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# The geographical distribution of dialysis services in Ghana

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## Abstract

**Background:** Chronic kidney disease (CKD) is an important global health challenge with increasing burden worldwide. CKD and acute kidney injury (AKI) may require renal replacement therapy (RRT) at some stages of the disease. Ghana currently has no renal transplant program. Dialysis services still remain a mirage to many chronic kidney disease patients in Ghana due to cost and paucity of hemodialysis machines. This survey highlights the geographical distribution of dialysis services in Ghana.

**Methods:** A cross-sectional situational survey of dialysis centers in the ten regions of Ghana was conducted by interviewing doctors and other health care professionals in all health institutions. Information on dialysis services, staff status, and number of hemodialysis machines and presence of peritoneal dialysis services in both private and government facilities was obtained and mapped out.

**Results:** Fifteen dialysis centers with a total of 103 hemodialysis machines were identified with majority 59 (57.2%) in state-owned facilities. One half of regions in Ghana do not have any form of dialysis facilities. Majority 65 (63.1%) of hemodialysis machines are in the Greater Accra region. Private hemodialysis services are available only in Greater Accra and Ashanti regions. There is no chronic peritoneal dialysis in Ghana but limited acute peritoneal dialysis. Ghana currently has eight nephrologists found only in the three government teaching hospitals. Most dialysis units across the country are supported by non-nephrologists.

**Conclusion:** There are few hemodialysis centers in Ghana; the distribution of which is skewed to few regions across the country. There is a need to improve dialysis services and equitable distribution across the country.

**Keywords:** Hemodialysis, Peritoneal dialysis, Geographical distribution, Ghana

## Background

Chronic kidney disease (CKD) is an important global health problem with increasing incidence and prevalence. Currently, the worldwide prevalence is 10–13% [1–3] and similar estimates of 13.9% have been reported in Africa in a recent meta-analysis [4]. The prevalence in Ghana is however not known. Chronic kidney disease inevitably progresses to end-stage renal disease (ESRD) which requires renal replacement therapy (RRT) in the form of hemodialysis, peritoneal dialysis, or renal transplantation as the main modalities of treatment. It has been shown consistently that renal transplantation is cost effective and improves patient survival and quality

of life as compared to peritoneal dialysis and hemodialysis [5–11].

Unfortunately, Ghana has no national renal transplantation program but has had limited renal transplantation services in the capital city Accra. This started in the Korle-bu Teaching Hospital, a 1600-bed teaching hospital [12] in 2008. Seventeen patients have since had renal transplants since its inception [13], but none has been done recently. A few well-to-do patients currently travel abroad for kidney transplantation services. Hemodialysis therefore remains the main form of renal replacement therapy in the country for patients with ESRD. Unfortunately, hemodialysis services are not widely available in Ghana. It was shown by Antwi [13] in 2015 that hemodialysis was mainly found in three teaching hospitals and three private institutions in Ghana and was inadequate to serve Ghana's population in the light

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of the increased burden of kidney diseases. Acute kidney injury is also reported in hospital admissions and may require renal replacement therapy in severe cases. Mortality rates of acute kidney injury in adults in Africa ranges from 13.5–43.5% [14] and may increase in settings where dialysis services are unavailable.

Peritoneal dialysis in adults with end-stage renal disease is non-existent in Ghana though the modality has been used for the management of acute kidney injury in children in some parts of the country [13].

Due to increased cost of hemodialysis, most patients after diagnoses are left to their fate when they cannot afford hemodialysis. The National Health Insurance Scheme (NHIS) does not cover patients with end-stage renal disease requiring hemodialysis. The high cost of renal replacement therapy is a deterrent in the management of end-stage renal disease as patients have to pay out of pocket for hemodialysis sessions in Ghana.

The cost of frequent laboratory investigations and the treatment for hypertension, anemia, and calcium and phosphate abnormalities will further increase the cost of treatment of end-stage renal disease. The tragedy for those who even start hemodialysis is that they impoverish their families and then eventually die very depressed with poor quality of life [15].

Furthermore, due to inadequate hemodialysis centers and machines, patients diagnosed with infections such as human immunodeficiency virus (HIV) and viral hepatitis B and C in some facilities are prevented from accessing the few hemodialysis machines available. This results in even fewer patients getting access to hemodialysis. Currently, the population of Ghana is about 27 million [16] and with the high prevalence rate of the causes of chronic kidney disease, there might be the need to increase the number and distribution of dialysis offered. The current number and geographical distribution of hemodialysis and peritoneal dialysis units remain unknown.

We set out to establish the number of hemodialysis machine in the various government and private facilities and to map out the regional distribution of renal replacement therapy in Ghana.

## Methods

It was a cross-sectional situational survey of dialysis centers in all the ten regions of Ghana as at 31 December 2016. Information was sought by interviewing doctors and health care workers providing renal care in all health care facilities in all the regions in Ghana to ascertain the availability of dialysis services in both government and private facilities. The presence of peritoneal dialysis services, the availability of trained staff, specialist, and nephrologists were also documented. The number of patients on dialysis in the centers was also

documented. The distribution of facilities with hemodialysis centers across the country were mapped using Google Earth. For facilities not already mapped on Google maps, Google search was used to retrieve the physical address of the facility and this was used in estimating the location of the facility.

## Ghana's administrative regions and population

Ghana is a country located in West Africa bounded by Burkina Faso on the north, Togo on the eastern border, Côte d'Ivoire on the west, and the gulf of Guinea on the south. Ghana has a gross domestic product (GDP) of 37.54 billion US dollars and a GDP per capita of 1696.64 US dollars as at 2016 [17].

Ghana has a geographical surface area of 238,540 km<sup>2</sup> and ten administrative regions. Greater Accra is the smallest region measuring 3245 km<sup>2</sup> and hosts the national capital Accra with a population of 4,010,054 [18]. The Northern region with its capital Tamale is the largest region in Ghana measuring 70,384 km<sup>2</sup> with a population of 2,479,461 followed by Brong Ahafo with a surface area of 39,557 km<sup>2</sup> in the middle belt of Ghana with a population of 2,310,983. Ashanti region also in the middle belt with capital Kumasi has a population of 4,780,380 and a surface area of 24,389 km<sup>2</sup> [18]. The other regions are the Western region, Central region, Brong Ahafo region, Upper East region, Upper West region, and the Volta region as shown in Fig. 1.

## Results

As at December 2016, there were 15 centers offering in-center hemodialysis services in Ghana. This included 7 in the government-owned facilities and 8 in private-owned centers. There were 103 functioning hemodialysis machines in Ghana with 59 (57.3%) in the government-owned hospitals and 44 (42.7%) in private-owned health centers. The government-owned hospitals with hemodialysis machines were mainly the teaching hospitals in the Northern, Ashanti, Central, the Greater Accra, and the Volta regions.

This included 18 functioning machines in the Renal Unit of Korle-bu Teaching Hospital besides 10 machines in the National Cardiothoracic Unit within the Korle-bu Teaching Hospital. The cardiothoracic unit is a 32-bed facility established in the 1960s but was recommissioned in 1992 for the management of thoracic and cardiac cases surgically. It is one of the few functioning cardiothoracic centers in Africa. The National Cardiothoracic Centre receives referrals from other African countries such as Benin, Togo, Nigeria, Ivory Coast, Cameroon, Ethiopia, and Tanzania.

There are 8 functioning machines in the Police Hospital in Accra, 10 in the Cape Coast Teaching Hospital, 8 in the Komfo Anokye Teaching Hospital, 3



**Fig. 1** The administrative regions of Ghana with regional capitals [18]. The regions and administrative capitals in Ghana [19, 20]

in the Tamale Teaching Hospital, and 2 in the Ho Regional Hospital in the Volta region as shown in Table 1. The Korle-bu Teaching Hospital has the greatest number of patients on dialysis in Ghana: 250 patients on hemodialysis as at December 2016. This was followed by the Cape Coast Teaching Hospital (68 patients) and the National cardiothoracic unit (65 patients). Komfo Anokye Teaching Hospital had the least number of patients on hemodialysis as shown in Table 1.

Chronic peritoneal dialysis was not available in any of the teaching hospital for the management of end-stage renal disease. Acute peritoneal dialysis was present in a large scale in Komfo Anokye Teaching Hospital for the management of acute kidney injury in pediatric population only. Acute peritoneal dialysis has recently been introduced in the Tamale Teaching Hospital, the Korle-bu Teaching Hospital and the Cape Coast Teaching Hospital on a small scale.

Some of the hemodialysis centers even in some teaching hospitals were not manned by trained nephrologists. The Cape Coast Teaching Hospital is manned by a consultant physician and two medical officers (specialist-in-training) and the Ho Regional Hospital is manned by a medical officer as shown in Table 1.

#### Private-owned dialysis centers in Ghana

Private-owned hemodialysis facilities were identified in only two out of the ten regions in Ghana. These facilities were found only in Accra and Kumasi, which are the regional capitals of the Greater Accra and Ashanti regions respectively. Six private facilities were identified in Accra and two in Kumasi in the Ashanti region within the study period. The private facilities in Accra include the Accra kidney clinic, the Trust Hospital, the Meridian Hospital, the Ghana Canada Hospital, Bengali Hospital, and the Labone dialysis clinic. It was found that most of the private-owned facilities were run by medical officers,

**Table 1** Dialysis services within government-owned hospitals in Ghana

Government hospital	Number of functioning hemodialysis machines	Personnel in-charge of unit	Number of patients	Peritoneal dialysis availability
Korle-bu Teaching Hospital	18	4 nephrologists 4 nephrology trainees	250	No
Cardiothoracic unit	10	1 nephrology trainee	65	No
Komfo Anokye Teaching Hospital	8	3 nephrologists 2 specialist physicians	22	Yes for acute dialysis in children only
Tamale Teaching Hospital	3	1 nephrologist (Cuban) 1 specialist physician	45	Yes for acute dialysis in children only
Cape Coast Teaching Hospital	10	1 consultant physician 2 medical officers	68	Yes for acute dialysis both adult and children
Ho Teaching Hospital	2	1 medical officer	26	No
Police Hospital, Accra	8	1 medical officer	25	No

dialysis nurses, and some nephrologists only on part-time basis. The number of functioning hemodialysis machines identified in these facilities is shown in Table 2.

Among private-owned facilities, Bengali clinic had the highest number of patients on hemodialysis of 34, followed by Ghana Canada clinic with 24 patients. Peace and Love Hospital had the least number of patients of 10 on hemodialysis as at December 2016 as shown in Table 2. There were no peritoneal dialysis services in any of these private facilities for either acute kidney injury or chronic kidney disease.

#### Regional distribution of dialysis units in Ghana

As shown in Table 2, the distribution of government- and private-owned dialysis centers is skewed towards the

Greater Accra, Ashanti, and Central regions. The Upper East, Upper West, Brong Ahafo, Eastern, and Western region do not have any form of renal replacement therapy for the management of renal diseases (Fig. 2).

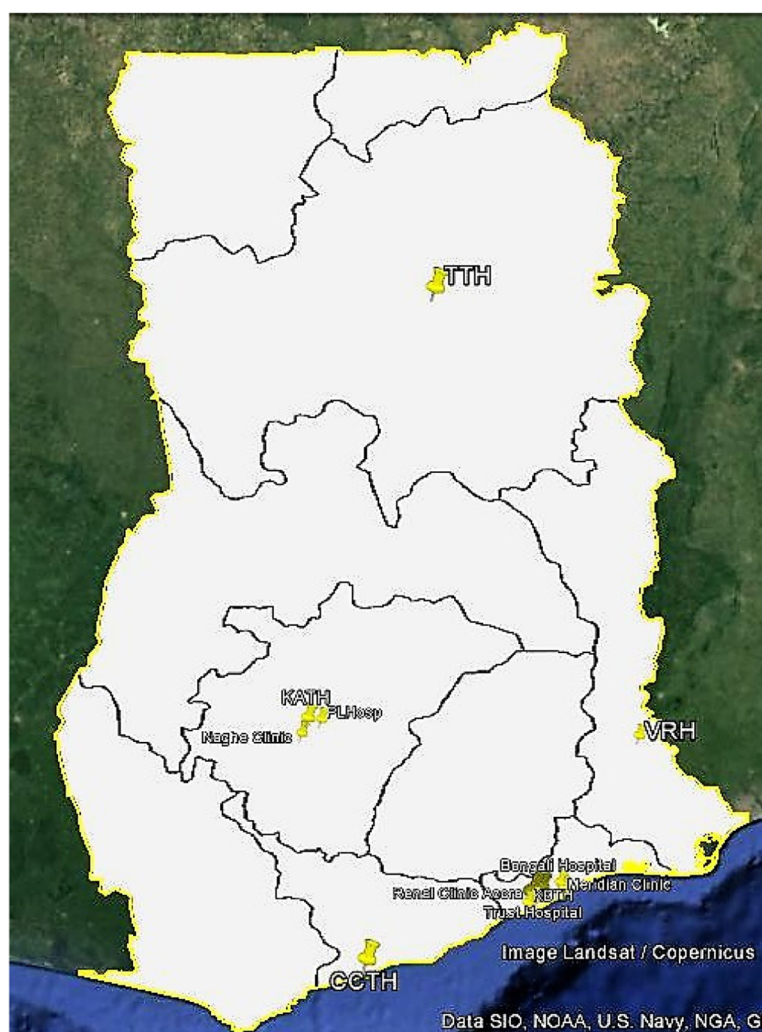
Private-owned hemodialysis centers are only in the greater Accra and Ashanti regions. These are in the regional capitals alone, i.e., Accra and Kumasi. There were none in the eight other regions and as shown in Table 3.

The overall national hemodialysis machines in both private- and government-owned facilities per million population (pmp) are 4.20. The greater Accra region has the highest number of dialysis machines of 65 (63.1%) in both the private- and government-owned hospitals. The Greater Accra region has 16.2 hemodialysis machines pmp in both private- and government-owned facilities followed by the

**Table 2** The regional distribution of dialysis services within private-owned facilities in Ghana

Region	Private facilities	Name of facility	Number of hemodialysis machines	Number of patients	Personnel in-charge of unit
Eastern	No	NA	NA	–	NA
Volta	No	NA	NA	–	NA
Greater Accra	Yes	Accra kidney clinic	7	23	1 nephrologist 1 medical officer
	Yes	Trust Hospital	4	20	1 medical officer
	Yes	Bengali clinic	5	34	1 nephrologist (locum) 1 medical officer
	Yes	Meridian clinic	5	12	1 renal nurse
	Yes	Ghana Canada Clinic	5	24	1 nephrologist (locum)
	Yes	Ababio clinic (Labone)	3	12	1 renal nurse
Central	No	NA	NA	–	NA
Western	No	NA	NA	–	NA
Brong Ahafo	No	NA	NA	–	NA
Ashanti	Yes	Peace and Love Hospital	5	10	1 senior medical officer
	Yes	Naghe Clinic	10	16	1 principal medical officer
Upper East	No	NA	NA	–	NA
Upper West	No	NA	NA	–	NA
Northern	No	NA	NA	–	NA

NA not available



**Fig. 2** The geographical distribution of the dialysis units in Ghana

**Table 3** The regional distribution of hemodialysis machines per million population (pmp) in Ghana

Region	Public units (n)	Private units (n)	Total (n)	Total (%)	Population per region	Hemodialysis machines (pmp)
Eastern	0	0	0	0	2,633,154	0
Volta	2	0	2	1.9	2,118,525	0.94
Greater Accra	36	29	65	63.1	4,010,054	16.20
Central	10	0	10	9.7	2,201,863	4.54
Western	0	0	0	0	2,376,021	0
Brong Ahafo	0	0	0	0	2,310,938	0
Ashanti	8	15	23	22.3	4,780,380	4.81
Upper east	0	0	0	0	1,046,545	0
Upper West	0	0	0	0	702,110	0
Northern	3	0	3	2.9	2,479,461	1.21
Total	59	44	103		24,658,823	4.20



Ashanti region of 4.81 hemodialysis machines pmp and Central region of 4.54 as shown in Table 3.

### Peritoneal dialysis in Ghana

Peritoneal dialysis as a modality for managing chronic dialysis is not practiced in Ghana currently. It is however available for the management of acute kidney injury in the Komfo Anokye Teaching Hospital, to a very less extent in the Korle-bu Teaching Hospital, Cape Coast Teaching Hospital, and Tamale Teaching Hospital.

### Discussion

This study is an audit of hemodialysis services in Ghana showing the regional distribution of hemodialysis facilities and number of hemodialysis machines in Ghana. There have been some improvements in the dialysis facilities in Ghana since the study by Antwi in 2014 [13]. There are now more private hemodialysis facilities but not much improvement in numbers in the state-owned facilities. The use of peritoneal dialysis as a form of renal replacement therapy in the management of acute and chronic kidney diseases in Ghana is however still minimal. The unavailability of chronic peritoneal dialysis in many sub-Saharan Africa including Ghana has been attributed to the high cost of the peritoneal dialysis fluid making it comparable or even more expensive than in-center hemodialysis sessions [21]. In developed countries, the cost of providing peritoneal dialysis is less than the cost of hemodialysis due to economies of scale in the production of dialysate but this is not so in developing countries [22] such as Ghana. Measures to produce peritoneal dialysate locally and lowering of import duties on peritoneal dialysate and peritoneal dialysis catheters have been suggested as important in decreasing the cost of peritoneal dialysis. Training of surgeons and physicians on Tenckhoff catheter insertion may provide peritoneal dialysis valuable modality as a renal replacement therapy with comparable quality of life to hemodialysis [11].

Acute peritoneal dialysis is however practiced in many regional and district hospitals in Ghana using improvised techniques and self-constituted fluids to decrease cost [23]. This has proven very useful in children for the management of acute kidney injury in some teaching hospitals in the country. The cost of peritoneal fluid is still a challenge for chronic peritoneal dialysis.

All the hemodialysis facilities are concentrated in the capital cities of the Greater Accra region, Ashanti region, the Central region, and Volta region with most regions bereft of any form of renal replacement therapy for the management of acute and chronic kidney diseases.

The unavailability of kidney transplantation services in Ghana leaves a lot of end-stage renal disease patients on hemodialysis for longer duration. Most patients do not get kidney transplant though it has been shown to be

the best modality for renal replacement therapy as compared to hemodialysis and peritoneal dialysis [5–10]. In Ghana, patients on hemodialysis have high mortality rate [24]. Our study reveals that hemodialysis machines per million population in Ghana is 4.20 much lower than other African countries such as Egypt, South Africa, and Nigeria [25]. The dialysis rates across Africa are less than 20 per million population as compared to a global prevalence of 223 pmp [26]. Ghana falls far below the 20 hemodialysis machines per million population. Most regions in Ghana do not have any form of renal replacement therapy and are therefore transferred to the few centers for management with varied outcomes.

There is the need to improve the number of dialysis machines per million population considering the perceived high prevalence of chronic kidney disease and acute kidney injury in Africa and Ghana as we work to establish a renal transplant services.

The regulation of the hemodialysis services to provide adequate dialysis, without the spread of infection with ultrapure water quality with the reverse osmosis (RO) system is imperative [27]. Unfortunately, dialysis service in Ghana is not officially regulated and regular checks for water quality are done at the discretion of the service providers. This needs to be addressed to provide quality dialysis services in all centers across the country to avoid cross infections among patients with end-stage renal disease and acute kidney injury.

Most hemodialysis facilities especially in the private-owned facilities are not managed by trained nephrologists or physicians but by medical officers and renal nurses. This is because Ghana has very few nephrologists of less than one per million population just as other African countries in sub-Saharan Africa [25]. These nephrologists are found only in the teaching hospitals in Accra and Kumasi. It was reported in an earlier study that Ghana had 0.1 nephrologists per million population as compared to 0.6 pmp in Nigeria, 0.5 pmp in Kenya, 4.5 pmp in Morocco, and 6.5 pmp in Egypt [21]. The total number of nephrologist have subsequently improved from 0.1pmp in 2010 to 0.26 pmp currently, but this is still inadequate for the population in Ghana. We do acknowledge the limitation of our study as data was obtained by interviewing staff or health care workers in each region. This is because there is no designated outfit responsible for registering dialysis facilities in Ghana.

The authors believe that kidney transplantation program should be established in the country. The country needs to educate the populace about prevention of kidney disease and sensitize the public about kidney donation. Chronic peritoneal dialysis should be introduced for the management of end-stage renal disease. Hemodialysis centers and machines per population should be increased

in both private-owned and government-owned facilities. Since cost of dialysis is also an important limiting factor affecting accessibility of renal replacement, there is the need for governmental support for renal replacement therapy. There is the need for the various dialysis facilities in Ghana to be regulated to provide quality renal services to patients with renal diseases.

## Conclusion

The distribution of renal dialysis services is skewed to a few cities and regions. There is an urgent need to establish more dialysis services equitably across the country to meet the need of the growing prevalence of chronic kidney disease and for the management of acute kidney injury in all the ten regions of Ghana.

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## Availability of data and materials

The datasets during and/or analyzed during the current study is available from the corresponding author on a reasonable request.

## Authors' contributions

All authors contributed equally to the study concept and design, acquisition of data, interpretation of data, and critical revision of the manuscript. All authors read and approved the final manuscript.

## Ethics approval and consent to participate

A waiver was obtained from the Cape Coast Teaching Hospital ethical review committee.

## Consent for publication

Not applicable.

## Competing interests

The authors declare that they have no competing interests.

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