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Fig. 21.10.1.2 (a) Glomerulus from patient with type 1 diabetes and severely increased albuminuria (haematoxylin and eosin stain). Note afferent (A) and efferent (E) arteriolar hyalinosis, thickened and split Bowman's capsule (B), and mesangial expansion

(M). (b) Glomerulus from patient with type 1 diabetes and severely increased albuminuria (toluidine blue stain) showing typical nodule (N). Note central accumulation of matrix material with surrounding nuclei.

21.10.1 Diabetes mellitus and the kidney 4979 increased albuminuria (microalbuminuria), and severely increased albuminuria (clinical proteinuria) (Table 21.10.1.1). Selecting only population-based cohorts with good patient ascertainment gives prevalence rates for moderately increased albuminuria of between 5 and 21% for type 1, and 11 to 42% for type 2 diabetes. Reported annual incidence rates are around 2% for type 1 patients (Table 21.10.1.2). For severely increased albuminuria, the prevalence is 6.4% in type 1 patients in the United Kingdom, with a range from 5 to 33% worldwide for type 2. A cumulative incidence of approximately 20% after 20 years' duration was found in type 1 diabetic cohorts of the Steno Hospital in Denmark and Joslin Clinic in the United States of America, and similar figures have been reported for patients with type 2 diabetes in the United States of America (25%) and Germany (27%). More recent data from patients prospectively studied from diagnosis of type 1 diabetes in Scandinavia have revealed lower cumulative incidences of 15% after 20 years (Denmark) and 11% after 30 years (Sweden). There have also been reductions in the numbers of patients with type 1 diabetes entering renal replacement therapy programmes in the United States of America (incident rate in 1995–1999 was 7.1% vs 3.9% in 2000–2004) although this reduction is not seen in African Americans who

continue to show a year-on-year increase. The cumulative incidence of endstage renal disease secondary to type 1 diabetes in Finland is only 7.8% after 30 years. The situation for type 2 diabetes is less clear as far as moderately and severely increased albuminuria are concerned, although the transition rates are similar to type 1 at 1 to 2% per year. A population-based study in the United States of America has suggested that fewer patients with type 2 diabetes presented with clinical proteinuria at diagnosis in the 1990s compared to 30 years previously. Analysis of the UKPDS cohort has suggested a cumulative incidence of a urinary albumin concentration between 50 and 299 mg/litre (moderately increased albuminuria) of 42% at 20 years and severely increased albuminuria of 20% after 20 years. Almost 20% of adults with diabetes in the 2007 to 2012 NHANES cohort in the United States of America had a diagnosis of chronic kidney disease (CKD), and 30% had moderately increased albuminuria. Diabetes was given as the primary renal diagnosis in 38% of prevalent patients and 47% of incident patients receiving renal replacement therapy in the US population in 2016. The corresponding figures in the United Kingdom in 2017 were 18% (prevalent cases) and 29% (incident cases). In considering these figures, however, it is important to note that the reliability of clinician-assigned 'primary cause' of end stage renal failure is not well established; that diagnosis of diabetic nephropathy is rarely established by renal biopsy; and that many patients may be more properly described as having end stage renal failure with diabetes as perhaps one of several aetiological factors, rather than end stage renal failure caused by diabetes. There is dramatic variation in the risk of moderately and severely elevated albuminuria, and of endstage renal disease, in different ethnic subgroups. In the United States of America, there is a four-fold increased prevalence of African American and native American patients on renal replacement therapy compared to white patients. The increase is threefold for those of Hispanic origin. A similar increased risk has been reported for South Asian populations in the United Kingdom. Many countries have disease registers of patients entering renal replacement therapy and in 2009 to 2010, prevalence rates of 51 to 63% for diabetes were reported for Mexico, Singapore, Malaysia, and New Zealand, with incident rates of 49 to 66%. Pacific Islanders and Maori people in New Zealand are much more prone to renal disease and diabetes than those of European extraction. The reasons for the excess risk of endstage renal disease in these groups is unclear but may be genetic, related to increased rates of hypertension, or the result of fetal programming. There are intriguing data suggesting that the number and size of glomeruli is different in Australian aborigines compared to white European patients.

50 microns (a) (b) Fig. 21.10.1.2 (a) Glomerulus from patient with type 1 diabetes and severely increased albuminuria (haematoxylin and eosin stain). Note afferent (A) and efferent (E) arteriolar hyalinosis, thickened and split Bowman's capsule (B), and mesangial expansion (M). (b) Glomerulus from patient with type 1 diabetes and severely increased albuminuria (toluidine blue stain) showing typical nodule (N). Note central accumulation of matrix material with surrounding nuclei.

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