

# THE GLOBAL KIDNEY HEALTH ATLAS

<Congress title>

Date

# Overview



- Aim
- Methods
- Key Results
- Implications

# Aim of the Global Kidney Health Atlas



To understand, compare and monitor how different countries around the world detect, treat, monitor and advocate for people with kidney disease (AKI or CKD)

**Key focus on availability, accessibility, affordability and quality of ESKD care**

# Global Kidney Health Atlas Survey





# Design and scope

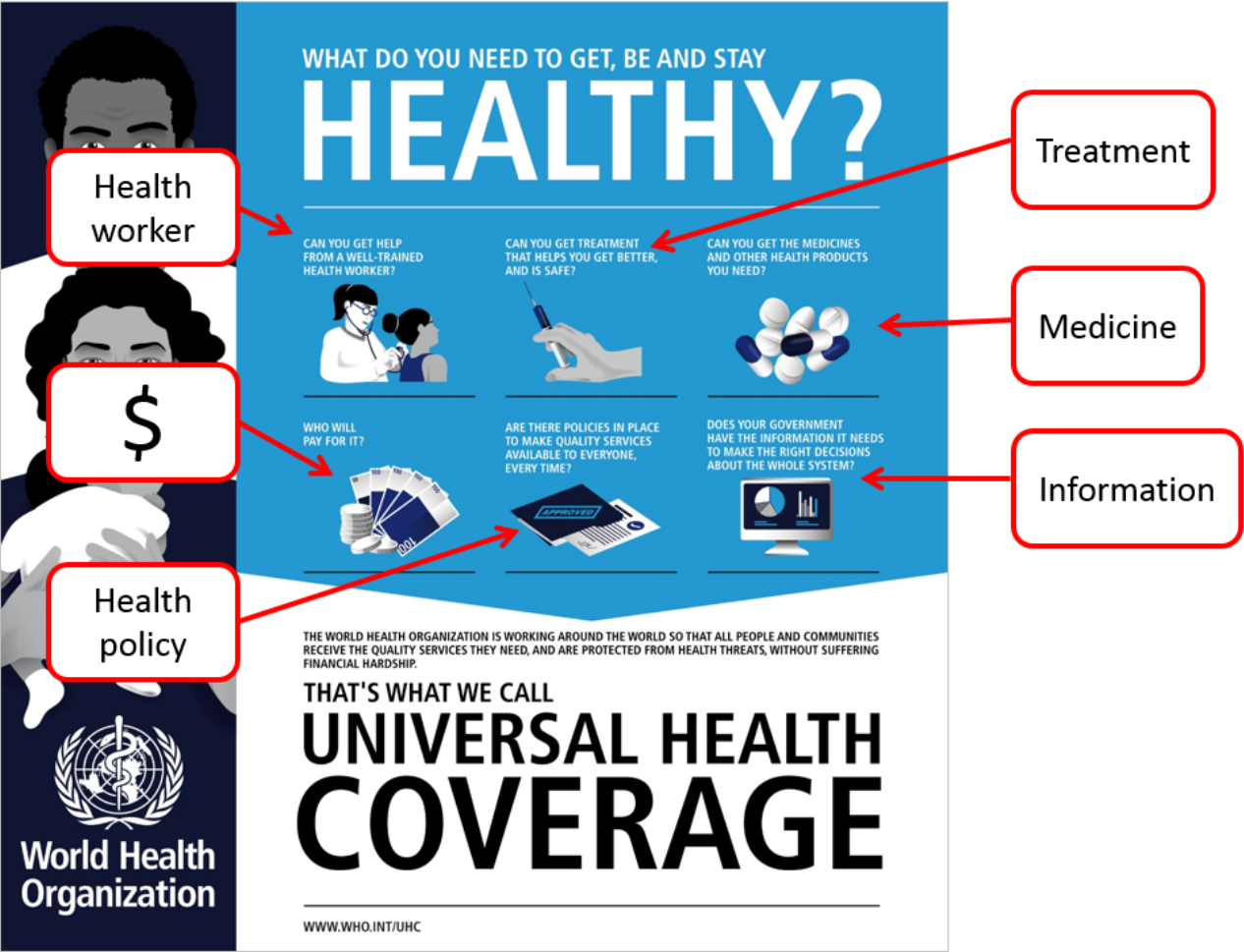
## **Desk research (across countries and regions)**

- Published and grey literature review
- Systematic review ESKD burden and outcomes
- Data extraction from major renal registries (USRDS, ERA-EDTA) and relevant national registries where available
- Scoping review of KRT cost estimates

## **Online questionnaire-based survey July – September 2018**

- 3 languages (English, French, Spanish)
- Across 182 countries
- ≥3 stakeholders per country
  - National nephrology society leadership
  - Healthcare policymakers
  - Patients / patient advocacy groups
- Discrepancies resolved by follow-up conferences with regional and country nephrology leaders

# Overall survey components



# Overall GKHA response

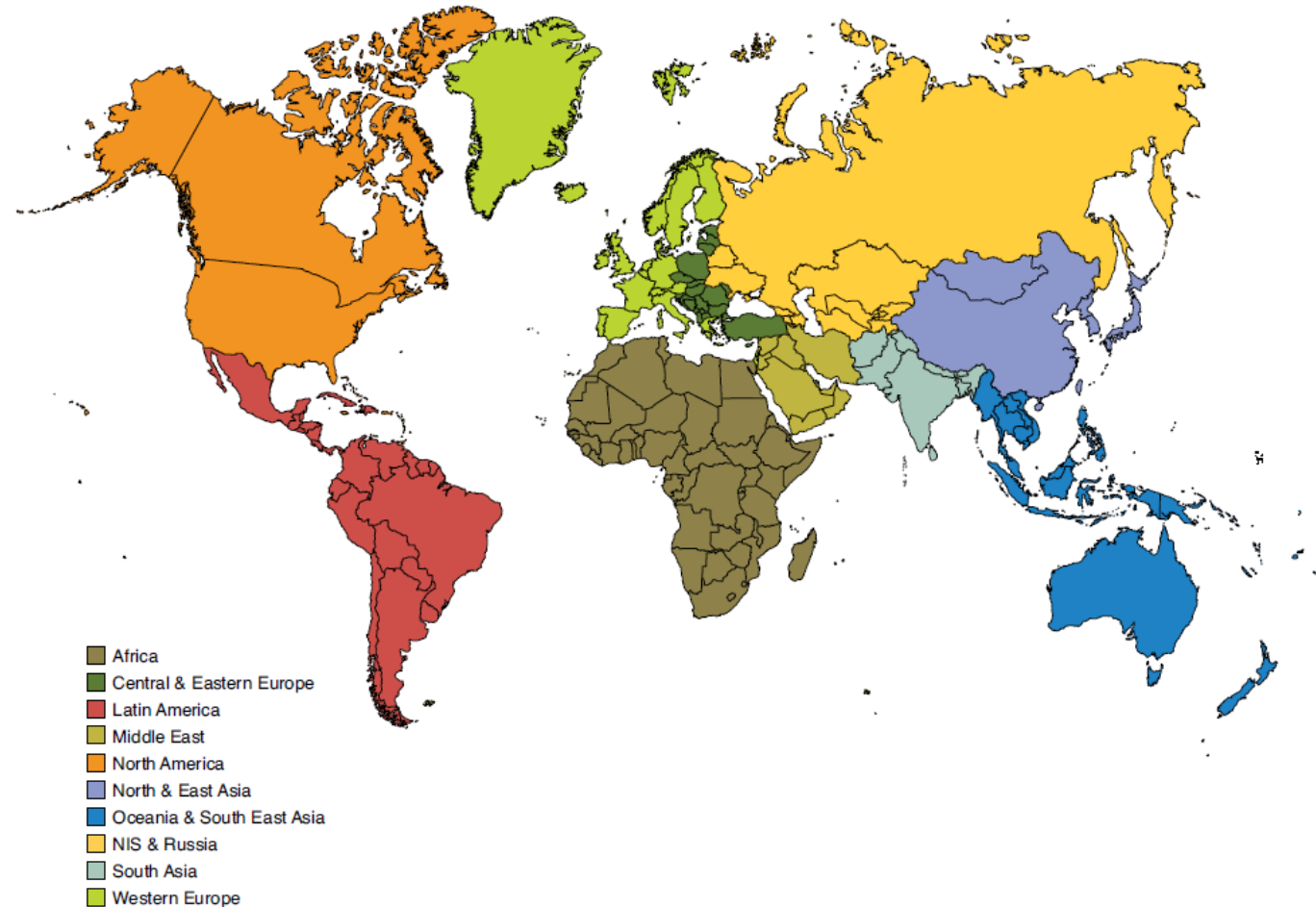
■ Participated in survey   ■ Did not participate in survey



**160 countries (88%)**  
**99% world's population**  
**317 individuals (69%) response**  
**3 respondents/country (IQR 2-4)**

**113 countries participated**  
**in both GKHA surveys**

# Results presented by ISN regions



# ISN Region: Middle East



# Demographics

Country	World bank ranking	Area (sq km)	Total population (2018)	GDP (PPP) (\$ billion)	Total health expenditures (% of GDP)
<b>Bahrain</b>	High income	760	1,442,659	71.17	4.9
<b>Iran, Islamic Rep.</b>	Upper middle income	1,648,195	83,024,745	1640	7.6
<b>Iraq</b>	Upper middle income	438,317	40,194,216	649.3	5.5
<b>Jordan</b>	Upper middle income	89,342	10,458,413	89	6.9
<b>Kuwait</b>	High income	17,818	2,916,467	289.7	4
<b>Lebanon</b>	Upper middle income	10,400	6,100,075	88.25	7.4
<b>Oman</b>	High income	309,500	3,494,116	190.1	3.8
<b>Qatar</b>	High income	11,586	2,363,569	339.5	3.1
<b>Saudi Arabia</b>	High income	2,149,690	33,091,113	1775	5.8
<b>Syrian Arab Republic</b>	Low income	185,180	19,454,263	50.28	3.3
<b>United Arab Emirates</b>	High income	83,600	9,701,315	696	3.5
<b>West Bank and Gaza</b>	Lower middle income	6,220	4,635,207	21.22	-
<b>Yemen</b>	Low income	527,968	28,667,230	73.63	6.0

‘ – ’ : data not reported/unavailable



# CKD and its risk factors burden

Country	CKD Prevalence % (95% CI)	Death attributed to CKD % (95% CI)	DALYS attributed to CKD % (95% CI)	Obesity % (95% CI)	Increased BP % (95% CI)
Bahrain	9.28 (8.4 - 10.12)	4 (3.59 - 4.32)	1.88 (1.64 - 2.13)	28.7 (23.5 - 34.2)	21.4 (15.7 - 27.8)
Iran, Islamic Rep.	10.57 (9.78 - 11.48)	2.67 (2.47 - 2.78)	1.5 (1.38 - 1.63)	25.5 (22.2 - 28.9)	19.7 (15.2 - 24.6)
Iraq	7.38 (6.85 - 7.99)	3.09 (2.82 - 3.31)	1.55 (1.41 - 1.69)	27.4 (22.7 - 32.4)	25.2 (19.1 - 31.6)
Jordan	7.37 (6.84 - 7.99)	4.66 (4.22 - 5.05)	2 (1.76 - 2.24)	33.4 (29.0 - 37.9)	21.0 (15.8 - 26.9)
Kuwait	8.39 (7.74 - 9.12)	2.29 (2.1 - 2.6)	1.27 (1.12 - 1.43)	37.0 (32.2 - 42.0)	23.6 (17.9 - 30.0)
Lebanon	8.31 (7.7 - 9.07)	1.77 (1.59 - 1.99)	1.14 (1.02 - 1.27)	31.3 (26.2 - 36.6)	20.7 (15.4 - 26.8)
Oman	7.42 (6.82 - 8.07)	2.26 (1.84 - 2.5)	1.29 (1.14 - 1.45)	22.9 (18.3 - 27.9)	24.8 (18.9 - 31.5)
Qatar	7.13 (6.46 - 7.79)	3.07 (2.6 - 3.33)	1.3 (1.13 - 1.48)	33.9 (27.7 - 40.5)	22.4 (16.1 - 29.8)
Saudi Arabia	7.2 (6.64 - 7.82)	4.04 (3.31 - 4.46)	2.02 (1.73 - 2.28)	35.0 (30.5 - 39.5)	23.3 (18.0 - 29.2)
Syrian Arab Republic	8.02 (7.34 - 8.73)	1.97 (1.8 - 2.36)	1.16 (1.05 - 1.29)	25.8 (20.7 - 31.3)	24.5 (18.7 - 30.8)
United Arab Emirates	7.67 (6.94 - 8.42)	3.14 (2.69 - 3.55)	1.8 (1.54 - 2.08)	29.9 (24.0 - 36.0)	21.1 (15.2 - 28.0)
West Bank and Gaza	-	-	-	-	-
Yemen	5.24 (4.85 - 5.71)	1.19 (1.08 - 1.35)	0.75 (0.68 - 0.84)	14.1 (10.8 - 17.8)	30.7 (23.3 - 38.7)

## Abbreviations:

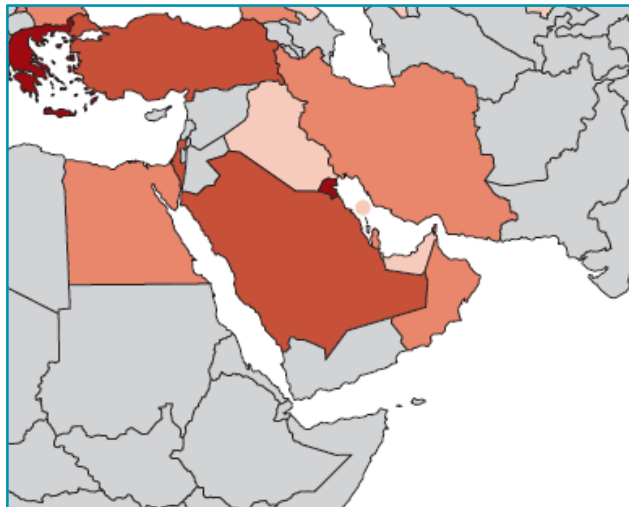
CKD (Chronic Kidney Disease),  
DALYS (disability-adjusted life years),  
BP (blood pressure),  
CI (confidence interval)

Data sources: GBD study database  
(<http://www.healthdata.org/gbd>),  
WHO data observatory  
(<https://www.who.int/gho/en/>)

‘ - ’ : data not reported/unavailable

# Burden of ESKD

## Prevalence of treated ESKD



<433.0 pmp 433.0–759.0 pmp 759.1–1048.0 pmp >1048.0 pmp Data not reported

Treated ESKD: all dialysis + transplant

\* pmp (per million population)

Data sources: Abu-Aisha & Elamin (Peritoneal Dialysis International) 2010, Jain et al. (JASN) 2012, Liyanage et al. (The Lancet) 2015, 2017/2018 USRDS Annual Data Report

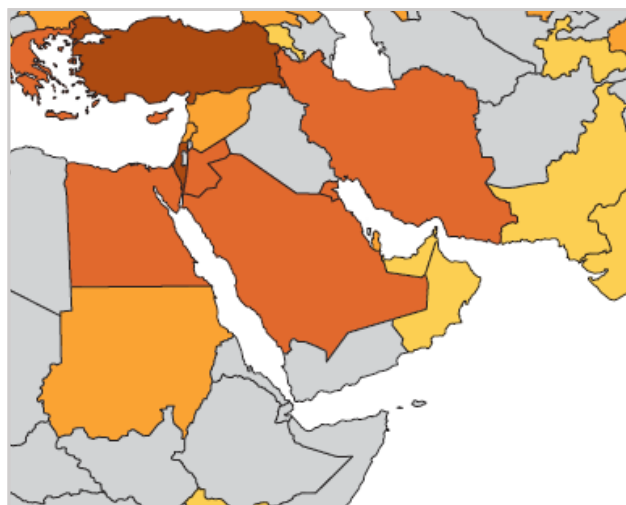
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Country	Treated ESKD		Chronic dialysis (HD+PD)		Chronic Hemodialysis		Chronic Peritoneal dialysis	
	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence	Incidence	Prevalence
Bahrain	207.5	339.7	-	250.2	-	-	-	-
Iran, Islamic Rep.	81	654	-	343	-	211.4	-	17.6
Iraq	-	251	-	145	-	-	-	-
Jordan	-	-	-	446.3	-	428.9	-	17.4
Kuwait	141	787	-	424	-	263.3	-	41.3
Lebanon	-	-	-	694	-	668.5	-	25.5
Oman	120	670	-	358	-	250	-	10.9
Qatar	123	618	-	341	-	296.4	-	104.5
Saudi Arabia	145	826	-	557	-	409.5	-	35
Syrian Arab Republic	-	-	-	155.1	-	149.1	-	6
United Arab Emirates	-	152	-	201.4	-	184.1	-	17.3
West Bank and Gaza	-	-	-	-	-	-	-	-
Yemen	-	-	-	108.4	-	99.1	-	9.3



# Burden of ESKD (cont'd)

## Incidence of kidney transplantation



■ <5.2 pmp 
 ■ 5.2–13.5 pmp 
 ■ 13.6–37.8 pmp 
 ■ >37.8 pmp 
 ■ Data not reported

\* pmp (per million population)

Data sources: GODT database (<http://www.transplant-observatory.org/data-charts-and-tables/>)

‘ – ’: data not reported/unavailable

Country	Kidney transplantation				
	Incidence overall	Prevalence overall	Incidence of deceased donor	Incidence of living donor	Incidence of pre-emptive
Bahrain	-	52.7	-	-	-
Iran, Islamic Rep.	30.96	311	17.49	13.48	-
Iraq	-	106	-	-	-
Jordan	25.19	-	0	25.19	-
Kuwait	21.71	363	7.07	14.63	-
Lebanon	12.88	-	1.02	11.86	-
Oman	2.22	279	0	2.22	-
Qatar	11.74	277	2.61	9.13	-
Saudi Arabia	27.99	269	4.41	23.59	-
Syrian Arab Republic	12.73	-	0	12.73	-
United Arab Emirates	3.04	-	0	3.04	-
West Bank and Gaza	-	-	-	-	-
Yemen	-	-	-	-	-

# Annual cost of kidney replacement therapy components

Country	Hemodialysis	Peritoneal dialysis	Kidney Transplant (First year)	Kidney Transplant (later years)	HD/PD cost ratio
Bahrain	41,535	-	18,361	7,345	-
Iran, Islamic Rep.	13,619	13,026	11,129	-	1.05
Iraq	-	-	-	-	-
Jordan	15,860	9,855	26,839	14,058	1.61
Kuwait	-	-	-	-	-
Lebanon	19,489	20,075	-	-	0.97
Oman	-	-	-	-	-
Qatar	-	-	-	-	-
Saudi Arabia	50,739	42,444	113,935	15,272	1.20
Syrian Arab Republic	-	-	-	-	-
United Arab Emirates	41,535	-	18,361	7,345	-
West Bank and Gaza	17,259	-	17,465	3,176	-
Yemen	-	-	-	-	-

\*Cost is in \$US 2016

**Abbreviations:**

HD (hemodialysis),

PD (peritoneal dialysis)

Data sources: Al Arrayed et al. (2000), Ali et al. (2008), Al-Jedai et al. (2012), Al Saran & Sabry (2012), Al-Shdaifat et al. (2013), Batieha et al. (2007), Mahdawi-Mazdeh et al. (2008), Najafi et al. (2010), Nourbala et al.(2007), Rizk et al. (2016), van der Tol et al. (2019), Younis et al. (2015)

‘ - ’ : data not reported/unavailable

# Survey response



- 11 of 13 countries in Middle East (85%) responded to the 2018 survey
- This represents 87% of the region's population

# Country level scorecard

Countries		Availability of KRT and CKM				Funding for Medications		Availability and Distribution of Registry				Advocacy Group			Nephrology Workforce (PMP)	
		Chronic hemodialysis	Chronic peritoneal dialysis	Kidney transplantation	CKM	Dialysis medications	Transplant medications	CKD	Dialysis	Transplantation	AKI	CKD	AKI	ESKD/RRT	Nephrologists	Nephrologist trainees
<b>Middle East</b>																
Bahrain	2017														5.94	13.37
	2019															
Iran	2017														3.91	0.26
	2019														4.97	0.35
Iraq	2017														1.03	0.32
	2019														2.49	1.00
Jordan	2017														10.22	2.71
	2019														8.08	1.82
Kuwait	2017														10.76	19.72
	2019														10.29	24.00
Lebanon	2017														22.64	1.62
	2019														28.28	2.05
Oman	2017														30.42	1.22
	2019														20.03	2.86
Qatar	2017														11.39	2.73
	2019														15.87	2.12
Saudi Arabia	2017														17.66	1.80
	2019														8.46	15.94
Syria	2017														4.69	1.17
	2019														5.14	1.03
United Arab Emirates	2017														8.65	0.87
	2019														6.70	0.72
		Nephrologists density				Nephrology trainees density										
		<1.2 PMP				<0.3 PMP				1.2–10.0 PMP				1.5–3.7 PMP		
		1.2–10.0 PMP				0.3–1.4 PMP				10.1–22.9 PMP				>22.9 PMP		
		>22.9 PMP				>3.7 PMP										

Yes

No

N/A

## Abbreviations

KRT: kidney replacement therapy  
CKM: conservative kidney management  
CKD: chronic kidney disease  
AKI: acute kidney injury  
ESKD: end stage kidney disease  
RRT: renal replacement therapy

# Country level scorecard (cont'd)

Countries		Availability of KRT and CKM				Funding for Medications		Availability and Distribution of Registry				Advocacy Group			Nephrology Workforce (PMP)	
		Chronic hemodialysis	Chronic peritoneal dialysis	Kidney transplantation	CKM	Dialysis medications	Transplant medications	CKD	Dialysis	Transplantation	AKI	CKD	AKI	ESKD/RRT	Nephrologists	Nephrologist trainees
Middle East																
West Bank & Gaza	2017	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	No	Yes	No	2.15	0.00
	2019	Yes	No	Yes	No	Yes	Yes	No	No	No	No	No	No	Yes	3.04	0.00
Yemen	2017	Yes	No	Yes	No	No	No	No	Yes	Yes	No	Yes	No	No	0.22	1.87
	2019	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Nephrologists density		<1.2 PMP		1.2–10.0 PMP		10.1–22.9 PMP		>22.9 PMP								
Nephrology trainees density		<0.3 PMP		0.3–1.4 PMP		1.5–3.7 PMP		>3.7 PMP								

Yes

No

N/A

## Abbreviations

KRT: kidney replacement therapy

CKM: conservative kidney management

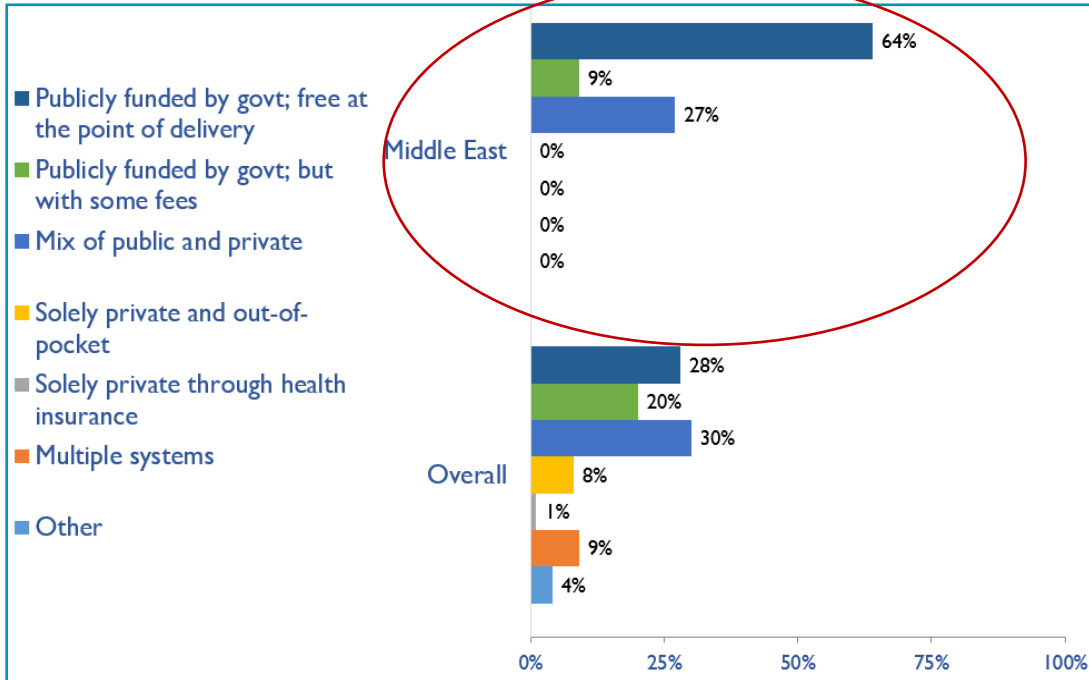
CKD: chronic kidney disease

AKI: acute kidney injury

ESKD: end stage kidney disease

RRT: renal replacement therapy

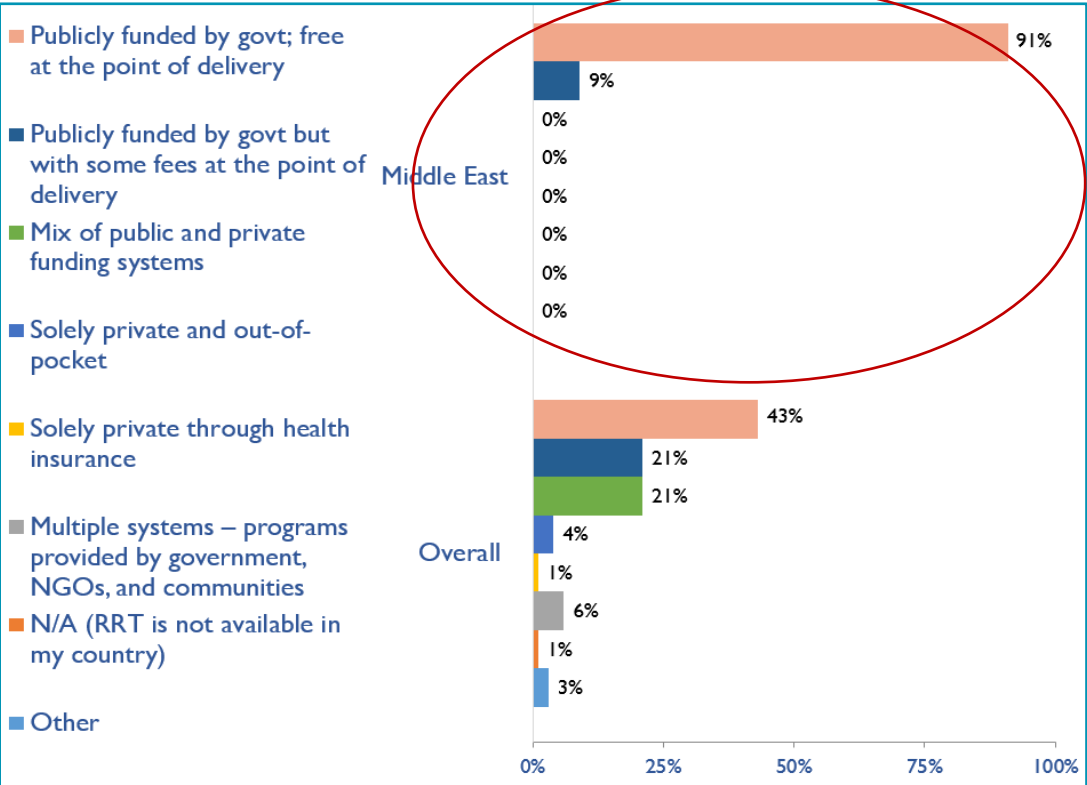
# Funding for non-dialysis CKD



Country	Publicly funded by govt; free at the point of delivery	Publicly funded by govt but with some fees at the point of delivery	Mix of public and private funding systems	Solely private and out-of-pocket	Solely private through health insurance	Multiple systems	Other
Iran, Islamic Rep.	X						
Iraq	X						
Jordan			X				
Kuwait	X						
Lebanon			X				
Oman	X						
Qatar		X					
Saudi Arabia			X				
Syrian Arab Republic	X						
United Arab Emirates	X						
West Bank and Gaza	X						

X : Yes

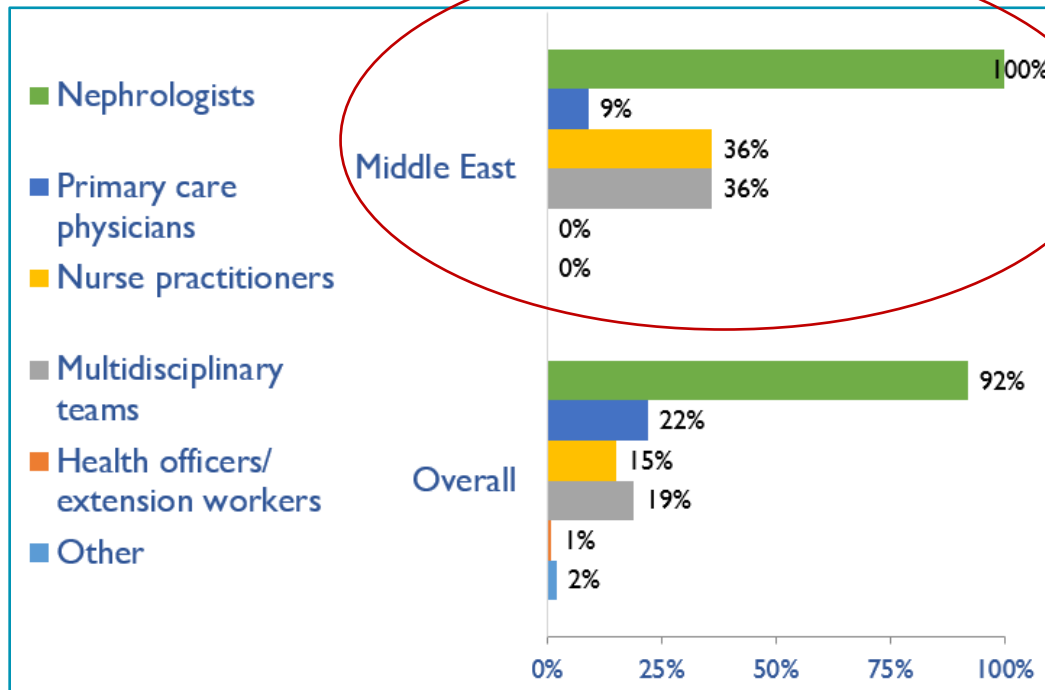
# Funding for kidney replacement therapy (KRT)



Country	Publicly funded by govt; free at the point of delivery	Publicly funded by govt but with some fees at the point of delivery	Mix of public and private funding systems	Solely private and out-of-pocket	Solely private through health insurance	Multiple systems	N/A (RRT is not available in my country)	Other
Iran, Islamic Rep.	X							
Iraq	X							
Jordan	X							
Kuwait	X							
Lebanon	X							
Oman	X							
Qatar		X						
Saudi Arabia	X							
Syrian Arab Republic	X							
United Arab Emirates	X							
West Bank and Gaza	X							

X : Yes

# Providers primarily responsible for ESKD care



Country	Nephrologists	Primary care physicians	Nurse practitioners or specialized nurses	Multidisciplinary teams	Health officers/extension workers	Other
Iran, Islamic Rep.	X		X			
Iraq	X					
Jordan	X					
Kuwait	X		X			
Lebanon	X			X		
Oman	X	X	X	X		
Qatar	X		X	X		
Saudi Arabia	X					
Syrian Arab Republic	X					
United Arab Emirates	X			X		
West Bank and Gaza	X					

X : Yes



# Shortage of ESKD care providers

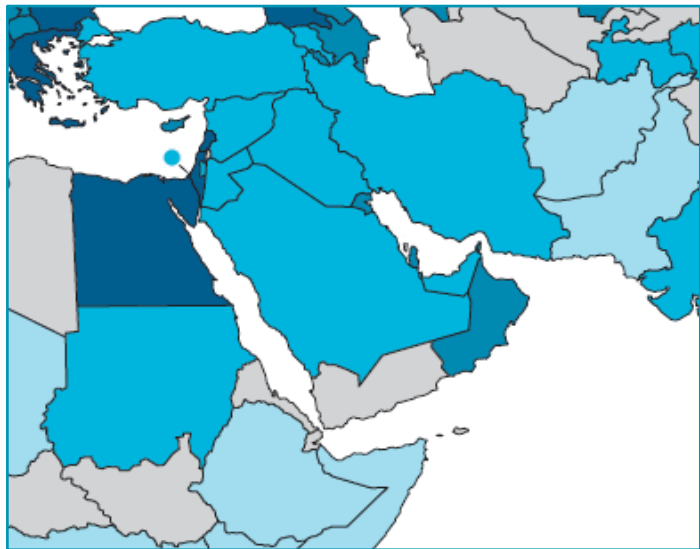
Country	Nephrologists	Transplant surgeons	Surgeons (HD access)	Surgeons (PD access)	Interventional radiologists (HD access)	Interventional radiologists (PD access)	Laboratory technicians	Dietitians	Radiologists (ultrasound)	Vascular access coordinators	Counsellors/psychologists	Transplant coordinators	Dialysis nurses	Dialysis technicians
Iran, Islamic Rep.	Shortage	No shortage	No shortage	Shortage	Shortage	Shortage	Shortage	No shortage	No shortage	Shortage	Shortage	Shortage	Shortage	No shortage
Iraq	Shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage
Jordan	No shortage	Shortage	No shortage	No shortage	Shortage	Shortage	Shortage	No shortage	No shortage	Shortage	Shortage	Shortage	No shortage	No shortage
Kuwait	Shortage	No shortage	No shortage	No shortage	Shortage	Shortage	Shortage	No shortage	No shortage	Shortage	No shortage	No shortage	No shortage	No shortage
Lebanon	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	No shortage	Shortage	No shortage	Shortage	Shortage
Oman	Shortage	Shortage	Shortage	No shortage	Shortage	Shortage	No shortage	No shortage	No shortage	Shortage	Shortage	Shortage	No shortage	No shortage
Qatar	No shortage	Shortage	No shortage	No shortage	Shortage	Shortage	No shortage	No shortage	No shortage	No shortage	Shortage	Shortage	No shortage	No shortage
Saudi Arabia	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	No shortage	No shortage	No shortage	Shortage	Shortage	No shortage	Shortage	Shortage
Syrian Arab Republic	Shortage	Shortage	No shortage	No shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage	Shortage
United Arab Emirates	Shortage	Shortage	No shortage	No shortage	Shortage	Shortage	Shortage	No shortage	No shortage	Shortage	Shortage	Shortage	Shortage	Shortage
West Bank and Gaza	Shortage	Shortage	Shortage	No shortage	Shortage	Shortage	No shortage	No shortage	No shortage	Shortage	Shortage	Shortage	No shortage	Shortage

No shortage

Shortage

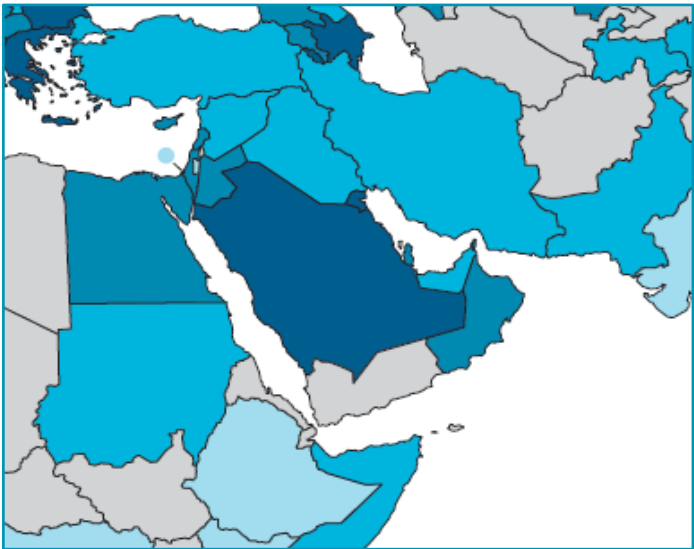
# Prevalence of nephrologists and trainees

Nephrologists



<1.2 pmp   1.2–10.0 pmp   10.1–22.9 pmp   >22.9 pmp   Data not reported

Nephrology trainees



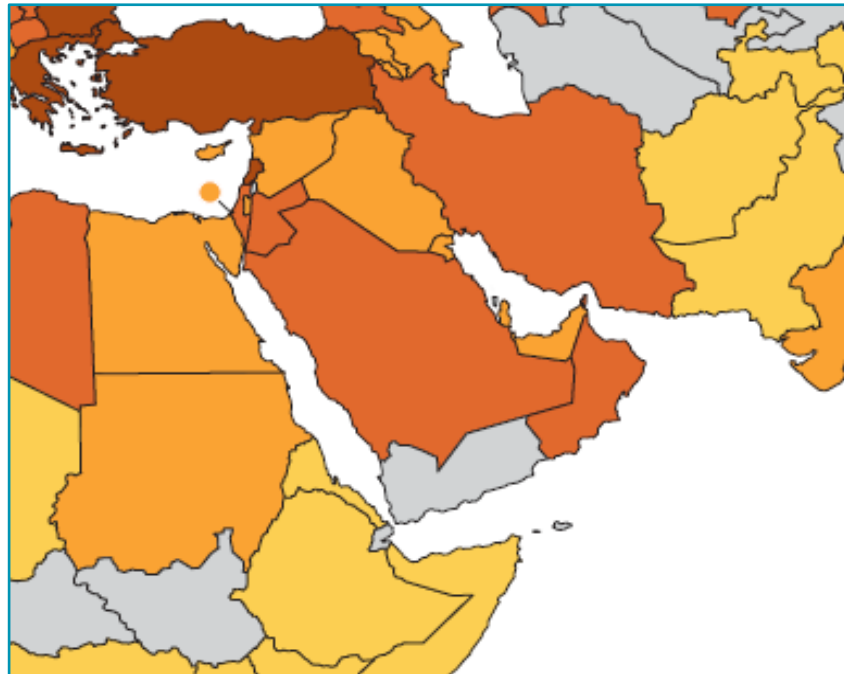
<0.3 pmp   0.3–1.4 pmp   1.5–3.7 pmp   >3.7 pmp   Data not reported

Country	Nephrologists PMP	Nephrology trainees PMP
Iran, Islamic Rep.	4.97	0.35
Iraq	2.49	1.00
Jordan	8.08	1.82
Kuwait	10.29	24.00
Lebanon	28.28	2.05
Oman	20.03	2.86
Qatar	15.87	2.12
Saudi Arabia	8.46	15.94
Syrian Arab Republic	5.14	1.03
United Arab Emirates	6.70	0.72
West Bank and Gaza	3.04	0.00

‘ – ’ : data not reported/unavailable

# Capacity for chronic dialysis (HD)

Chronic HD centers



 <1.2 pmp  1.2–4.5 pmp  4.6–9.9 pmp  >9.9 pmp  Data not reported

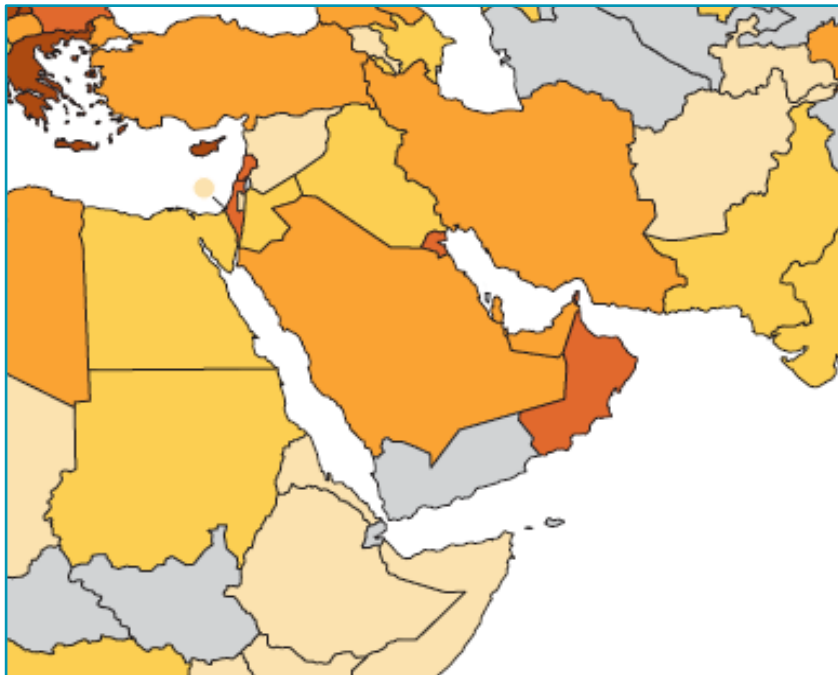
- Chronic HD services are available in all countries of the region
- The Middle East average of HD treatment centers is 3.75 pmp

Country	Chronic HD Centres PMP
Iran, Islamic Rep.	6.89
Iraq	1.24
Jordan	5.16
Kuwait	2.06
Lebanon	11.89
Oman	5.72
Qatar	2.54
Saudi Arabia	5.29
Syrian Arab Republic	3.60
United Arab Emirates	2.06
West Bank and Gaza	3.75

‘—’: data not reported/unavailable

# Capacity for chronic dialysis (PD)

Chronic PD centers



- Chronic PD services are available in 9 (82%) countries of the region
- The Middle East average of PD treatment centers is 0.77 pmp

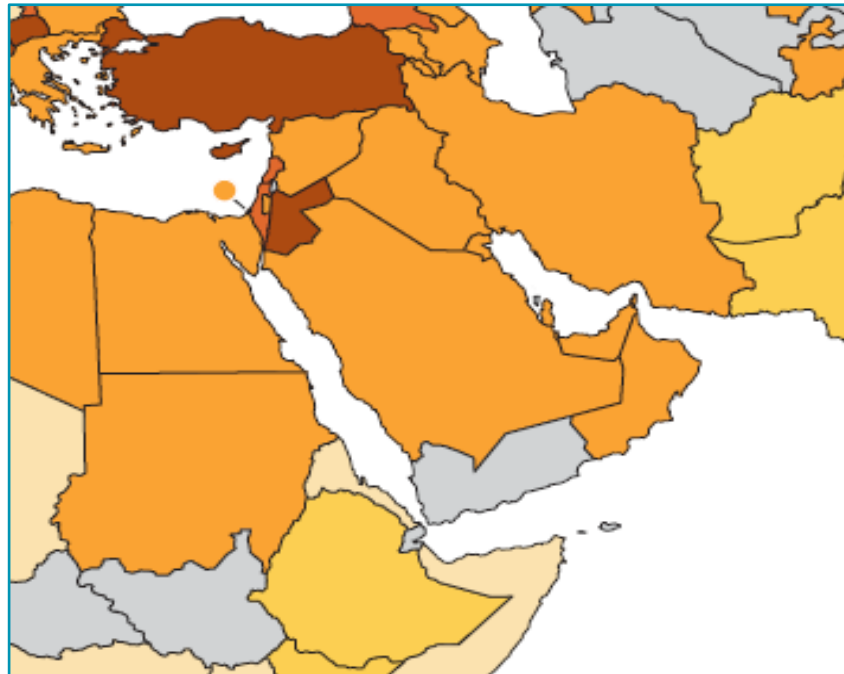
Chronic PD not provided
  <0.4 pmp
  0.4–1.3 pmp
  1.4–2.5 pmp
  >2.5 pmp
  Data not reported

Country	Chronic PD Centres PMP
Iran, Islamic Rep.	0.77
Iraq	0.20
Jordan	0.29
Kuwait	2.06
Lebanon	1.48
Oman	2.15
Qatar	1.27
Saudi Arabia	0.57
Syrian Arab Republic	-
United Arab Emirates	0.41
West Bank and Gaza	-

'-': data not reported/unavailable

# Capacity for kidney transplantation

## Kidney transplantation centers



■ Kidney transplantation not provided ■ <0.2 pmp ■ 0.2–0.4 pmp ■ 0.5–0.7 pmp ■ >0.7 pmp  
■ Data not reported

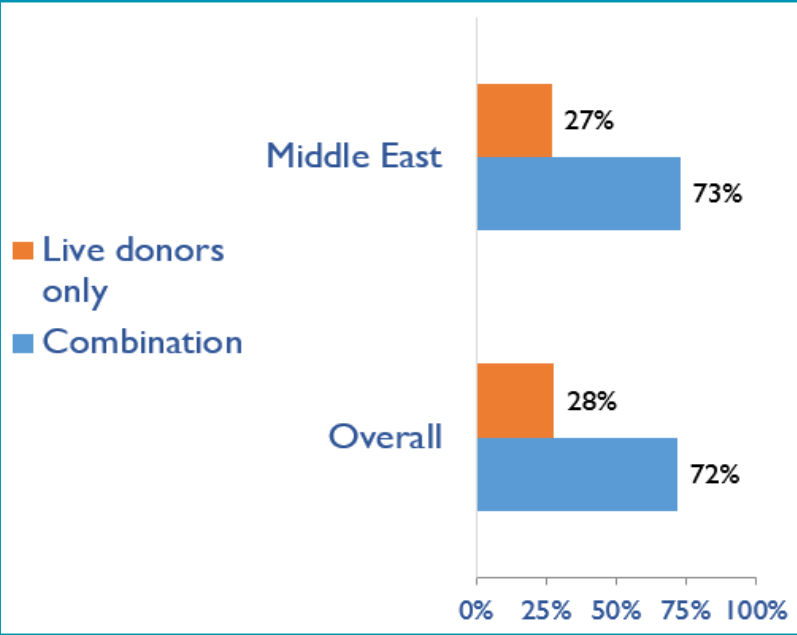
- Kidney transplantation services are available in all countries of the region
- The Middle East average of Kidney transplantation centers is 0.41 pmp

Country	Kidney Transplantation availability	Transplant centers PMP
Iran, Islamic Rep.	X	0.36
Iraq	X	0.15
Jordan	X	1.00
Kuwait	X	0.34
Lebanon	X	0.74
Oman	X	0.43
Qatar	X	0.42
Saudi Arabia	X	0.41
Syrian Arab Republic	X	0.31
United Arab Emirates	X	0.41
West Bank and Gaza	X	0.36

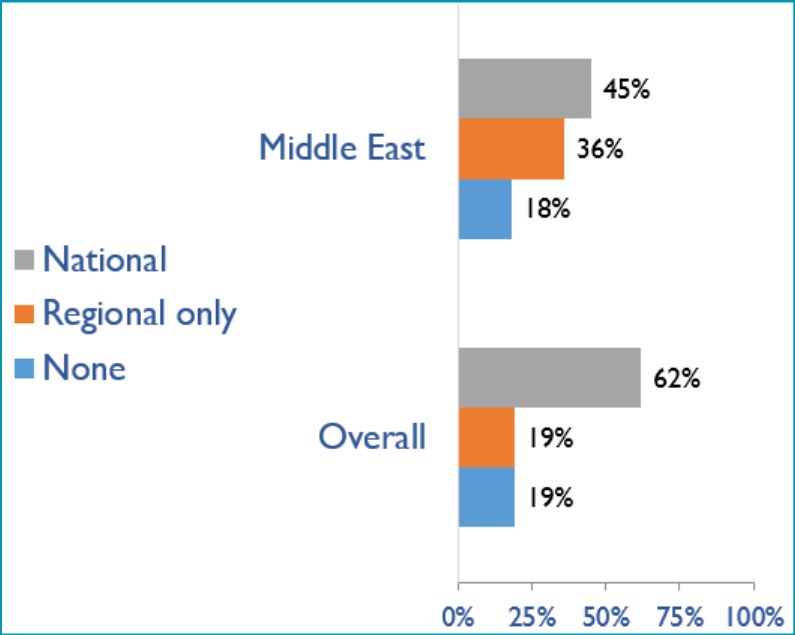
X : Yes

# Capacity for Kidney transplantation (cont'd)

Transplant donor type



Transplant waitlist

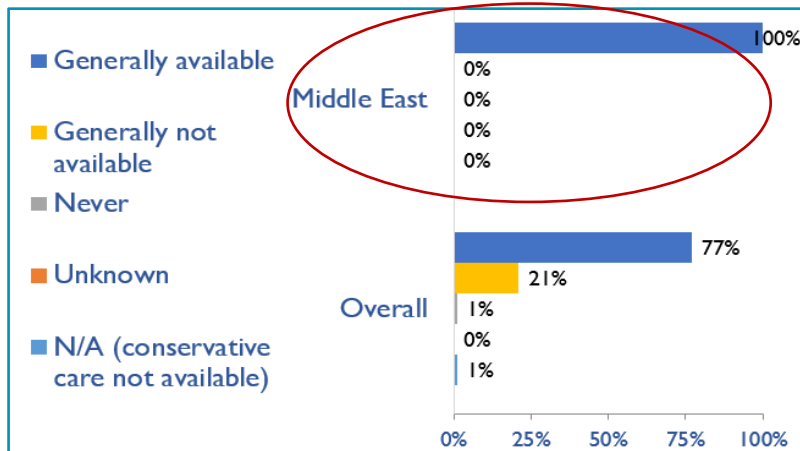


Country	Donor type		Transplant waitlist		
	Live donors only	Combination	National	Regional only	None
Iran, Islamic Rep.		X		X	
Iraq	X			X	
Jordan		X			X
Kuwait		X	X		
Lebanon		X	X		
Oman		X	X		
Qatar		X	X		
Saudi Arabia		X	X		
Syrian Arab Republic	X			X	
United Arab Emirates		X		X	
West Bank and Gaza	X				X

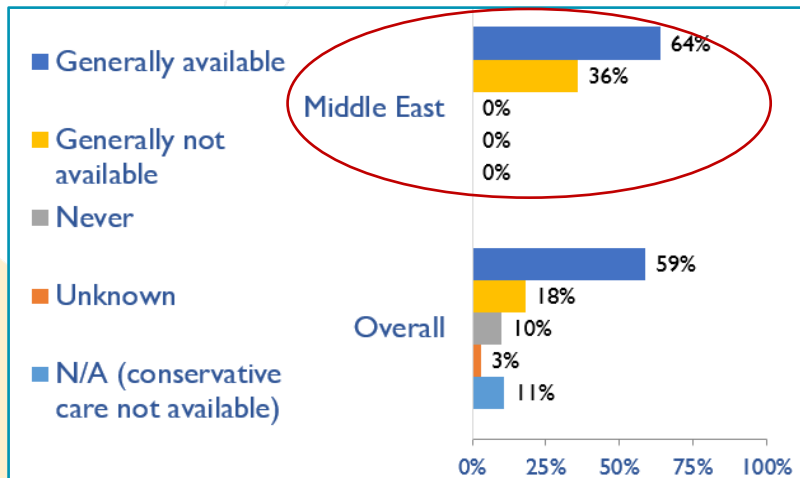
X : Yes

# Availability of services within dialysis care

HD frequency



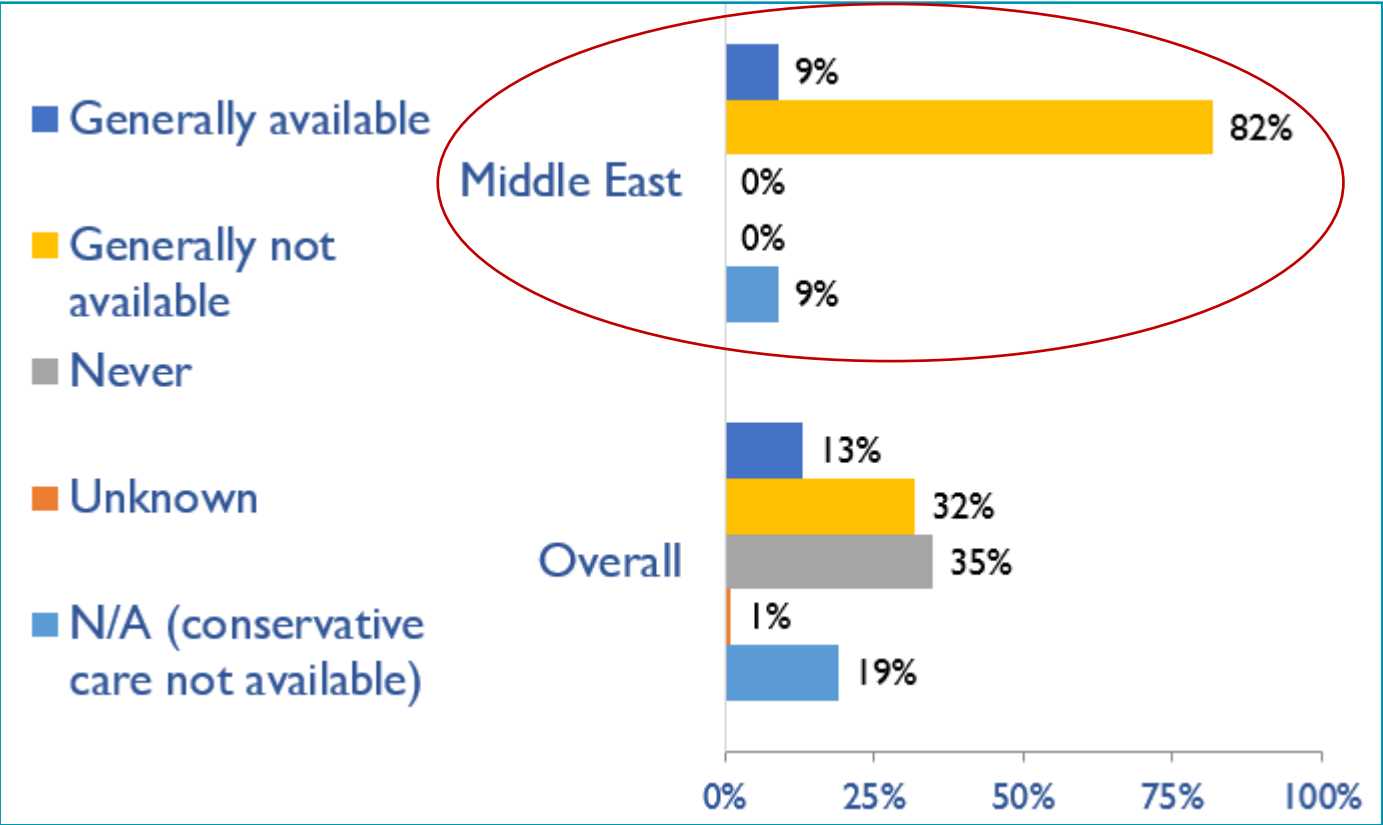
PD frequency



Country	HD frequency a center-based service that involves treatment 3x week/3-4x hours					PD frequency ability to do adequate exchanges 3-4x day (or equivalent cycles on automated PD)				
	Generally available	Generally not available	Never	Unknown	N/A (dialysis not provided)	Generally available	Generally not available	Never	Unknown	N/A (dialysis not provided)
Iran, Islamic Rep.	X						X			
Iraq	X					X				
Jordan	X						X			
Kuwait	X					X				
Lebanon	X					X				
Oman	X					X				
Qatar	X					X				
Saudi Arabia	X					X				
Syrian Arab Republic	X									X
United Arab Emirates	X					X				
West Bank and Gaza	X									X

X : Yes

# Availability of home hemodialysis



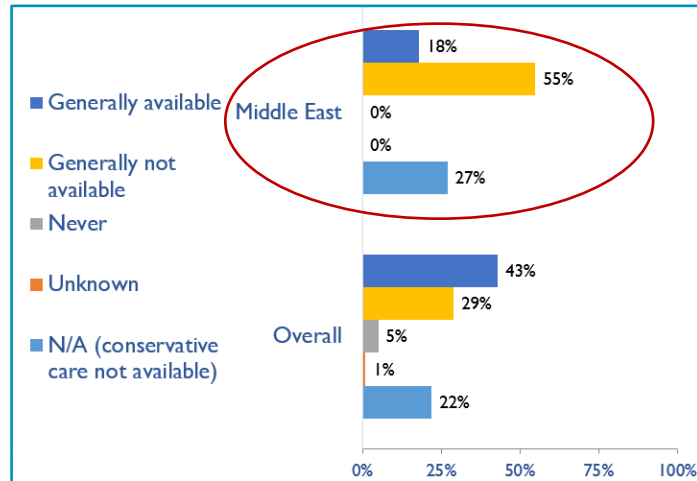
Country	Availability of Home hemodialysis				
	Generally available	Generally not available	Never	Unknown	N/A (dialysis not provided)
Iran, Islamic Rep.		X			
Iraq		X			
Jordan		X			
Kuwait		X			
Lebanon		X			
Oman			X		
Qatar	X				
Saudi Arabia		X			
Syrian Arab Republic		X			
United Arab Emirates		X			
West Bank and Gaza		X			

X : Yes

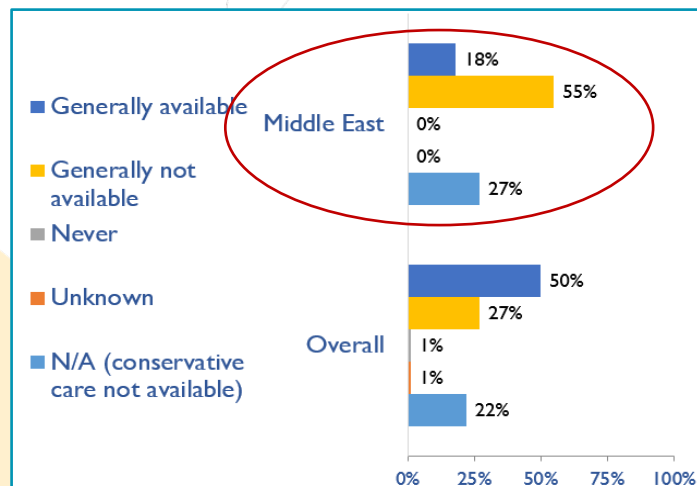


# Capacity for conservative kidney management (CKM)

## Choice–restricted CKM



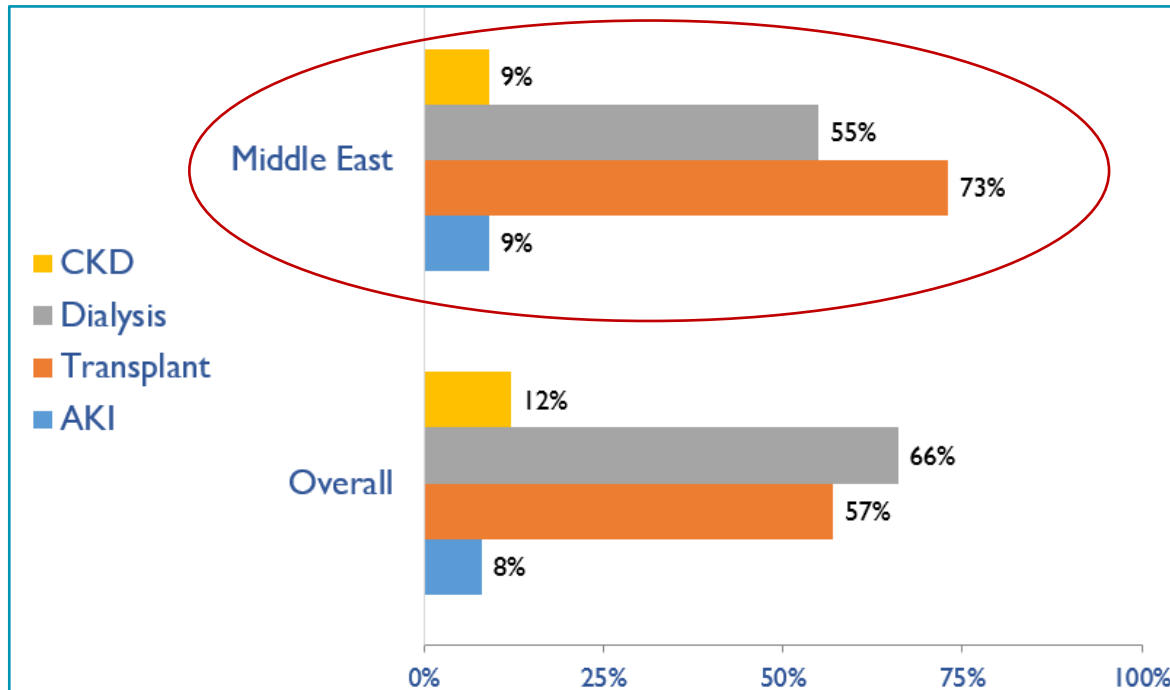
## Chosen or medically advised CKM



Country	Established choice–restricted conservative care					Established conservative care that is chosen or medically advised				
	Generally available	Generally not available	Never	Unknown	N/A (conservative care not available)	Generally available	Generally not available	Never	Unknown	N/A (conservative care not available)
Iran, Islamic Rep.		X					X			
Iraq		X					X			
Jordan	X					X				
Kuwait		X					X			
Lebanon		X					X			
Oman	X					X				
Qatar		X							X	
Saudi Arabia		X					X			
Syrian Arab Republic					X					X
United Arab Emirates				X			X			
West Bank and Gaza					X					X

X : Yes

# Availability of official registry



Country	Official Registry			
	CKD	Dialysis	Transplant	AKI
Iran, Islamic Rep.			X	
Iraq			X	
Jordan		X	X	
Kuwait		X	X	
Lebanon			X	
Oman	X	X	X	X
Qatar		X	X	
Saudi Arabia		X	X	
Syrian Arab Republic				
United Arab Emirates				
West Bank and Gaza				

X : Yes

# Summary of 2019 GKHA findings

- KRT availability, access, and quality is high in the region
- Conservative kidney management is available, focus on improved services
- Government funding for kidney care is high
- High presence of registries, particularly for ESKD care
- Good supply of nephrologists but other workforce limitations present
- Little advocacy for kidney disease in the Middle East

# Implications

- Increase health care financing for ESKD prevention and management
- Address workforce shortages through multidisciplinary teams and telemedicine
- Incorporate the collection and reporting of quality indicators in ESKD care
- Expand health information systems to prevent and manage ESKD
- Promote ESKD prevention and treatment by implementing policies, strategies, and advocacy, and mitigating barriers

To access the Atlas report:



[www.theisn.org/global-atlas](http://www.theisn.org/global-atlas)