

# Current status of maintenance hemodialysis in Beijing, China

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The Beijing Hemodialysis Quality Control and Improvement Center started patient data collection from 2007. We report here the trends in incidence, prevalence, and mortality of end-stage renal disease (ESRD) patients on maintenance hemodialysis (MHD). The incidence increased from 94 per million population in 2007 to 147.3 per million population in 2010. The leading cause of ESRD changed from chronic glomerulonephritis (32.1%) to diabetes (40.1%). The point prevalence of MHD at the end of 2006 was 269 per million population, and gradually increased to 509 per million population in the end of 2010. The leading cause of ESRD in 2010 prevalent patients was chronic nephritis (33.9%), followed by diabetes (29.5%). The annual mortality varied from 7.4 to 9.0%. Old or diabetic patients suffered a higher mortality. The 2010 prevalent MHD patients achieved KDOQI hemoglobin, calcium, phosphate, and intact parathyroid hormone guidelines, which was comparable to other DOPPS (Dialysis Outcome and Practice Pattern Study) countries; Beijing MHD patients had a relatively higher albumin level.

*Kidney International Supplements* (2013) **3**, 167–169; doi:10.1038/kisup.2013.6

KEYWORDS: epidemiology; hemodialysis; incidence; mortality; prevalence

## METHODS

In 1999 the Chinese Society of Nephrology reported national annual incidence data (15.3 per million population) and point prevalence (33.16 per million populations) for end-stage renal disease (ESRD).<sup>1</sup> In 2008, the annual incidence and point prevalence increased to 36.1 and 79.1, respectively.<sup>2</sup>

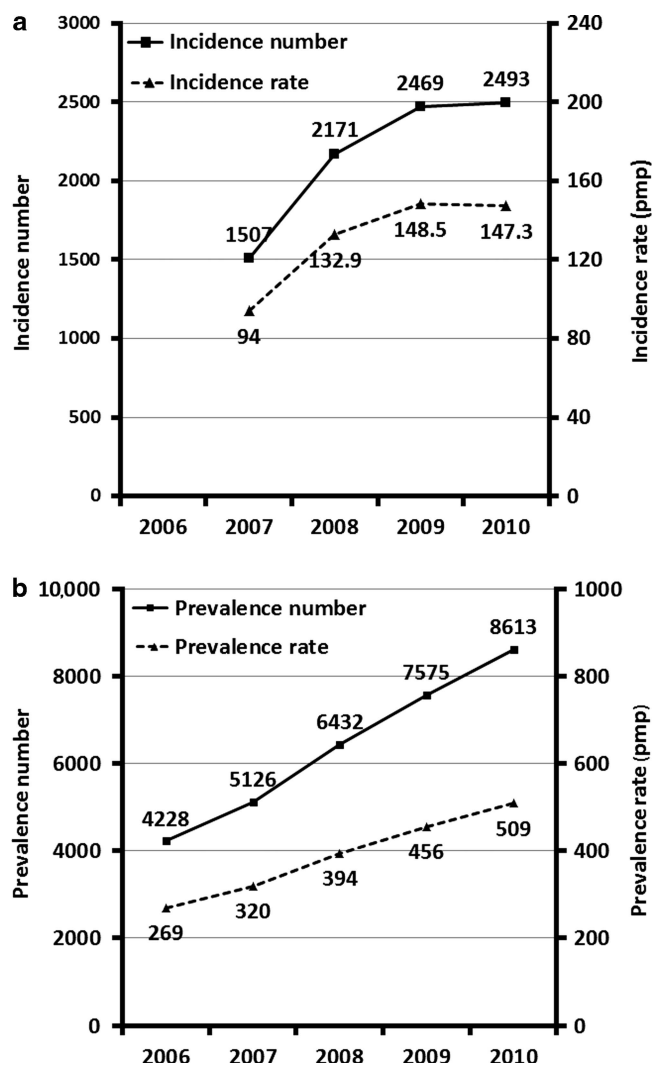
The Beijing Health Bureau established the Beijing Hemodialysis Quality Control and Improvement Center (BJHDQCIC) in 2002. One of the important missions of BJHDQCIC is hemodialysis registration. Before 2007, BJHDQCIC collected only facility-level data and summarized the information to form an annual data report.<sup>3</sup> From 2007, all Beijing hemodialysis facilities were requested to use a commercial electronic data-capturing system, and thus patient-level data were collected. Before 2011, peritoneal dialysis (PD) patient data were not collected. The captured patient information included birth date, gender, and primary cause of ESRD, date of first dialysis, and dates and causes of censoring. The main reasons for censoring included transfer to PD, renal transplant, death, transfer to regions outside Beijing, or loss to follow-up. At the same time, data were collected relating to the quality of dialysis including hepatitis and HIV infection, dialysis adequacy, hemoglobin, serum albumin, calcium, phosphate, and intact parathyroid hormone (iPTH).

Using the collected patient information, annual incidence was calculated as the number of new patients entering hemodialysis between 1 January and 31 December, and annual incident rate was calculated as incidence number per million population (p.p.m.). Point prevalence of hemodialysis was calculated as the number of maintenance hemodialysis (MHD) patients at 31 December, and the prevalence rate was calculated as the prevalent number p.p.m. The mortality rate was reported as the number of deaths per 1000 patient years; the annual mortality (actual data) was also recorded.

## RESULTS

In 2007, 1507 patients entered MHD (94 per million population). The number of patients who entered hemodialysis increased thereafter. In 2010, 2493 patients entered MHD (147.3 per million population) (Figure 1a). The leading cause of ESRD in incident patients on MHD was chronic nephritis (32.1%), DKD followed (29.3%), and the third was hypertension (14.3%). The percent of patients with chronic nephritis decreased gradually to 24.0% in 2010 and the percent of DKD increased to 40.1%. DKD became the leading cause of ESRD in incident cases in 2010. 62.5% of incident patients used an arteriovenous fistula as their first blood access.

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**Figure 1 | Incidence and prevalence of Hemodialysis patients in Beijing, China.** (a) Incident hemodialysis patients increased from 94 per million populations in the year 2007 to 147.3 per million population by 2010. (b) Prevalent hemodialysis patients increased from 269 per million populations in the end of 2006 to 509 per million population by the end of 2010.

At the end of 2006, there were in total 4228 patients on MHD, corresponding to 269 hemodialysis patients per million population. The number of prevalent patient gradually increased to 8613 at the end of 2010, which corresponded to 509 per million population (Figure 1b). The number of MHD patients with chronic nephritis decreased from 37.2% in 2007 to 33.9%, and those with DKD increased from 21.4% in 2007 to 29.4% in 2010. Chronic nephritis was still the leading cause of ESRD in prevalent MHD patients, followed by DKD and hypertension.

Annual mortality varied from 7.4% to 9.0% within the period 2007–2010. For those less than 60 years old, the annual mortality was less than 5%; for those 70 or older, annual mortality reached 19%; for patients 80 or older, the annual mortality reached 36%. The leading cause of death

was cardiovascular disease (congestive heart failure, myocardial infarction, arrhythmia), which accounted for 27.8% of deaths. The next most common cause of death was stroke, which accounted for 11.5% of deaths. Infection was responsible for 11.5% of deaths.

The nature of the primary cause of ESRD impacted significantly on patient survival. In the year 2010, the overall mortality was 76.8 per 1000 patient-years: female (74.8 per 1000 patient-years) compared with male (78.7 per 1000 patient-years). For patients with DKD, the mortality was 108.7 per 1000 patient-years; this was significantly higher than that of patients with chronic nephritis (49.4 per 1000 patient-years) and that of patients with hypertensive kidney disease (90.0 per 1000 patient-years).

In summary, the main causes of ESRD were primary glomerular disease, hypertensive kidney disease, and diabetic kidney disease. The main causes of death were cardiovascular disease, stroke, infection, and neoplasm.

In 2010, among prevalent MHD patients 3.5% had hepatitis B surface antigen positivity and 5.2% had positive hepatitis C virus antibody; 49.6% had a hemoglobin level >11 g/dl; 46.7% had serum calcium level within 2.10–2.37 mmol/l, and 33.7% were hypocalcemic; 40.3% had serum phosphate level within 1.13–1.78 mmol/l; 47.4% had hyperphosphatemia; 39.1% had iPTH within 150–600 pg/ml, and 29.7% had a level exceeding 600 pg/ml; 63.1% had a serum albumin level >35 g/l.

## DISCUSSION

The incidence and prevalence of MHD is increasing rapidly in Beijing, the capital of China. There are several reasons for the increasing trend of MHD. First, government-operated medical insurance has been covering an increasing number of Beijing residents, including those living in rural areas. Thus, the economic barrier for renal replacement therapy (RRT) is decreasing and RRT is becoming affordable for most Beijing residents, who are requested to buy medical insurance for an acceptable price: if they unluckily contract ESRD, they pay only 5–10% of the cost of treatment. Second, the incidence and prevalence of diabetes is increasing rapidly in the general population of Beijing, and so is the incidence of ESRD due to DKD, and thus, as noted, it has now become the leading cause of ESRD in incident MHD patients.

It is also notable that the mortality of prevalent MHD patients is significantly lower than reported by the United State Renal Data System (USRDS).<sup>4</sup> According to the USRDS annual data report 2011, the mortality of MHD patients in 2008 was 200–250 per 1000 patient-years. Why MHD patients in Beijing had such a low mortality is not clear. There are some clinical practice pattern differences between Beijing and the United States. It was not clear, though, if they are responsible for the gap in mortality between regions. The practice pattern differences include the following: (1) In Beijing, each hemodialysis facility is hospital based, and there are at all times licensed nephrologists on the spot. Every time a patient arrives for dialysis, he/she always consults with a

nephrologist. (2) Though a relatively low blood flow rate (200–300 ml/min) on dialysis is popular in Beijing compared with the United States, the total dialysis time for each week is higher in Beijing compared with the United States. (3) Arteriovenous fistula is the most commonly used blood access, in contrast with the practice in the United States. (4) It is likely the USA nephrologists treat patients with MHD who are older and sicker, and they therefore are more likely to die. Although patients can select between MHD and PD according to their preference in Beijing, it is still likely that PD patients will be older, sicker, and with higher percentage of diabetes than those on MHD. It is estimated that 20% ESRD patients in Beijing are on PD. According to single-center data in Beijing, the annual mortality rate of patients on PD was around 15% (unpublished data), which is significantly higher than that of patients on MHD, but still significantly lower than that of US MHD patients.

The number of MHD patients who reach the clinical practice guidelines recommendations of hemoglobin, serum calcium, phosphate, and iPTH was similar to that of the other Dialysis Outcome and Practice Pattern Study (DOPPS) countries.<sup>5</sup> Beijing MHD patients had relatively higher serum albumin levels compared with other DOPPS countries. The reason for this is not clear.

In summary, the incidence and prevalence of MHD in Beijing, China, is increasing rapidly. In the future, ESRD treatment will consume an increasing proportion of the medical insurance budget. Strategies will need to be adopted to prevent initiation of chronic kidney disease and its progression. DKD, glomerulonephritis, and hypertensive kidney damage comprised nearly 90% of the cases among incident MHD patients, and DKD is becoming the leading cause. The mortality of Beijing MHD patients is relatively lower compared with that of the US MHD patients. The reasons for this need to be explored.

#### DISCLOSURE

The authors declare no competing interests.

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