,Monitoring of work flow ,Initial Report revision
5	Dr.Ahmad Masadeh	Data analysis
6	Dr. Abdelhadi Abu mehsen	Report revision and editing.
7	Dr.Asmaa Mohammad Al Ghzawi	Report revision and editing.

Serial	Names	Focal Points at Hospitals / Facilities
Government Hospitals		
1.	Nidal Maghayrah	Al Basheer
2.	Mohammed Sami Al-Bashjawesh	Prince Hamza
3.	Khalid Al saudi	Jamil Totanji
4.	Ataa salah issa alqbelat	Princes Salma
5.	Ahmad Suleiman Abu Mattahna	Al Nadeem
6.	Ahmed Wahdan	Prince Faisal
7.	Ibrahim Al-Khawaldeh	Al Zarqa government
8.	Reem Al-Sufan	Al-Hussein Hospital
9.	Faris Hadya	Prince Hussein Hospital
10.	Oudi Al-Rahamanh	Southern Shounah Hospital
11.	Bayan Frehat	Princess Iman Hospital
12.	Mohammad Shuqair	Northern Badia Hospital
13.	Hayam Sahman Al-Hwidi	Mafraq Governmental Hospital
14.	Mohammad Al-Mashaqbah	Al-Ruwaished Hospital
15.	Manzuma Al-Yadak	Al-Yarmouk Hospital
16.	Fadi Al-Afifi	Princess Basma Hospital
17.	Abdulrahman Al-Tamari	Abu Ubaida Hospital
18.	Abd Ismail Al Ibraheem	Muath Bin Jabal Hospital
19.	Musa Ahmed Al-Rababah	Princess Raya Hospital
20.	Rami Al-Hourani	Ramtha Governmental Hospital
21.	Hayat Al-Sabbagh	Jerash Governmental Hospital
22.	Bayan Frehat	Al-Iman Hospital
23.	Hussein Mohammed	Ma'an Governmental Hospital
24.	Fathiya al masha	Ghor Al-Safi Hospital
25.	Mohammad Al-Bustanji	Karak Governmental Hospital
26.	Ahmad Al-Hassanat	Queen Rania Hospital
27.	Mohammad Al Qatameen	Tafileh Governmental Hospital

Serial	Names	Focal Points at Hospitals / Facilities
Royal Medical Services		
1.	Nahid Wahdani	Al-Hussein Medical City
2.	Faten Hwaitat	Queen Alia
3.	Samira Dawood	Queen Rania Children's Hospital
4.	Ibrahim Ata Al-Jaraira	Al-Latnoon
5.	Suzan Najadat	Prince Rashid bin Al-Hassan Hospital
6.	Majdy Moussa Al Shaar	Prince Zaid bin Al-Hussein Hospital
7.	Khalid Sulaiman Al-Hassanat	Prince Hashim bin Abdullah Hospital
8.	Rasha Youssef Al-Faraya	Prince Ali bin Al-Hussein Hospital
9.	Ahmad Al-Nayef	Princess Haya bint Al-Hussein
10.	Omar Al-Shuqairat	Shoubak Military Hospital
11.	Reem Awad Nasir	Al-Qweirah
12.	Khadija Abdelsalam Al-Tarawneh	Al-Hasa Hospital
13.	Hiba Al amoosh	Prince Hashim bin Al-Hussein Hospital
14.	Waleed Al-Zainat	Madaba Medical Center
15.	Rami Ali Khalifat	Azraq Medical Center
16.	Qasem Hajaj	King Talal Hospital
Private Hospitals		
1.	Heba Wajeh Barakat	Jabal Al-Zaytoun Hospital
2.	Amal Jamal Khidr	Qasr Shubeib Hospital
3.	Nidaa Al-Nawati	Al-Delail Hospital
4.	Ahmad Al-Khuzai'lah	Al Hekma Hospital
5.	Hikmat Al-Rababah	Irbid Specialty Hospital
6.	Alaa Oweidat	Al-Najah Hospital / Irbid
7.	Anwar Al-Alimi	Rosary Sisters Hospita
8.	Abdullah Al-Nahoud	Sara Hospital / Mafraq
9.	Suleiman Al-Saraira	Italian Hospital / Karak
10.	Malik Al-Tahat	Greek Catholic Hospital / Irbid
11.	Saeed Al-Sharbini	Al-Qawasmi Hospital
12.	Basem Ali Alian	Specialty Hospital / Amman
13.	Abdullah Anaswah	Al-Shmeisani Hospital
14.	Shaimaa Alsweer	Ibn Al-Haytham Hospital
15.	Ashraf Salem	Al-Israa Hospital
16.	Osama Al-Hunaiti	Jordan Hospital
17.	Jihad Al-Abadi	Arab Medical Center
18.	Rami Thalji	Tlaa Al-Ali Hospital
19.	Ruqaya Salah	Al-Ahli Hospital
20.	Abdulrahim Al-Omari	Al-Jazeera Hospital
21.	Nasr Mahmoud Mahrouq	Al-Maqased Hospital
22.	Sanad Alaywat	Philadelphia Hospital
23.	Munthir Ma'ayeh	Al-Mahabba Hospital
24.	Ahmed Rasheed	Al-Hayat General Hospital
25.	Qusai Al-Daqamseh	Al-Khansa Hospital
26.	Waleed Malkawi	Saudi Hospital
27.	Mahmoud Ahmad Al-Eid	Red Crescent Hospital
28.	Mohammad Musleh	Amman Surgical Hospital
29.	Sana Hamad	Al-Hanan Hospital

Serial	Names	Focal Points at Hospitals / Facilities
30.	Ahmed Issa	Marka Specialty Hospital
31.	Khalil Matarneh	Luzmila Hospital
32.	Marwa Al-Tanbour	Al-Istiqlal Hospital
33.	Nargis Abdullah	Islamic Hospital / Amman
34.	Waleed Malkawi	Aqleh Hospital
35.	Munther Ma'ayeh	Italian Hospital / Amman
37.	Asma Abu Dan	Islamic Hospital / Irbid
38.	Mohammad Arabiat	Al-Rasheed Hospital
39.	Waleed Al Obyaat	Gardens Hospital
40.	Waseem Nabeel	Istishari Hospital (<i>Consultant Hospital</i>)
Academic Hospitals		
1	Saleh Al-Rababah	King Abdullah I Hospital
2	Ghada Abu Sharbi	Jordan University Hospital

TABLE OF CONTENTS

Acknowledgment	ii
LIST OF PARTICIPANTS	iii
Table of contents	vi
List of Tables	vii
Table of Figures	vii
Executive summary	viii
Introduction	1
Methodology.....	2
• Data Collection Methods	2
• Tools and Forms	2
Confidentiality.....	3
Results.....	6
• Dialysis Units in Jordan.....	6
• Distribution of Dialysis Machines by Health Sector, Jordan 2021-2022	7
• Total cases by region until 2022:	8
• New cases by region	9
• Incidence Rate 2021-2022:	10
• Total Cases by Governorate:	11
• New Cases by governorate.	12
• New Cases by Age Groups 2021 -2022	13
• Primary cause of ESRD 2021-2022.	15
• Total Cases by health sector 2021-2022	17
• Insurance type 2021-2022:	19
• Number of Dialysis Sessions per week by sex.....	20
• Blood group by sex 2021-2022.	21
• Prevalence of non-communicable diseases (NCDs) among (ESRD) from 2013 to 2022.....	22
Discussion.....	24

LIST OF TABLES

Table 1: Jordan Population by End of 2022.....	5
Table 2: Distribution of dialysis units by health sector, Jordan.....	6
Table 3 : Distribution of Dialysis Machines by Health Sector, 2021, 2022	7
Table 4: Total Cases by Region.	8
Table 5: Incidence Rate 2021.	10
Table 6: Incidence rate 2022.....	11
Table 7: Primary cause of Dialysis 2021-2022.....	17
Table 8: Insurance type by gender 2021-2022.....	20
Table 9: Number of Dialysis Sessions per week by sex.	21

TABLE OF FIGURES

Figure 1 : Population Pyramid – Jordan 2021-2022	4
Figure 2: Total Cases by Region.....	8
Figure 3 : New cases by region 2021	9
Figure 4 : New cases by region 2022	9
Figure 5 Total Cases by Governorate 2022.	12
Figure 6 : New Cases by Governorate.	13
Figure 7:New Cases by Age Groups 2021-2022.	14
Figure 8: New Cases by Age Groups 2022.....	15
Figure 9:Total Cases by health sector -2021.....	18
Figure 10:Total Cases by health sector -2022.....	18
Figure 11:ESRD by Blood group 2021-2022.	22
Figure 12: prevalence of non-communicable diseases (NCDs) among (ESRD).....	23

EXECUTIVE SUMMARY

The National Registry of End-Stage Renal Disease (ESRD) in Jordan shows a continued rise in the burden of kidney failure between 2021 and 2022.

In 2021, there were 2,799 total patients on dialysis, compared with 3,744 patients in 2022, marking an overall increase of nearly 34% within one year. In 2021, the highest total incidence rate was recorded in Amman, with 310 cases and a rate of 6.68 per 100,000, followed by Irbid (5.51 per 100,000) and Zarqa (4.62 per 100,000). Males generally exhibited higher incidence rates compared to females across all governorates.

In 2022, Amman again maintained its position with the highest total incidence rate, recording 459 cases and a rate of 9.67 per 100,000. Once again, Irbid (8.16 per 100,000) and Zarqa (5.45 per 100,000) demonstrated notable incidence rates.

Of the 2022 total, 2,202 (58.8%) were males and 1,544 (41.2%) females, with a male-to-female ratio of 1.43:1. The Middle region accounted for the majority of cases in both years (63% in 2021 vs. 64% in 2022), followed by the North (27% in both years) and the South (slight decline from 10% in 2021 to 9% in 2022). The 45–69 age group remained the most affected, comprising 55% of all cases across both years. Hypertension was the leading cause of ESRD, responsible for 46% of cases in 2021 and 47% in 2022, while diabetes mellitus showed a notable increase from 25% in 2021 to 31% in 2022. Dialysis provision shifted further toward the private sector, which managed 38% of cases in 2021 and 44% in 2022, while the governmental sector declined from 37% to 27%. Insurance coverage was high overall, but about 2% of patients remained uninsured in both years. Most patients (84%) continued to receive dialysis three times weekly, and the number of patients on the kidney transplantation waiting list rose to 795 in 2022, with the majority at medium priority. Hemoglobin levels below 10 g/dl were recorded in 66% of patients in both years, reflecting persistent anemia challenges. Comorbidities remained common, with hypertension present in 68% and diabetes in 36% of ESRD patients.

A total of 43% of dialysis patients receive care in the private medical sector, while only 2% — equivalent to 58 individuals — lack insurance coverage. Approximately 83.7% of patients undergo dialysis three times per week, and 53% are categorized as having medium priority for kidney transplantation.

INTRODUCTION

The National Registry of End-Stage Renal Disease (ESRD) was established in 2007, under the jurisdiction of the Ministry of Health, by order of His Excellency, the Minister of Health.

One of the primary objectives of the ESRD National Registry is to establish a comprehensive database system to collect and manage data on patients with End-Stage Renal Disease (ESRD). This system provides valuable insights into the national burden of the disease and monitors government expenditures on dialysis services. It also serves as a critical resource for health planners and researchers, facilitating the development of strategies for prevention, early detection, and cost management. Additionally, it offers preliminary data to help assess patient suitability for kidney transplantation.

METHODOLOGY

The National Registry of End-Stage Renal Disease (ESRD) is a database system that collects information about nearly all patients undergoing Renal Replacement Therapy (RRT), including dialysis (hemodialysis and peritoneal dialysis) and kidney transplantation. Data were collected from 83 centers across the country. It is assumed that patients undergoing treatment in these units represent the total number of ESRD cases, including home peritoneal dialysis.

- **Data Collection Methods**

- The report includes data on all ESRD patients (all nationalities) receiving treatment in governmental, military, private, and university hospitals in Jordan during 2021–2022.
- Data were collected and analyzed using Microsoft Excel for statistical analysis.
- The information was derived from records entered electronically into the Jordan Interactive Electronic Reporting System (JIERS), which has been operational since mid-2021, marking the transition from the previous manual reporting system.

- **Tools and Forms**

Three structured forms were used for data collection from dialysis units:

Patient Demographic and Clinical Form – documenting name, age, sex, nationality, clinical information, source of treating facility, follow-up, vital status, and type of insurance.

Mortality Form – documenting name, age, sex, nationality, date of death, cause of death, and place of death.

Dialysis Equipment Form – documenting the total number of dialysis machines, reserve machines, and those used for isolation.

All data were entered electronically into the ESRD software system by trained Focal points assigned to each dialysis unit. These focal points received specific training in data entry and are continuously monitored through direct communication, regular field visits, and telephone follow-up. Any remarks or urgent issues are addressed promptly in collaboration with the Information Technology focal points at the Ministry of Health.

Data Collection

Data were collected electronically using tablets distributed to designated focal points at each dialysis unit. The forms were completed for all patients directly on the tablets. Focal point was regularly monitored to ensure complete data entry, either through phone follow-ups or during on-site visits to the units. Any technical issues were addressed in collaboration with the Ministry's IT team, who also serve as program focal points. This approach ensured accurate, complete, and timely data collection.

All submitted forms were reviewed at the Renal Registry Unit, filtered, and checked for duplication. Follow-up data on patients, including survival status, causes of death, and last dialysis dates, were verified and documented.

Data Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS), Epi Info 7, and Microsoft Excel. Calculations of incidence and prevalence in this report are based on population figures provided by the Department of Statistics (DOS) for the years 2021–2022. Incidence and prevalence calculations in this report are based on the information shared by the Department of Statistics (DOS) site information 2021-2022.

Confidentiality

It is essential to maintain the confidentiality of identifying information collected by ESRD staff. Access to the electronic reporting system is restricted to password-protected accounts.

Each staff member must have a unique password linked to their specific workplace, which must not be shared with colleagues. This ensures the security and integrity of the system.

Accurate and complete data for patients with End-Stage Renal Disease (ESRD) are critical. Only designated focal points within the ESRD Registry at the NCD Directorate are responsible for verifying and ensuring data quality. Any other departments requiring access must submit a formal request through proper channels. These measures protect patient privacy and maintain data integrity.

Figure 1 : Population Pyramid – Jordan 2021-2022

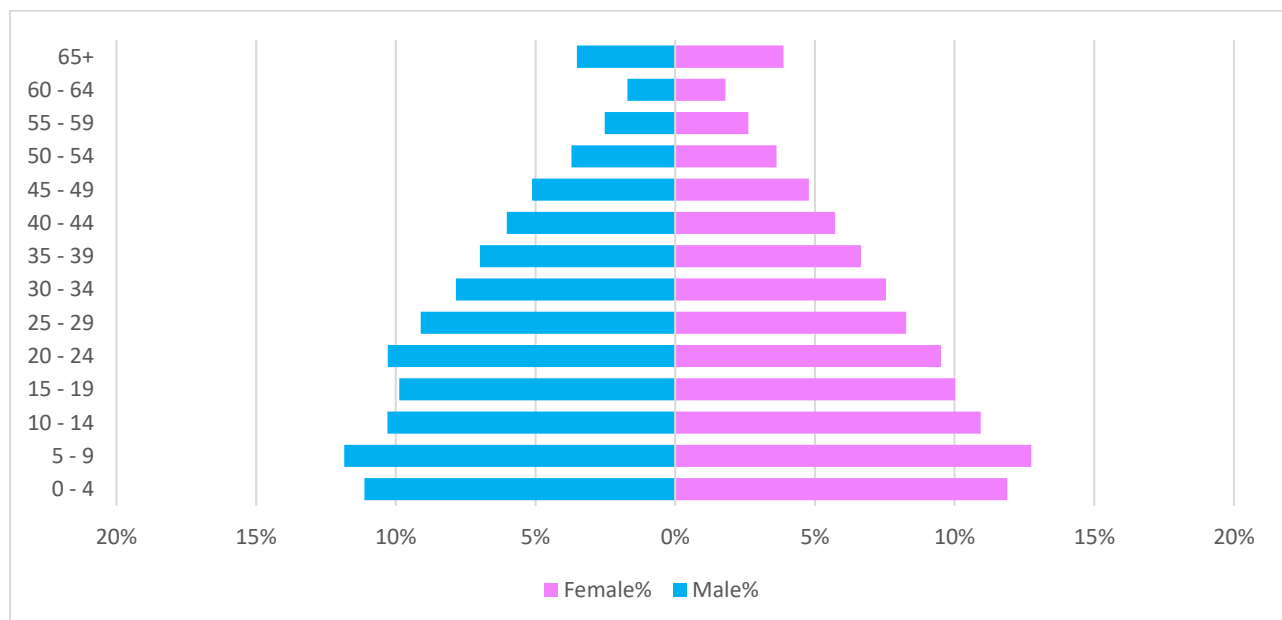


Table 1: Jordan Population by End of 2022.

Governorate	Total
Amman	4744700
Balqa	582100
Zarqa	1616000
Madaba	224000
Irbid	2095700
Mafrq	651100
Jarash	280700
Ajlon	208500
Karak	374800
Tafeleh	114000
Maan	187600
Aqaba	222800
Total	11302000

Source: Department of Statistics, Jordan, 2022.

RESULTS

- **Dialysis Units in Jordan**

There are 83 dialysis units distributed across the country, 27 units administered by Ministry of Health (MOH), 16 units administered by Royal Medical Services (RMS), 2 units administered by university hospitals: one administered by Jordan University Hospital, one by King Abdullah University Hospital (KAUH) and 40 units administered by Private Sector (PS),(Table 2).

Table 2: Distribution of dialysis units by health sector, Jordan

Governorate	Government Hospitals	Military Hospitals	Private Hospitals	Educational	Total
Amman	3	4	28	1	36
Ajloun	1	1			2
Mafrq	3	1	1		5
Irbid	6	1	5	1	13
Zarqa	2	2	4		8
Madaba	2	1	1		4
Balqa	4				4
Karak	2	1	1		4
Jerash	1				1
Aqaba		2			2
Tafilah	1	2			3
Maan	2	1			3
Total	27	16	40	2	85

- **Distribution of Dialysis Machines by Health Sector, Jordan 2021-2022**

The total number of dialysis machines (1099) in all units was distributed as follows: 463 machines in MOH units, 235 machines in RMS, 54 machines in universities hospitals and 347 machines in private sector hospitals, (Table 3).

Table 3 : Distribution of Dialysis Machines by Health Sector, 2021, 2022

Hospital	2021	2022
University (King Abdullah I)	19	19
University of Jordan	35	35
Private Hospitals	394	347
Medical Services	235	235
Government Hospitals	326	463

The focal points in all 83 Dialysis Units filled the special form of data collection and then sent it to National ESRD Registry located in the Ministry of Health. (Annex1), data about ESRD patients was received from all hospitals.

- **Total cases by region until 2022:**

Total cases by reported by region in Jordan until 2022 were 3744. Among these regions, the Middle region had the highest number of cases, with 2,307 reported cases, accounting for approximately 62% of the total cases. Following that, the North region had 1,045 reported cases, representing approximately 28% of the total cases. In contrast, the South region has the lowest number of reported cases, with 392 cases, making up approximately 11% of the total cases. Overall, these figures provide insights into the regional distribution of cases, highlighting variations in the prevalence of cases across different areas. Further analysis could delve into factors influencing these regional disparities and inform targeted interventions for healthcare management and resource allocation.

Figure 2: Total Cases by Region.

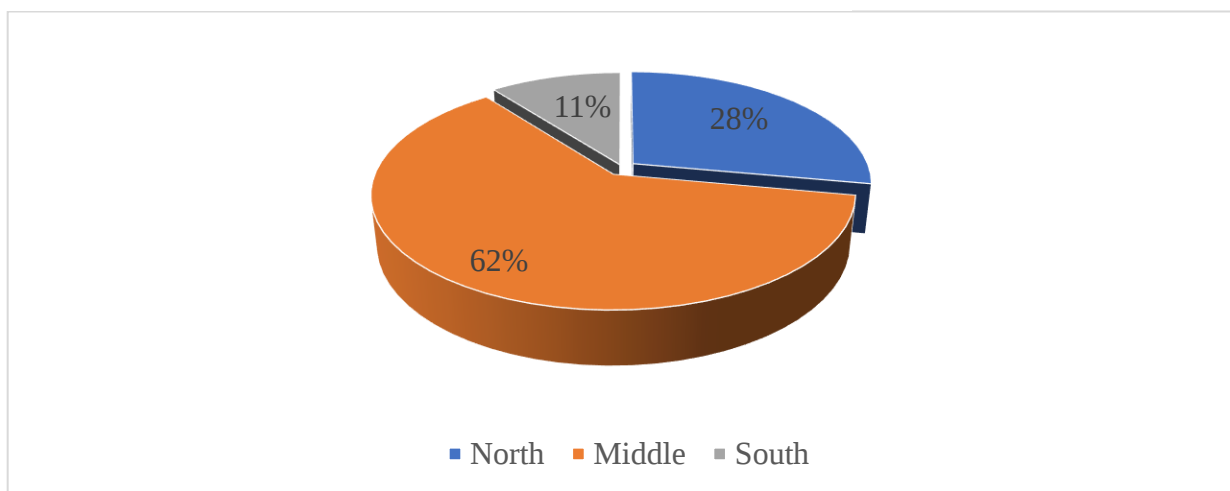


Table 4: Total Cases by Region.

Region	N
North	1045
Middle	2307
South	392
Total	3744

- **New cases by region**

The data from the two pie charts representing new cases of dialysis in Jordan in 2021 and 2022 shows a relatively stable distribution across the different regions. In 2021, the majority of new cases (63.10%) were recorded in the middle region, followed by the north region with 26.70%, and the south region with 10.20%. Comparatively, in 2022, the distribution remained largely consistent with 64.30% of new cases in the middle region, 26.70% in the north region, and 9.00% in the south region. This suggests that there was no significant shift in the distribution of new dialysis cases across the regions from 2021 to 2022. However, it's worth noting the slight decrease in the percentage of cases in the south region from 2021 to 2022, which could indicate either a decrease in incidence or improved healthcare access and prevention efforts in that area. Overall, while the data indicates stability in the distribution of new dialysis cases across Jordan's regions, further investigation into regional healthcare disparities and factors influencing dialysis incidence could provide valuable insights for targeted interventions and resources allocation.

Figure 3 : New cases by region 2021

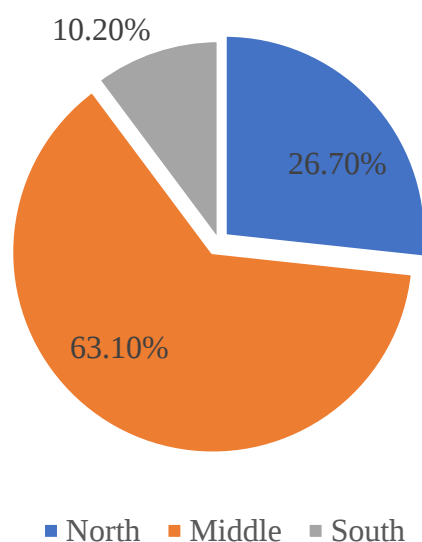
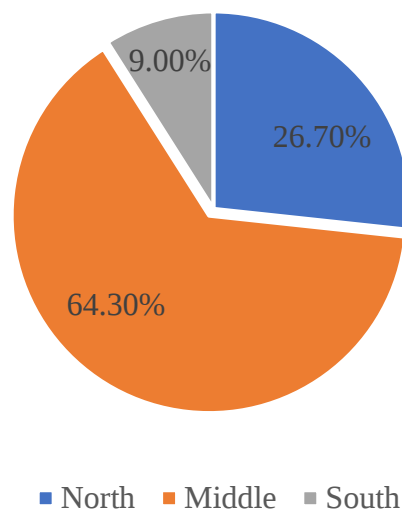


Figure 4 : New cases by region 2022



- **Incidence Rate 2021-2022:**

The analysis of the incidence rates per 100,000 of dialysis cases in Jordan for the years 2021 and 2022 reveals several significant trends.

In 2021, the highest total incidence rate was recorded in Amman, with 310 cases and a rate of 6.68 per 100,000, followed by Irbid (5.51 per 100,000) and Zarqa (4.62 per 100,000). Males generally exhibited higher incidence rates compared to females across all governorates.

In 2022, Amman again maintained its position with the highest total incidence rate, recording 459 cases and a rate of 9.67 per 100,000. Once again, Irbid (8.16 per 100,000) and Zarqa (5.45 per 100,000) demonstrated notable incidence rates.

These findings underscore the importance of continued monitoring and targeted interventions to address the prevalence of dialysis cases, particularly among males and in urban centers like Amman.

Additionally, the data on the number of dialysis sessions per week highlights the substantial demand for treatment, with the Middle region recording the highest number of sessions. This comprehensive analysis provides valuable insights for healthcare policymakers and stakeholders to devise strategies aimed at improving dialysis care delivery and addressing the growing burden of chronic kidney disease in Jordan.

Table 5: Incidence Rate 2021.

Governat e	Femal e (N)	Female Rate/100 k	Female %	Mal e (N)	Male Rate/100 k	Male %	Tota l (N)	Total Rate/100 k	Total %
Ajloun	13	13.13	4.60%	12	11.65	3.00%	25	12.25	3.60%
Amman	131	6.09	46.30%	179	7.18	44.50%	310	6.68	45.30%
Aqaba	9	9.51	3.20%	13	10.54	3.20%	22	10.10	3.20%
Balqa	11	4.17	3.90%	15	4.90	3.70%	26	4.56	3.80%
Irbid	49	4.99	17.30%	64	6.04	15.90%	113	5.51	16.50%
Jarash	4	3.04	1.40%	6	4.00	1.50%	10	3.64	1.50%
Karak	10	5.71	3.50%	19	9.92	4.70%	29	7.91	4.20%
Ma'an	5	5.70	1.80%	9	9.39	2.20%	14	7.63	2.00%
Madaba	8	7.74	2.80%	15	12.95	3.70%	23	10.50	3.40%
Mafrq	8	2.59	2.80%	27	8.22	6.70%	35	5.50	5.10%
Tafeileh	2	3.76	0.70%	3	5.15	0.70%	5	4.48	0.70%
Zarqa	33	4.43	11.70%	40	4.79	10.00%	73	4.62	10.70%
Total	283	5.44	100.00 %	402	6.87	100.00 %	685	6.20	100.00 %

Table 6: Incidence rate 2022.

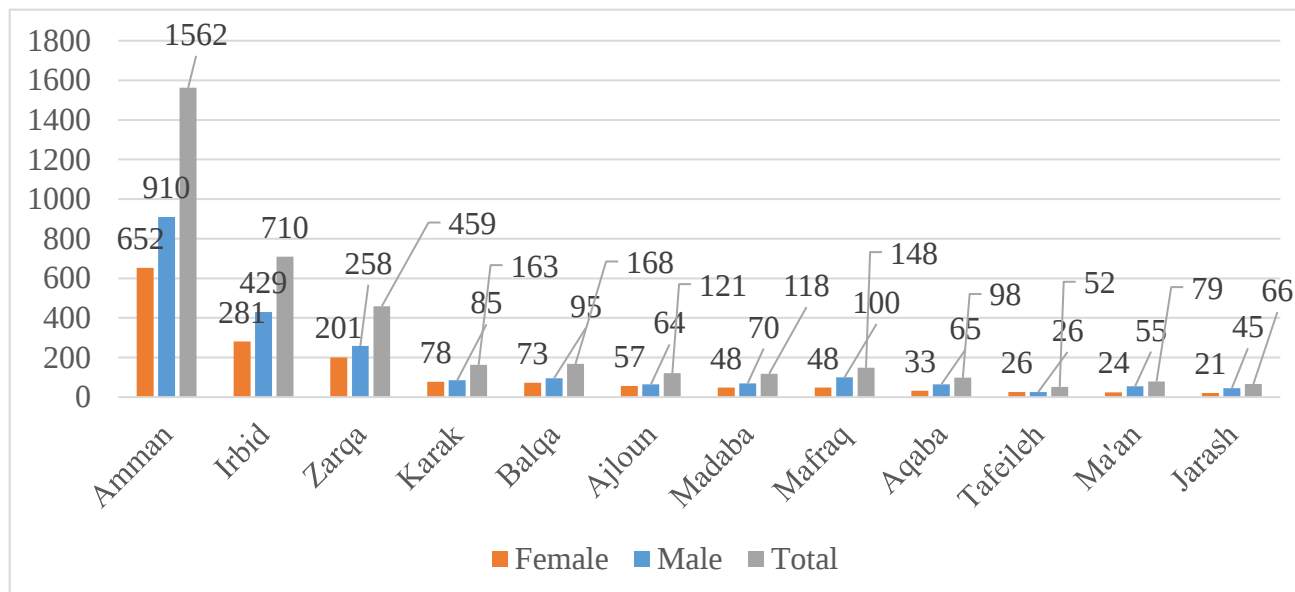
Governat e	Femal e (N)	Female Rate/100 k	Female %	Mal e (N)	Male Rate/100 k	Male %	Tota l (N)	Total Rate/100 k	Total %
Ajloun	16	14.91	4.10%	13	12.85	2.40%	29	13.91	3.10%
Amman	194	7.62	49.40%	265	12.06	48.00%	459	9.67	48.60%
Aqaba	7	5.55	1.80%	13	13.43	2.40%	20	8.98	2.10%
Balqa	14	4.48	3.60%	27	10.02	4.90%	41	7.04	4.30%
Irbid	68	6.28	17.30%	103	10.17	18.70%	171	8.16	18.10%
Jarash	4	2.74	1.00%	12	8.90	2.20%	16	5.70	1.70%
Karak	20	10.21	5.10%	22	12.29	4.00%	42	11.21	4.40%
Ma'an	2	2.04	0.50%	11	12.26	2.00%	13	6.93	1.40%
Madaba	7	5.91	1.80%	11	10.42	2.00%	18	8.04	1.90%
Ma'raq	16	4.77	4.10%	20	6.34	3.60%	36	5.53	3.80%
Tafeileh	4	6.71	1.00%	6	11.03	1.10%	10	8.77	1.10%
Zarqa	39	4.56	9.90%	49	6.38	8.90%	88	5.45	9.30%
Total	393	6.57	100.00 %	552	10.38	100.00 %	945	8.36	100.00 %

- **Total Cases by Governorate:**

The bar chart illustrates the distribution of total dialysis cases in Jordan across its 12 governorates, categorized by sex. Amman, being the most populous governorate, exhibits the highest total cases with 1562, comprising 652 females and 910 males. This trend aligns with Amman's status as the capital city and major urban center. Irbid follows with 710 total cases, reflecting a significant healthcare burden. Other governorates show varying degrees of dialysis cases, with Zarqa, Balqa, and Madaba also demonstrating relatively high numbers. Notably, Tafileh and Ma'an exhibit the lowest total cases, suggesting potential disparities in healthcare access or incidence rates in these areas.

Sex-wise, males consistently show higher numbers of cases across governorates, indicating potential gender-specific health trends or disparities in healthcare-seeking behavior. This data underscores the importance of targeted healthcare interventions and resource allocation to address regional disparities and mitigate the burden of dialysis across Jordan.

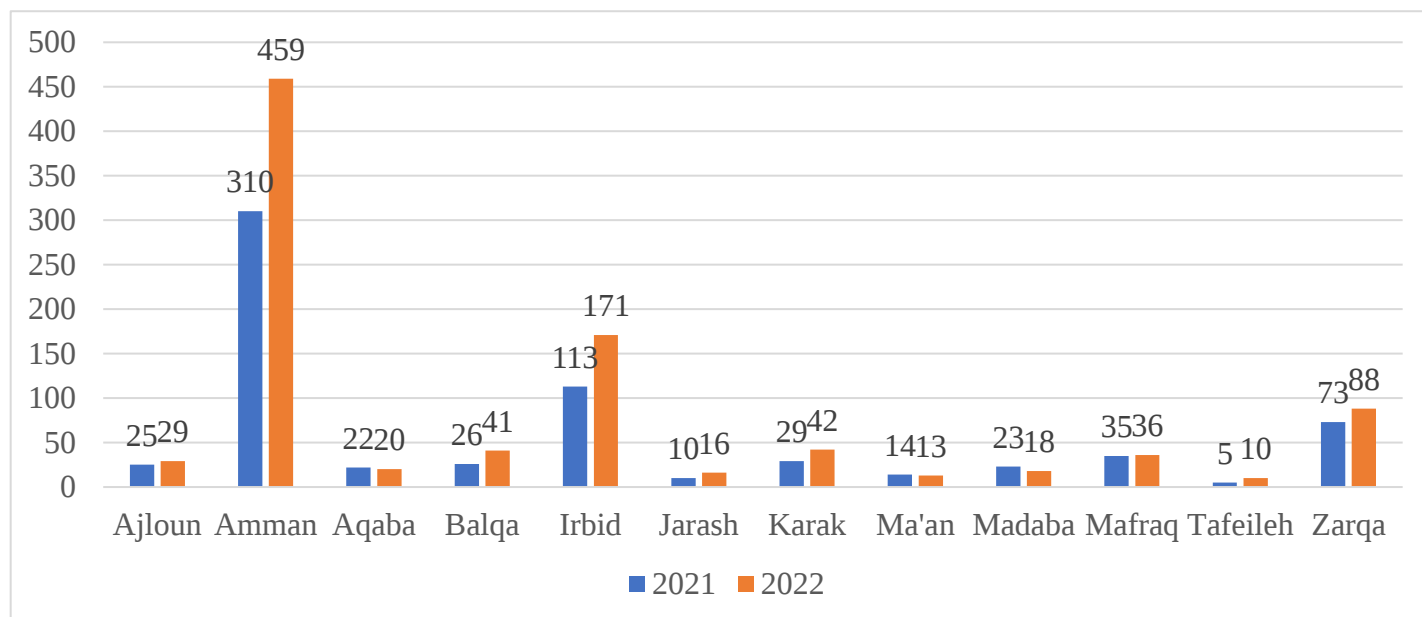
Figure 5 Total Cases by Governorate 2022.



- **New Cases by governorate.**

The bar chart presents the new cases of dialysis in Jordan across its 12 governorates for the years 2021 and 2022. Across the board, there appears to be an increase in new cases from 2021 to 2022, with most governorates showing higher numbers in the latter year. Notably, Amman, being the most populous governorate, exhibits a considerable rise from 310 new cases in 2021 to 459 cases in 2022, reflecting a substantial increase in dialysis incidence. Similarly, Irbid, Zarqa, and Karak also show notable upticks in new cases from 2021 to 2022. However, some governorates like Madaba and Aqaba demonstrate decreases in new cases in 2022 compared to 2021. These variations could indicate shifts in healthcare access, awareness, or underlying health conditions across different regions. Overall, the data highlights the importance of ongoing monitoring and intervention to address the increasing burden of dialysis and ensure equitable access to healthcare services across Jordan's governorates.

Figure 6 : New Cases by Governorate.



- **New Cases by Age Groups 2021 -2022**

After analyzing of age and sex distribution data from 2021 to 2022, several key trends emerge. Firstly, it is evident that across both years, the largest segments of the population are concentrated within the 50-59 and 60-69 age brackets. This suggests a notable emphasis on healthcare provision for middle-aged and older adults. Furthermore, there was also a noticeable shift in sex distribution, as there is a discernible uptick in the proportion of females across most age groups from 2021 to 2022. This phenomenon hints at potential shifts in healthcare-seeking behavior among women or underlying demographic changes within the studied population. Additionally, the overall dataset size notably expands from 685 individuals in 2021 to 945 in 2022, indicating either a substantial increase in the number of individuals seeking medical attention or a broader sampling scope. This growth underscores the importance of continually monitoring and adapting healthcare strategies to effectively address the evolving needs of diverse demographic groups.

Figure 7: New Cases by Age Groups 2021-2022.

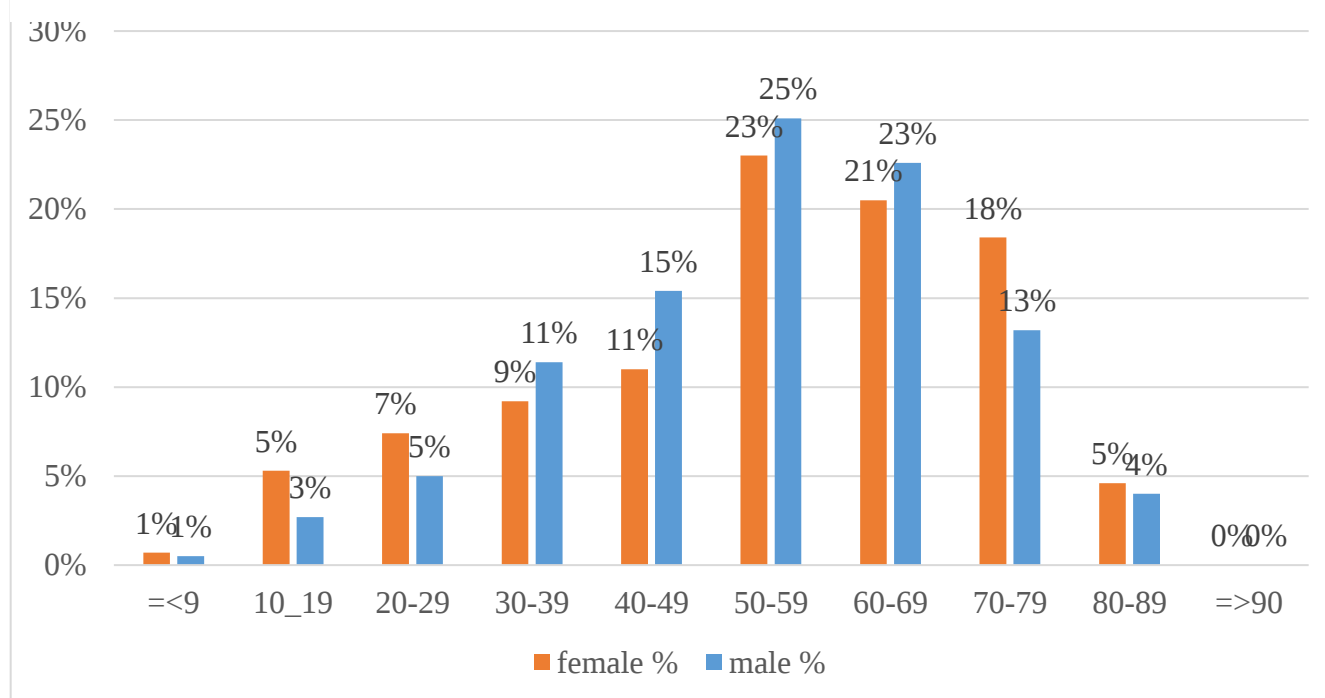
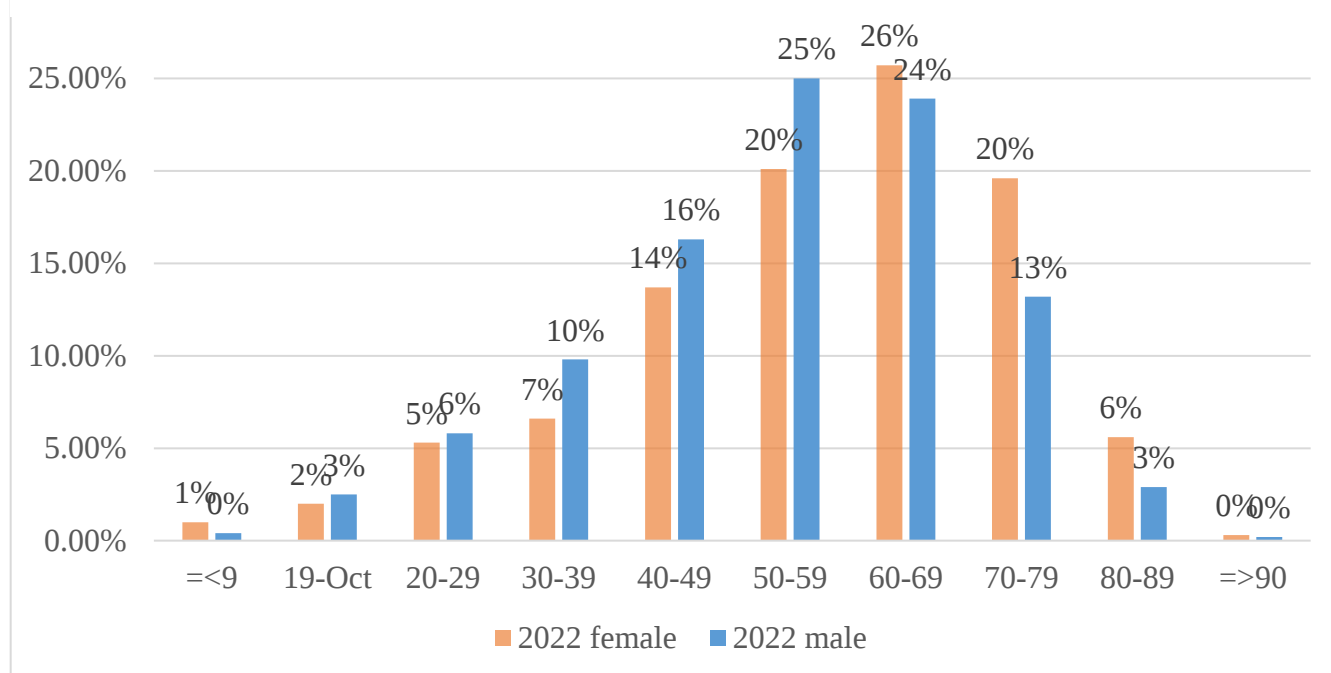


Figure 8: New Cases by Age Groups 2022.



- **Primary cause of ESRD 2021-2022.**

The Pareto chart illustrating the primary causes of dialysis in Jordan offers valuable insights into the prevalence and distribution of kidney diseases within the country's population. Hypertension (HTN) emerges as the leading cause, accounting for a significant proportion at 45.80%. This underscores the importance of hypertension management and control strategies in reducing the burden of kidney disease in Jordan. Diabetes mellitus (DM) follows as the second most common cause, representing 24.30% of dialysis cases. This highlights the strong association between diabetes and kidney disease, emphasizing the need for effective diabetes prevention and management programs to mitigate the risk of kidney complications. Glomerulonephritis, accounting for 9.90% of cases, is another noteworthy cause, indicating the importance of addressing immune-mediated kidney diseases in Jordan's healthcare policies and initiatives.

The presence of a relatively high percentage of cases classified as "Unknown" at 8.90% suggests the need for improved diagnostic and reporting systems to better understand and address the underlying causes of kidney disease in the country.

Other causes such as congenital anomalies, polycystic kidney disease, and drug-induced nephropathy represent smaller but still significant proportions of cases, highlighting the diverse range of factors contributing to kidney disease in Jordan. With systemic lupus erythematosus (SLE) being identified as a cause, it adds another layer of complexity to the primary causes of dialysis in Jordan. While SLE accounts for a relatively small percentage at 0.90%, its inclusion highlights the significance of autoimmune diseases in contributing to kidney dysfunction.

Overall, this data underscores the multifactorial nature of kidney disease and the importance of comprehensive public health approaches targeting risk factors such as hypertension, diabetes, and immune-mediated conditions.

An examination of the primary causes of dialysis for the years 2021 and 2022 reveals critical insights into the prevalent health conditions driving individuals to undergo dialysis treatment. Hypertension (HTN) and Diabetes Mellitus (DM) consistently stand out as the leading causes of dialysis across both years. This recurrent pattern underscores the significant impact of these chronic conditions on the population's health and the imperative for healthcare interventions to address them effectively. However, notable changes are observed when comparing the data between the two years. Particularly noteworthy is the substantial increase in DM as the primary cause of dialysis from 2021 to 2022. This surge suggests potential shifts in disease prevalence, diagnostic criteria, or healthcare practices that warrant further investigation. Understanding the underlying factors contributing to these changes is essential for healthcare providers and policymakers to implement targeted prevention and management strategies, thereby mitigating the burden of chronic kidney disease and improving overall public health outcomes.

Table 7: Primary cause of Dialysis 2021-2022.

variable	2021						2022					
	female		male		total		female		male		total	
Primary cause	N	%	N	%	N	%	N	%	N	%	N	%
Congenital	9	3.2%	13	3.2%	22	3.2%	5	1.3%	11	2.0%	16	1.7%
DM	70	24.7%	99	24.6%	169	24.7%	109	27.7%	182	33.0%	291	30.8%
Drugs induced nephropathy	7	2.5%	10	2.5%	17	2.5%	4	1.0%	13	2.4%	17	1.8%
Glomerulonephritis	24	8.5%	22	5.5%	46	6.7%	23	5.9%	39	7.1%	62	6.6%
HTN	129	45.6%	186	46.3%	315	46.0%	200	50.9%	242	43.8%	442	46.8%
Infection	6	2.1%	11	2.7%	17	2.5%	3	0.8%	2	0.4%	5	0.5%
Other	11	3.9%	18	4.5%	29	4.2%	16	4.1%	25	4.5%	41	4.3%
Polycystic kidney	12	4.2%	17	4.2%	29	4.2%	5	1.3%	13	2.4%	18	1.9%
SLE	1	0.4%	2	0.5%	3	0.4%	7	1.8%	3	0.5%	10	1.1%
Unknown	12	4.2%	19	4.7%	31	4.5%	15	3.8%	19	3.4%	34	3.6%
Vesical ureteric reflux	2	0.7%	5	1.2%	7	1.0%	6	1.5%	3	0.5%	9	1.0%
Total	283	100.0%	402	100.0%	685	100.0%	393	100.0%	552	100.0%	945	100.0%

- **Total Cases by health sector 2021-2022**

An analysis of the dialysis sector data for the years 2021 and 2022 reveals intriguing insights into the distribution of individuals receiving dialysis across different sectors. Firstly, it is evident that the private sector consistently accommodates the highest number of individuals requiring dialysis in both years. This finding highlights the substantial reliance on private healthcare services for dialysis within the studied population. However, notable shifts are observed when comparing the data between the two years. Specifically, there is a notable increase in the number of individuals receiving dialysis in the governmental and military sectors from 2021 to 2022.

These shifts suggest potential changes in the healthcare landscape of Jordan, with a growing reliance on private sector dialysis services. The decrease in the percentage of services provided by governmental facilities could reflect challenges such as resource constraints or changes in healthcare policies. Meanwhile, the increase in university hospital provision may indicate efforts to expand dialysis services within academic healthcare settings. Overall, understanding these trends is crucial for healthcare planning and resource allocation to ensure equitable access to dialysis services across different sectors in Jordan.

Figure 9: Total Cases by health sector -2021.

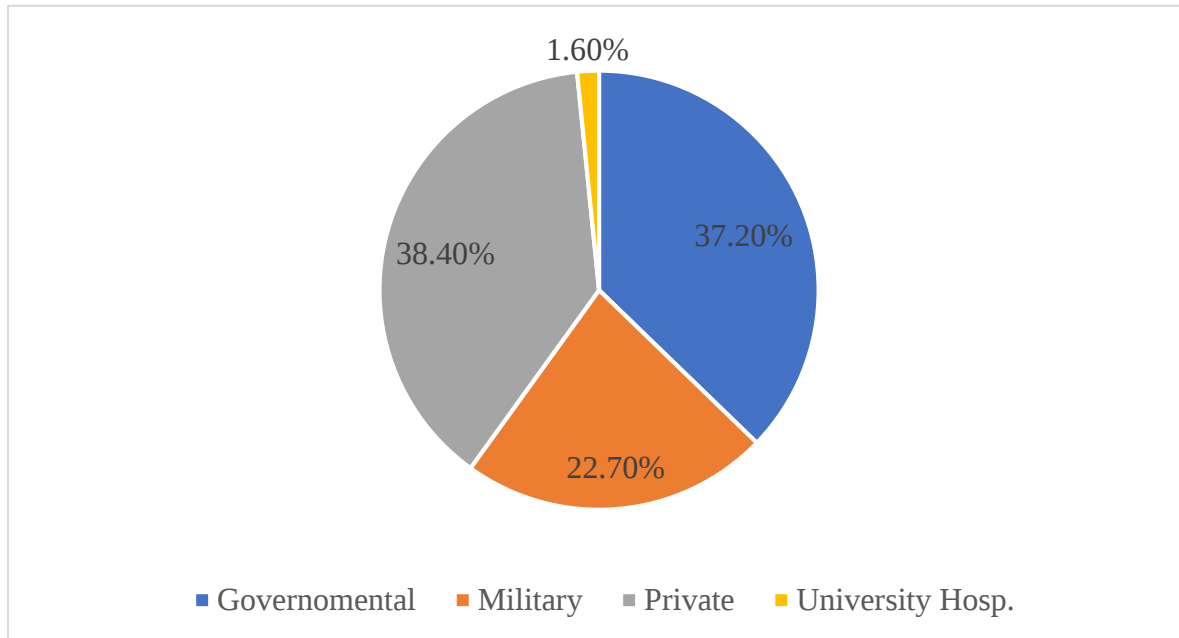
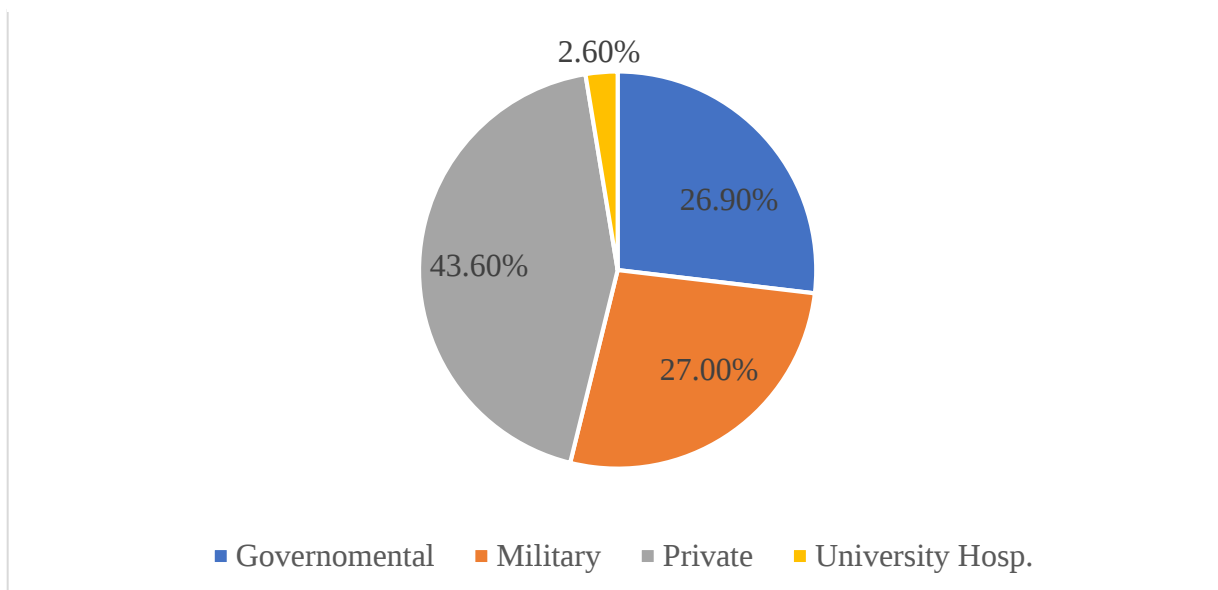


Figure 10: Total Cases by health sector -2022.



- **Insurance type 2021-2022:**

The analysis of insurance coverage among patients for the years 2021 and 2022 reveals notable patterns and changes across different insurance schemes. In 2021, the Renal Fund constituted the largest proportion of insurance coverage (46.3%), followed by Governmental insurance (28.8%), Military insurance (23.3%), Private insurance (1.0%), and No insurance (0.7%). By 2022, the Renal Fund remained the predominant source of coverage (45.2%), although with a slight decline compared to 2021. Governmental insurance coverage also decreased to 24.4%, whereas Military insurance showed an increase to 27.7%. Private insurance remained minimal (0.6%), and the proportion of patients without insurance increased from 0.7% in 2021 to 2.1% in 2022.

Gender distribution within insurance categories shows consistent trends. Males were more represented in the Renal Fund in both years (48.7% in 2021 and 47.6% in 2022) compared to females (42.7% and 41.7%, respectively). Conversely, females were slightly more represented in Military insurance in 2022 (30.0%) compared to males (26.1%). The increase in patients without insurance, particularly among males (rising from 0.3% in 2021 to 2.2% in 2022), highlights a potential gap in accessibility or coverage.

Overall, the results suggest a gradual shift from Governmental to Military insurance, alongside a concerning rise in uninsured patients. These findings may indicate policy changes, socioeconomic influences, or differences in patient enrollment dynamics that warrant further exploration.

Table 8: Insurance type by gender 2021-2022

variable	2021						2022					
	female		male		total		female		male		total	
Insurance	N	%	N	%	N	%	N	%	N	%	N	%
Renal Fund	105	42.7%	173	48.7%	278	46.3%	143	41.7%	239	47.6%	382	45.2%
Governmental	71	28.9%	102	28.7%	173	28.8%	87	25.4%	119	23.7%	206	24.4%
Military	64	26.0%	76	21.4%	140	23.3%	103	30.0%	131	26.1%	234	27.7%
Private	3	1.2%	3	0.8%	6	1.0%	3	0.9%	2	0.4%	5	0.6%
No Insurance	3	1.2%	1	0.3%	4	0.7%	7	2.0%	11	2.2%	18	2.1%
Total	246	100.0%	355	100.0%	601	100.0%	343	100.0%	502	100.0%	845	100.0%

- **Number of Dialysis Sessions per week by sex.**

The distribution of dialysis sessions per week provides insights into treatment intensity and adherence over the two-year period. In 2021, the majority of patients (82.5%) underwent three dialysis sessions per week, consistent with standard clinical guidelines. This proportion declined slightly in 2022 to 75.5%. The reduction in three-session adherence was accompanied by an increase in the proportion of patients receiving two sessions per week, which rose from 16.0% in 2021 to 23.9% in 2022. The proportion of patients attending only one or four sessions per week remained negligible across both years.

Gender distribution demonstrates that males were consistently more likely to adhere to the three-session regimen (84.4% in 2021; 78.4% in 2022) compared to females (79.7% and 71.4% in the respective years). Conversely, females showed a higher proportion of receiving two sessions per week in 2022 (28.0%) compared to males (21.0%). This shift may reflect differences in clinical decision-making, patient compliance, or resource availability.

The overall decline in adherence to the recommended three-session schedule between 2021 and 2022 raises concerns regarding treatment adequacy and long-term patient outcomes. Such a trend necessitates closer evaluation of contributing factors, including healthcare system capacity, patient-related barriers, and possible financial constraints.

Table 9: Number of Dialysis Sessions per week by sex.

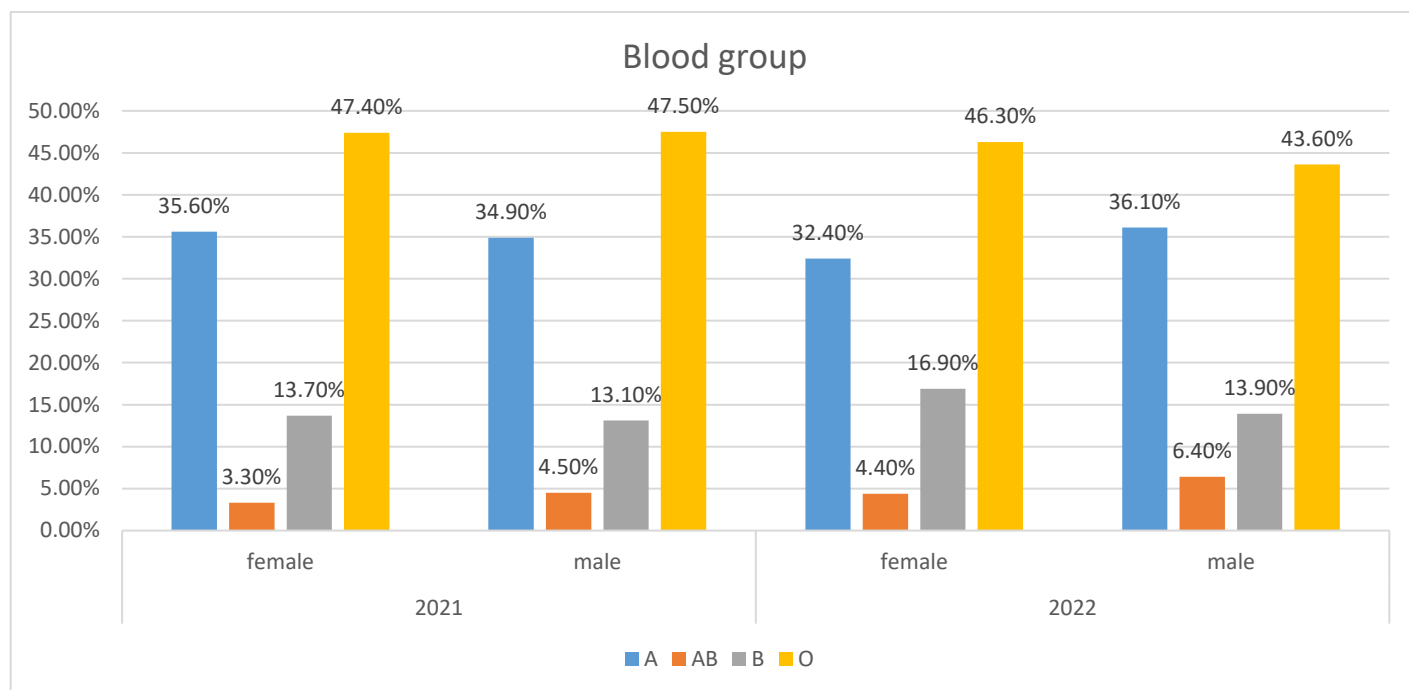
year	2021						2022					
	female		male		total		female		male		total	
Sessions / Week	N	%	N	%	N	%	N	%	N	%	N	%
1	2	0.80%	3	0.90%	5	0.80%	2	0.60%	1	0.20%	3	0.40%
2	45	18.70%	50	14.20%	95	16.00%	98	28.00%	104	21.00%	202	23.90%
3	192	79.70%	297	84.40%	489	82.50%	250	71.40%	388	78.40%	638	75.50%
4	2	0.80%	2	0.60%	4	0.70%	0	0.00%	2	0.40%	2	0.20%
Total	241	100.00%	352	100.00%	593	100.00%	350	100.00%	495	100.00%	845	100.00%

- **Blood group by sex 2021-2022.**

The blood group distribution was dominated by group O in both years, followed by group A, with groups B and AB comprising smaller shares. Weighted by the sample sizes in each year (2021: N=601; 2022: N=845), the overall distribution shifted modestly between 2021 and 2022 as follows: O decreased from 47.5% to 44.7%, A decreased slightly from 35.2% to 34.6%, B increased from 13.3% to 15.1%, and AB increased from 4.0% to 5.6%.

Gender patterns revealed nuanced changes. Among females, the proportion of group A declined (35.6% → 32.4%), while group B increased (13.7% → 16.9%). Among males, group A rose slightly (34.9% → 36.1%), and AB increased (4.5% → 6.4%). Group O remained the most prevalent in both genders, though it declined more in males (47.5% → 43.6%) than in females (47.4% → 46.3%).

Figure 11:ESRD by Blood group 2021-2022.



- **Prevalence of non-communicable diseases (NCDs) among (ESRD) from 2013 to 2022.**

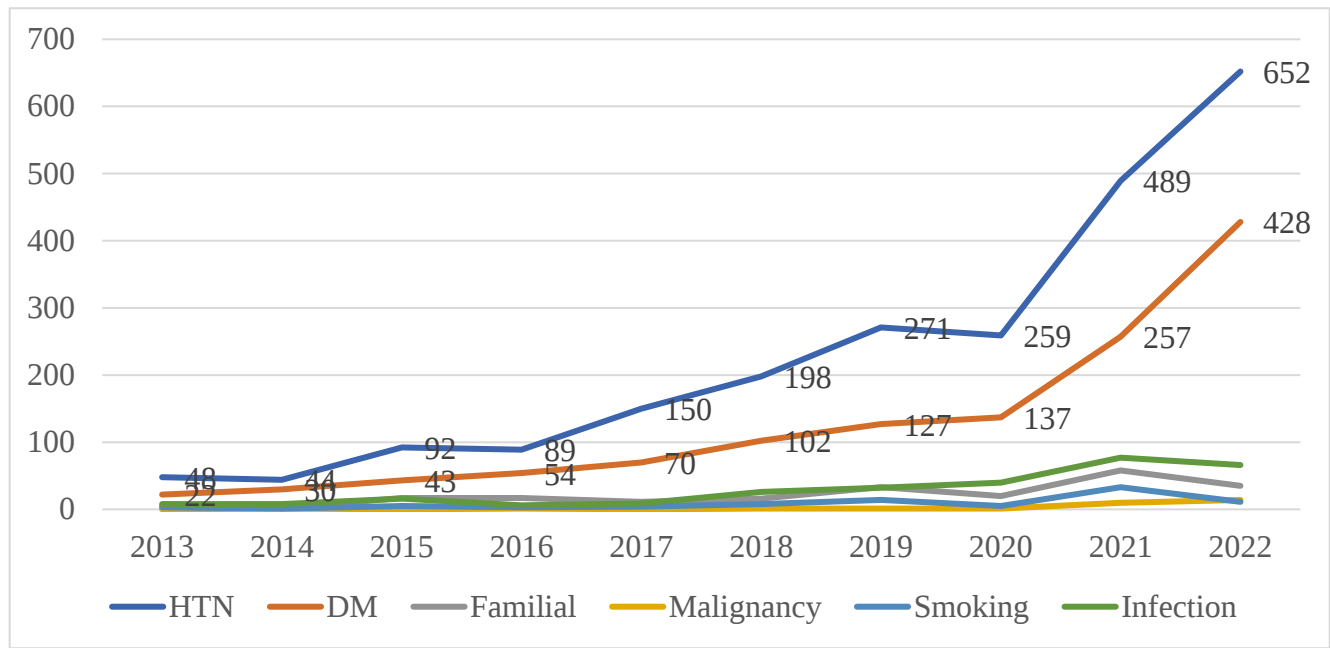
The data extracted from the linear chart provides insights into the prevalence of non-communicable diseases (NCDs) among end-stage renal disease (ESRD) patients in Jordan over a ten-year period from 2013 to 2022. The chart displays the number of cases of various NCDs, including hypertension (HTN), diabetes mellitus (DM), familial diseases, malignancies, smoking-related diseases, and infections, represented by different colored lines.

Throughout the years, hypertension consistently emerges as the most prevalent NCD among ESRD patients, with a prevalence of 68% by the year 2022. Diabetes mellitus also exhibits a substantial prevalence of 36%. Familial diseases, malignancies, smoking-related diseases, and infections show lower but still notable prevalence rates, ranging from 1% to 9%.

The data underscores the significant burden of NCDs among ESRD patients in Jordan, with hypertension and diabetes mellitus being the most common comorbidities. The prevalence rates provide valuable insights into the epidemiology of NCDs in this population, highlighting the need for comprehensive management strategies to address these conditions and their impact on

renal health. Additionally, the temporal trends depicted in the chart suggest the importance of continuous monitoring and proactive interventions to mitigate the progression and complications of NCDs among ESRD patients in Jordan.

Figure 12: prevalence of non-communicable diseases (NCDs) among (ESRD).



DISCUSSION

The 2021–2022 ESRD data in Jordan reveal a rapidly escalating public health challenge, marked by a substantial increase in both total dialysis patients and new cases. The total number of dialysis patients rose from 2,799 in 2021 to 3,744 in 2022, representing a nearly 34% increase, while new cases increased from 685 to 945 over the same period. Geographic analysis highlights the predominance of the Middle region, particularly Amman, which consistently recorded the highest incidence rates, followed by Irbid and Zarqa, whereas the South region remained comparatively less affected. Demographically, males constitute the majority of cases, with a male-to-female ratio of 1.43:1 in 2022, and the 45–69 age group remains the most affected, emphasizing the burden of ESRD on the economically productive population. Notably, the proportion of females among new cases has risen, suggesting evolving demographic patterns.

Hypertension remains the leading cause of ESRD, responsible for nearly half of cases, while diabetes mellitus shows a significant increase as a primary contributor, highlighting the ongoing impact of non-communicable diseases on kidney health. Other causes, including glomerulonephritis, congenital anomalies, and drug-induced nephropathy, are less frequent, and a decline in cases with "unknown" etiology reflects improvements in diagnostic and reporting systems. The healthcare landscape demonstrates a shift toward the private sector, which managed 44% of dialysis cases in 2022, with the government sector showing a relative decline. Overall insurance coverage remains high, yet the small increase in uninsured patients underscores gaps in access. Treatment patterns show a majority of patients receiving three dialysis sessions per week, though adherence declined slightly in 2022, raising concerns about treatment adequacy. Persistent anemia, ongoing co-morbidities, and the growing kidney transplantation waiting list highlight clinical challenges, while low rates of HBV and HCV infection

indicate successful infection control measures. The transition to the Jordan Interactive Electronic Reporting System (JIERS) has improved data accuracy and timeliness, supporting the National Registry's critical role in evidence-based planning and resource allocation.

It is important to interpret these trends in the context of data quality considerations. Some discrepancies between the 2021 and 2022 reports can be attributed to differences in data collection and reporting methodologies. Data for 2021 and earlier reports relied on manual entry, which may have contributed to delays or duplication in updating patient records. Regarding the 2021 and earlier reports, there was no reference or comparison with the Civil Registry system to verify patient deaths, which may have affected the accuracy of the final counts. Moreover, data during 2021 were not fully integrated with the datasets used for the 2021 and 2022 reports, and only information entered into the electronic system was considered, which may explain part of the apparent discrepancies. The involvement of multiple entities responsible for kidney patient data, and the distribution of responsibilities across different directorates within the Ministry and other institutions such as the Health Insurance system, made it difficult to obtain reliable and unified figures. In addition, some of these entities did not rely on standardized electronic systems for case entry, limiting their ability to filter information and accurately track patient deaths. Subsequent efforts have focused on improving data quality through the implementation of integrated electronic systems and enhanced coordination with relevant institutions, ensuring greater accuracy and timeliness in reporting.

Collectively, these findings underscore the urgent need for targeted interventions, enhanced management of hypertension and diabetes, expansion of transplantation programs, and continued monitoring to address regional disparities and improve outcomes for ESRD patients in Jordan.