Chapter 9 Vital Signs and Anthropometrics

Heart Rate, Blood Pressure & Respiratory Rate

Body Mass Index, Waist Circumference & Percent Body Fat

Vital signs in HD patients are important indicators of emerging comorbidity, especially when they become persistent. Anthropometric measures also serve as risk indicators in this patient population where a large proportion of patients suffer from or are vulnerable to developing metabolic syndrome.

At the launch of the registry in March 2011, less than 10% of patients had a recorded height, about 0% had a recorded respiratory rate, and rarely was waist circumference measured. Today, over 95% of patients in the registry have a recorded height, and hence a monthly computation of body mass index. Also, even though respiratory rate documentation was optional, it was recorded in over 40% of patient-months. Waist, neck and hip circumferences which were requested to be documented in the registry once per year were completed for over 60% of patients. These circumference measurements were intended to 1) stimulate more active involvement by the hospital dietitian in the care of HD patients; and 2) estimation of the percent body fat using the U.S. Navy formula and total body water using the Watson formula, separately in men and women, and provide insight into fat distribution in the body.

Vital Signs (Ref. table 9.1)

Heart rate, blood pressure and respiratory rate are simple measurements through which the body either exhibit clinical stability or reveal distress signals. A high or low heart rate and/or respiratory rate occurring frequently may be normal in some patients, but should be an indicator for further investigation to detect abnormal cases. Extremes at the upper and lower ends of these measurements should be a reason for closer patient observation.

Heart Rate averaged a normal 78.6 ± 9.4 bpm (median = 78). Over 5% of patient-months were at a faster pulse of 94 bpm or higher, with only 1% of patient-months at a slow pulse of 57 or lower.

Respiratory Rate averaged a normal 18.8 ± 2.8 bpm (median = 18). Over 10% of patient-months were at a rate of 22 bpm or higher, with another 5% of patient-months at 14 bpm or lower.

As patients accumulate fluids between dialysis sessions, they are expected to come into dialysis with an elevated blood pressure due to expanded blood volume, which is usually normalized by session's end.

Blood Pressure (BP) Mean systolic/diastolic pre-dialysis was 134.8 ± 21 / 74.6 ± 11.9 (median = 130/70). Mean systolic/diastolic post-dialysis was 115.7 ± 18.7 / 65.8 ± 11.2 (median = 120/62). On average, systolic pre-dialysis was 20 mmHg higher than post-dialysis and 10 mmHg higher diastolic pre-dialysis than post-dialysis.

In pre-dialysis BP measurements, over a quarter of systolic patient-months were 150 mmHg or higher (peripheral hypertensive stress signal), while a quarter of diastolic patient-months were 60 mmHg or lower (central hypotensive stress signal). Either one of these situations would be a reason to monitor the post-dialysis readings in these patients.

In post-dialysis BP measurements, only 5% of patient-months were 150 mmHg or higher, while a quarter of patient-months were still 60 mmHg or lower. These two segments of measurements, if occurring repeatedly in a patient, are an indication for close observation of a patient's BP, and possibly introducing some adjustments to one or more of the dietary practices, BP medications and/or dose of HD.

Anthropometrics (Ref. table 9.2)

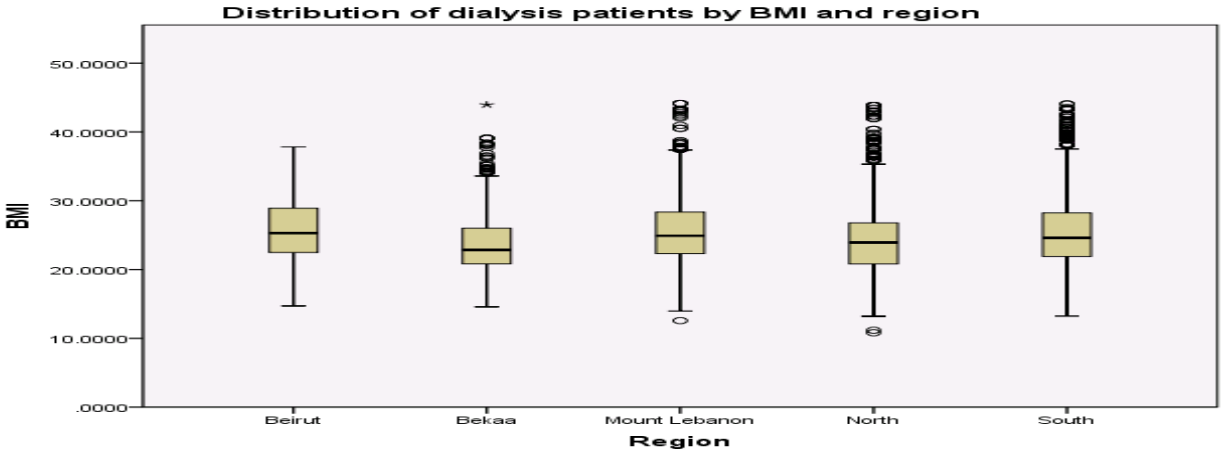
Patients undergoing HD suffer, in addition to non-functional kidneys, from one or more major comorbidities. Diabetes, hypertension, heart disease, anemia and a number of metabolic disorders complicated by reduced intestinal absorption, uremic toxicity and fluid retention. All these factors make clinical management of HD patients quite tricky to balance and optimize.

Obesity can be a major complicating risk factor in HD patients especially those who are diabetic. Complications of diabetes include peripheral vascular disease, peripheral neuritis and retinopathy to name a few. Severity of these complications is enhanced by hyperlipidemia and high body fat deposits. Additionally, obesity makes insertion and maintenance of a functional vascular access more difficult. Finally, a high proportion of HD patients is hypertensive or has cardiac disease, and compounded by obesity, makes metabolic syndrome a common occurrence. Hence, obesity may constitute further contribution to the risk of mortality and morbidity in these patients.

Body mass index (BMI) can be routinely assessed as patient dry weight is measured every session while height is constant. Also, measuring body circumference at key spots where fat tissue accumulates can detect "sneaky" depositions occurring with a borderline BMI. Waist, hip and neck circumferences measured at least once a year can uncover such occurrences early.

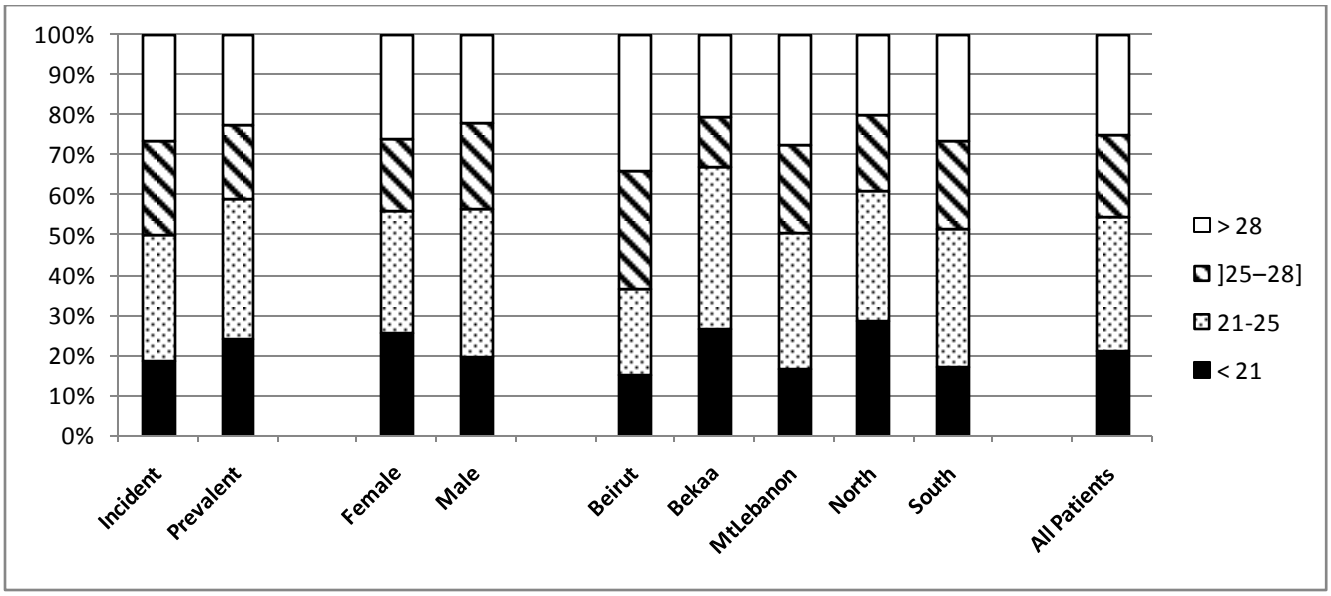
Body Mass Index averaged 25.3 ± 9.5 Kg/m2 (median = 24.4) with minimal difference between incident and prevalent patients. Only Beqaa had a low mean BMI of 23.9 (median = 22.9), while the other 4 regions had a mean BMI > 25 (**figure 9.1**). This regional distribution is similar to the one observed at start of HD. Over a quarter of patient-months had BMI levels of moderate to severe obesity (>28 Kg/m2). However, another quarter of patient-months were at overweight BMI levels (BMI in the 25-28 Kg/m2). At the lower end of BMI, 10% of patients had levels <19 kg/m2, bordering on the underweight.

Figure 9.1 Distribution of BMI levels by region



The distribution of patients to BMI levels by patient category, gender and region are shown in **figure 9.2**.

Figure 9.2 BMI levels in maintenance HD patients, by patient category, gender and region



Waist Circumference (WC) is a must check given the proportion of patient-month levels that corresponded to overweight or obesity. The average WC was 99.5 ± 15.1 cm (median = 99), which is higher than normal regardless of gender. There was little difference by patient category and all regions had a mean & median of at least 98 (**figure 9.3**). This observation points to the importance of taking the overweight BMI levels in the 25-28 Kg/m2 range seriously, and repeating the waist, hip and neck circumferences and using the registry module to compute estimates for percent body fat and total body water, when these levels are observed.

Neck and hip circumferences were also measured. Their summaries will not be reported separately here. However, they will contribute to the estimation of percentage body fat using the US Navy fitness formula.

Body Fat Percentage (BFP) average estimate was 24.8 ± 10.8 (median = 23.5). Recent starters had slightly lower levels (mean = 23.1 ± 9.5, median = 21.9) compared to earlier starters (mean = 25.3 ± 11.1, median = 23.9). Over a quarter of all patients had BFP of 31.8 or higher which are overweight levels even in females. Of the 5 regions (**figure 9.4**), Beirut had a mean BFP of 29.8 ± 9 (median = 28), which may be expected for a strictly urban region, and over a quarter of patients were at BFP of 35.8 or higher.

Total Body Water (TBW) was estimated using the Watson formula. Average TBW was 35.2 ± 6.8% (median = 34.8). These levels are lower than expected for a normal population; however, may be expected in an older population who are dialyzed to be kept on the dry side.

Figure 9.3 Distribution of waist circumference levels by Region

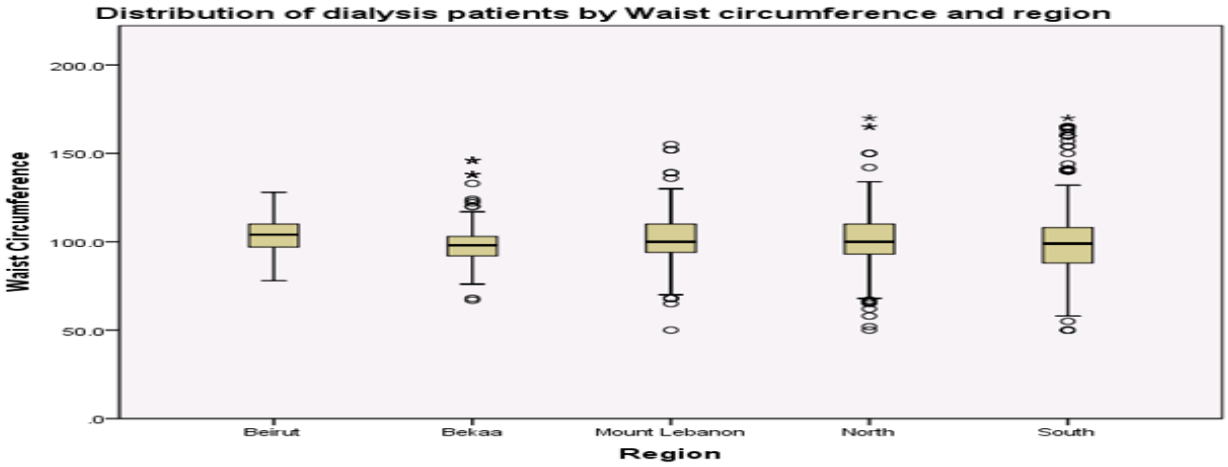
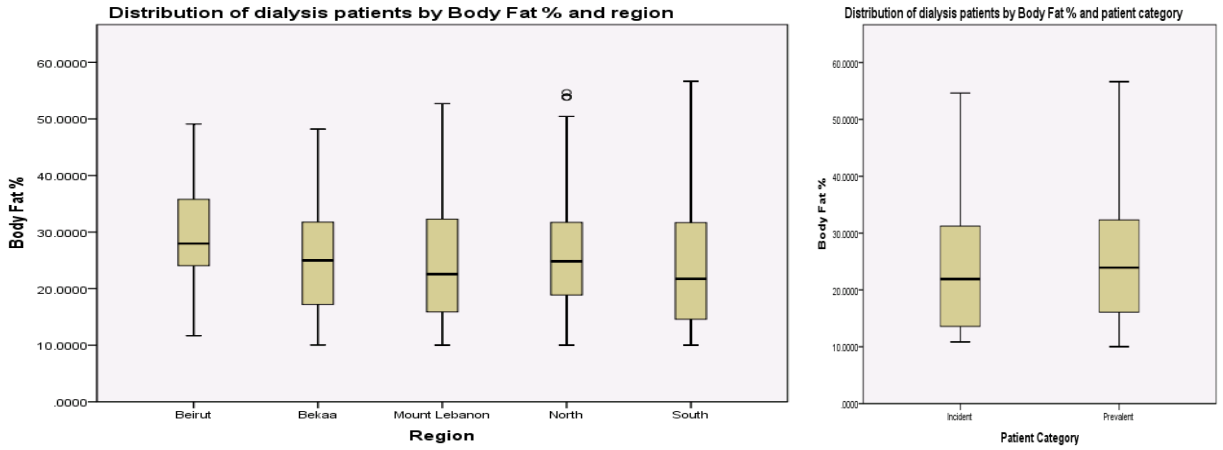


Figure 9.4 Distribution of percent body fat levels by region and patient category



A dietitian trained in nutritional management of renal disease provides effective nutritional education, thus enhancing patient's nutritional knowledge, ability for self- management and boosting dietary and medications compliance. That can make a difference in improving the clinical outcomes of bone and mineral disease, anemia, diabetes complications, hypertension, Interdialytic weight gain … etc.

The kidney registry introduced the measurement of BMI and waist/neck/hip circumference at least once a year to compute % body fat and water, providing essential anthropometric information for dietitians.