Obesity and nephrology: results of a knowledge and practice pattern survey

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ABSTRACT

Background. Obesity, the largest epidemic of modern time, carries a markedly increased risk of type-2 diabetes, cancer, fatty liver, sleep apnea, hypertension, dyslipidemia and atherosclerotic cardiovascular disease. In addition, obesity increases the risk of chronic kidney disease (CKD) and its progression to end-stage renal disease (ESRD). There are limited data regarding the basic knowledge of nephrologists on how to assess and manage obesity in the setting of CKD.

Methods. To learn more about practice patterns among nephrologists, a survey on obesity was published online in NDT-Educational between 8 November 2012 and 31 January 2013. Three-hundred and ninety-nine responses were received mostly from nephrologists in Europe (57%), South and Central America (12%) and the Middle East (10%). The majority practiced in clinical nephrology (64%) and outpatient dialysis clinics (23%). Whereas 54% of the participants worked in hospitals, 31% worked in academic centers.

Results. Most participants stated that the number of obese patients has increased both among their CKD stage 2–5 patients and in their dialysis clinics during the last 10 years. For routine estimation of body fat content in the dialysis clinic, the majority of nephrologists (43%) still rely on the body mass index (BMI). A majority (72%) does not think that weight gain should be promoted in dialysis patients with a BMI of <35 kg/m². The survey also showed that 30% of the responders did not have any predetermined cut-off level for BMI. However, 29% used a cut-off level of 35 kg/m² and 27% used a cut-off level of 30 kg/m² for approval for kidney transplantation in their clinics.

Conclusions. The level of understanding of the intricacies of obesity in the setting of CKD needs improvement among nephrologists. Similarly, there is no consensus regarding weight management strategies in CKD patients with obesity. Studies are needed in this orphan area of renal research.

INTRODUCTION

Obesity has reached epidemic and catastrophic proportions during the 21st century with a worldwide prevalence of >20% [1]. Obesity may promote chronic kidney disease (CKD) indirectly via hypertension, type-2 diabetes and accelerated atherosclerosis. Emerging evidence suggest that increased fat mass may also have direct detrimental effects on kidney hemodynamics and function. Obesity is also a modifiable risk factor for the progression of kidney disease, and pretransplant obesity affects graft function. Despite the marked impact of this increasingly prevalent condition, leading nephrology journals have posed suboptimal attention to this condition. In order to understand how nephrologist estimate and manage obesity in the setting of CKD and end-stage renal disease (ESRD), we conducted a survey with two parts: a knowledge survey and a practice patterns survey.

MATERIALS AND METHODS

The survey was developed by the authors and was posted on the NDT-E website. The response period was between 8 November 2012 and 31 January 2013. The survey compromised...
of two sections: (i) eight basic knowledge questions about obesity in CKD and (ii) eight specific practice patterns related to management of obesity in the setting of CKD. Specific survey questions are listed at http://www.ndt-educational.org/page-25-0-0-369-obesity.php. Once the response period ended, the data were compiled and analyzed for accuracy and reliability. The results are analyzed and presented by basic descriptive statistics.

**RESULTS**

A total of 399 nephrologists completed the survey. Of those who completed the survey, 57% were from Europe, 12% were from South and Central America, 10% from the Middle East and 9% from Asia. Minor portions were from North America (5%), Oceania (5%) and Africa (2%). The majority (35%) of the respondents were between the ages 45–54 years, 30% were between the ages of 55–64 years and 19% were between the ages of 35–44 years. Fifty-four percent of the respondents were working in a hospital, 31% in an academic department and 11% in a ‘free-standing’ dialysis unit.

**Specific questions in the knowledge part of the survey**

**Question 1 (definition of obesity).** Whereas the majority (76%) correctly stated that ‘overweight’ is defined as a body mass index (BMI) between 25.0 and 29.9 kg/m², 20% defined ‘overweight’ as a BMI between 30.0 and 34.9 kg/m² and 4% as a BMI between 35.0 and 39.9 kg/m².

**Question 2 (epidemiology of obesity).** Thirty percent responded correctly ‘In the western world the increased prevalence of obesity parallels the increases in sugar consumption’ and 29% responded correctly that ‘About two-thirds of adults in Mississippi and several other US states will be obese by year 2030’. Moreover, 20% responded correctly ‘There is a marked difference in the prevalence of obesity between Europe and USA’ and 12% responded correctly ‘Greece, Mexico and Egypt are now on the top-20 list of countries in the world with highest BMI’. However, only 9% responded that all of these four statements were true.

**Question 3 (obesity and associated comorbidities).** Sixty-six percent answered correctly ‘All of the listed co-morbidities are associated with obesity’. Twenty-four percent answered that ‘only gallbladder disease’ is associated with obesity, and a few answered that ‘only sleep apnea’ (7%), ‘only osteoarthritis’ (1%), or ‘only cancer’ (1%) were associated with obesity.

**Question 4 (measurement of excessive fat).** Thirty-three percent of the responders answered correctly that ‘skinfold thickness’ was the best measure of excessive fat. Whereas 39% considered ‘waist circumference’ as the best measure of excess fat, 28% answered ‘BMI’. None considered ‘body weight’ as the best measure of estimating excessive fat.

**Question 5 (linking obesity to CKD).** Only 65% of the responders answered correctly ‘Obesity per se is a risk factor for CKD’. Of the 35% that did not answer this question correctly, 20% considered ‘Hypertension as the key factor underlying the risk for CKD in obesity’. Nine percent answered that ‘Only in the presence of hyperglycemia or frank diabetes, hypercholesterolemia and hypertension are risk factors for CKD in obese patients’, and 6% answered ‘Obese CKD is characterized by proteinuria >2 g/24 h’.

**Question 6 (appropriate treatment of CKD in the obese patient).** Forty-one percent of the responders answered correctly ‘The evidence that ACE-inhibition is the best nephroprotective treatment in proteinuric patients with overweight and obesity is still circumstantial’. Fifty-nine percent of the responders answered correctly that ‘The efficacy of weight reduction on CKD progression are not proven by randomized trials’. Ten percent answered (not correct) ‘It is well proven that ACE-inhibition is superior to weight reduction for nephroprotection in obese patients with CKD’. Eight percent answered (not correct) ‘It is well proven that ACE-inhibitors and calcium-channel blockers offer similar nephroprotection in obese patients with CKD’.

**Question 7 (body composition and clinical outcomes).** This question included a series of ‘True’ or ‘False’ statements regarding the risk profiles of body composition and overall nutritional status in CKD patients. Thirty-three percent answered correctly ‘Higher muscle mass is associated with greater survival’, 25% answered correctly ‘Wasting can exist with adiposity and high BMI’ and 20% answered correctly ‘Overweight and obesity prevail over underweight in maintenance dialysis patients’. Whereas 9% answered ‘Underweight is the most frequent nutrition disorder in dialysis patients’, 6% answered ‘Evidence of inflammation exists in underweight and/or wasted patients only’. The two latter statements are not correct.

**Question 8 (bariatric surgery in the setting of CKD).** This question included a series of ‘True’ or ‘False’ statements regarding bariatric surgery in CKD patients. Thirty-seven percent answered correctly ‘The presence and severity of CKD is associated with a higher risk of complications among patients undergoing bariatric surgery’, and 29% answered correctly ‘Recent data suggest that there is greater than 50% reduction in incidence of diabetic nephropathy 5 years following bariatric surgery’. Twenty-four percent answered correctly ‘After bariatric surgery there is an improvement in microalbuminuria in the early post-operative period’.

**Specific questions in the practice patterns part of the survey**

**Question 1 (decreasing the prevalence of obesity in CKD stage 2–5 patients during the last 10 years).** Fifty-eight percent of the survey participants responded that the obesity prevalence had ‘somewhat increased’, 28% responded that obesity prevalence had ‘markedly increased’, 16% responded that the obesity prevalence had ‘not changed’ and only 1% responded that the prevalence of obesity actually had ‘decreased’ in their practices.
Question 2 (actions taken in obese stage 3–4 CKD patients). This question was aimed at understanding the preferences regarding actions taken to manage obesity in the setting of moderate CKD. Thirty-four percent of the responders indicated that they would ‘Prescribe a caloric restricted diet and try to motivate the patient to increase his/her degree of physical activity’, 32% would ‘Check fasting glucose and blood lipids’ and 28% would ‘Refer the patient to a dietician’. Only 3% indicated that they ‘Would not change anything in their usual practice’ if their patient were obese.

Question 3 (additional actions taken when initial interventions fail in obese stage 3–4 CKD patients). In response to this question, 32% indicated that they ‘Would not take any additional action,’ whereas 27% indicated that they ‘Would consult a surgeon to discuss bariatric surgery’ and 15% indicated that they ‘Would prescribe an anti-obesity drug’. The specific anti-obesity drug was not included in the question. The rest (26%) of the responders provided a variety of different free answers, such as ‘Provide education’, ‘Continue motivation’, ‘Continue with diet and exercise’, ‘Insist on motivation. I fear anti-obesity drugs’, ‘On-going education and behavior change’, ‘Try to keep them as active as possible’ and the more nihilistic option ‘Wait and see’.

Question 4 (health care professionals available to refer obese CKD patients). The survey also showed that most nephrologists have access to health professionals to whom they can refer obese CKD patients; i.e. dietitians (36%), other specialists, such as endocrinologists (24%), physiotherapists (17%), surgeons specialized in bariatric surgery (16%) or a weight less center (6%).

Question 5 (the changing prevalence of obesity in the outpatient dialysis units over the last 10 years). Fifty-four percent of the survey participants responded that the obesity prevalence had ‘somewhat increased’, 15% responded that obesity prevalence had ‘markedly increased’ and 27% responded that the obesity prevalence had ‘not changed’ in the outpatient dialysis unit setting. Only 4% responded that the prevalence of obesity had ‘decreased’ in the outpatient dialysis units that the responders were affiliated with.

Question 6 (methods used to estimate fat mass). The majority (43%) responded that they used ‘BMI’ and 22% indicated that they used their measuring tape to estimate ‘waist–hip ratio or waist circumference’ in their patients. ‘Bioelectrical impedance’ was used by 15% and ‘skinfold thickness’ by 13% of the responders to estimate fat mass. ‘Dual energy X-ray absorptiometry’ (2%), ‘computed tomography’ (1%), ‘conicity index’ (1%) and ‘abdominal height’ (2%) were methods for fat mass assessment not commonly used in the clinical setting (Figure 1).

Question 7 (weight gain in maintenance dialysis patients). This question was aimed at understanding the preferences of nephrologists regarding weight gain in their dialysis patients with a BMI of <35 kg/m². A majority (72%) answered ‘No’ to this question, which specifically asked whether they would encourage weight gain. Seventeen percent answered ‘Yes’ and 11% answered, ‘I do not know’.

Question 8 (BMI cut-off level for approval for kidney transplantation). Whereas a large portion (30%) of the responders indicated that there is ‘No cut-off level for referral for kidney transplantation in their practice’, 29% indicated that they had a ‘cut-off of >35 kg/m²’ and 27% indicated that their BMI ‘cut-off level was >30 kg/m²’ (Figure 2).

DISCUSSION

The primary goal of this survey was to understand the level of knowledge regarding obesity assessment in the setting of CKD among practicing nephrologists. We also aimed at gathering information regarding the practice patterns in terms of hand-
ling of obese CKD patients. Overall, the results indicate that there are important knowledge gaps in this area and that practice standards for the management of obese patients with CKD are highly variable. These data highlight the need for further research in this potentially devastating and rapidly increasing morbid condition.

We have observed that the epidemiology of obesity is not well recognized among many nephrologists. There also seems to be limited knowledge about the definition of obesity since approximately one-fourth of the responders were not able to accurately differentiate between ‘overweight’ and ‘obesity’ according to the World Health Organization. Similarly, there was a lack of knowledge regarding the trends in obesity prevalence around the world. These findings have important implications since obesity is a serious public health problem that affects a large part of the world population across all age and racial/ethnic groups. The upward trend in obesity prevalence across regions and continents is a worldwide concern and in 2008, more than 1.4 billion adults 20 years and older were overweight [2], a number that is projected to grow by 40% over the next 10 years [3]. The major complication of obesity is type-2 diabetes. Whiting et al. [4] reported that the 336 million type-2 diabetic patients of 2011 will increase to 552 million by 2030. This ‘tsunami’ of type-2 diabetic patients will put tremendous pressure on the renal replacement therapy organization and health economy all over the world.

The information on the worldwide obesity epidemic becomes more relevant when we observed that 35% of the responders did not identify obesity as a risk factor per se for CKD. By now, there are numerous studies, indicating that obesity, especially high grade, is a risk factor for the prevalence and progression of CKD [5]. A meta-analysis showed that obesity not only increases the risk of CKD, but also that the association appeared to be stronger in females [6]. Data based on incident Dutch dialysis patients showed that obesity is a strong risk factor for loss of residual renal function after initiation of dialysis [7]. Besides the fact that obesity leads to co-morbidities, such as type-2 diabetes, hypertension and atherosclerosis, which may have an impact on both the initiation of kidney disease and its progression, increased fat mass may also have a direct impact on kidney function, causing increased glomerular capillary wall tension, hyperfiltration, fibrosis and podocyte stress [8].

Another area with a significant gap in knowledge is the appropriate method(s) used to assess obesity in the setting of CKD. Whereas one-third correctly identified skinfold thickness as the best measure of excessive fat, as many as 28% selected BMI. Although BMI is used in many nutritional guidelines and is a well-known obesity index among the public (as it is so easy to calculate), this metric is a poor estimate of fat mass and its distribution within the body, especially in patients with gross imbalances of fluid balance, such as kidney disease patients. The waist–hip ratio (WHR) and skinfold thickness are superior to BMI for the correct classification of obesity in CKD in cross-sectional studies [9]. However, one study showed that the WHR may not be a valid estimate of changes in visceral fat mass over time [10]. Since gold standard measurements of body fat content and distribution, such as computed tomography and dual energy X-ray absorptiometry, are problematic and costly to use in longitudinal clinical evaluations of kidney patients, both WHR and skinfold thickness are recommended for routine use in this patient group [9].

The conicity index, which is an anthropometric estimate using waist circumference, height and weight to model the relative accumulation of abdominal fat without requiring the hip circumference to assess fat distribution [11], is an emerging method that identified CKD patients with abdominal obesity and inflammation [12]. It may constitute a valid anthropometric risk estimate in disease states with a wasting component [13]. Information on body composition, i.e. total fat mass versus muscle mass and visceral (abdominal) versus non-visceral fat mass, should be taken into account when calculating the relationship with clinical outcomes. Studies have shown that estimates of lower muscle mass in the setting of high BMI predict poor outcome [14]. The importance of taking body fat mass distribution into account was shown by Postorino et al. [15] who demonstrated that whereas BMI showed an inverse relationship with mortality in 537 HD patients, an increased

**Figure 2**: Distribution of answers to the question “In my clinic, the following BMI cut-off for approval for kidney transplantation is...".
WHR predicted all-cause and cardiovascular mortality. It is clear that introduction of more precise measures of body composition and fat mass distribution is necessary to individualize weight management in clinical nephrology practice. In the survey, 43% answered that they still use BMI as a surrogate marker of the fat content, whereas only 13% use skinfold thickness in their clinical practice (Figure 1).

An important aim of the survey was to gather information regarding weight management practices in CKD patients with obesity. The survey shows that almost all nephrologists (97%) intend to take some action to manage obesity in their patients, although there is no specific intervention that seems to be overwhelmingly chosen as the initial step. A third of the practitioners indicated that they would prescribe dietary interventions (i.e. decreased calorie intake), a third indicated interventions to increase physical activity or exercise and a third indicated that they would check biomarkers that would indicate diabetes or cardiovascular risk. In our opinion, all of the measures should be taken in the initial management of the obese CKD patient. Interestingly, only 28% of the respondents indicated that they would refer the obese patient to a dietician. This could indicate that dietitians are not available in most renal clinics. A follow-up question was intended to provide information on actions taken if the initial intervention failed. Interestingly, 32% indicated that they would not take any further action and 15% indicated that they would prescribe weight-loss medications. Only 27% indicated that they would refer their patients to bariatric surgery. These data once again indicate the lack of any established consensus regarding management of obesity in the renal clinic. This may reflect the lack of sufficiently powered randomized trials on obesity managing interventions, such as diets, physical exercise, anti-obesity drugs and bariatric surgery, in this underserved patient group.

Another reason for the lack of any consensus regarding weight management could be that there are limited healthcare professionals available to provide expert opinion or recommendations for the care of these patients. In the survey, only 6% of the responders indicated that they had access to a specialized weight-loss center at their respective institutions. Similarly only 36% indicated that a dietician was readily available for consultation regarding weight management at their institutions. The use of other specialists or sub-specialist was also noted in the survey. Overall, these data indicated the lack of specialists and structured programs as important factors leading to inadequate management of obesity in the CKD patients and highlight the need for institutional initiatives to overcome this problem.

The final part of the survey was aimed at understanding the epidemiology and preferences at the setting of ESRD and maintenance dialysis. Based on the question of personal observations of changing obesity epidemiology at the outpatient dialysis unit setting, there was an obvious perception that obesity prevalence increased at the setting of ESRD (69% indicated increased obesity prevalence over the last decade). This question was followed by an inquiry regarding promoting weight gain in ESRD patients. Since studies, especially in the USA, have demonstrated that a high BMI is associated with improved survival, we believed that most nephrologists would consider that weight gain should be promoted also in obese patients. However, in the survey, the majority (72%) answered that weight gain should not be promoted in dialysis patients with a BMI of <35 kg/m². While the paradoxical finding that even morbid obesity predicts better outcome [16] has been linked to residual confounding by protein energy wasting, inflammation and competing mortality risk, these observations have led some to argue that weight gain should be promoted in maintenance dialysis patients regardless of its body compartment, i.e. fat or muscle mass. Although obesity may be associated with more efficient disposal of lipophilic uremic toxins, better bone strength and hemodynamic tolerance [17], the fact that increased fat stores usually reflects well-preserved energy stores and good appetite may be the most important reason why high BMI links to better outcome [18]. Although convincing epidemiological data exist that links high BMI to better outcome, some reports indicate that a generalization of this sort could be inappropriate and that further consideration of certain phenotypic features and comorbidities is necessary for proper risk assessment and management of obese patients [17]. As an example, younger patients with low or very high BMI had in contrast to older dialysis patients, an elevated risk of death [19]. The concept of ‘healthy obesity’ [20], i.e. that ~30% of obese patients in the general population are considered metabolically healthy with intact insulin sensitivity, should be studied also in the context of CKD.

In the final question, we asked about the BMI cut-off for kidney transplantation approval (Figure 2). Surprisingly, 30% answered that no BMI cut-off existed in their unit. Whereas 29% answered that the cut-off for kidney transplantation approval was >35 kg/m², 27% had a cut-off level of >30 kg/m² in their clinic. Studies have shown that pretransplant obesity is a significant risk factor for delayed graft function [21], complications after surgery [22] and patient death [23]. As BMI is a recognized poor estimate of fat mass distribution, studies should be conducted to evaluate if more precise methods to assess fat mass distribution, such as WHR, DEXA, waist circumference or conicity index, could help nephrologists and transplant surgeons to predict which obese CKD patient has increased risk for surgical complications, delayed graft function and mortality.

The results of this survey should be interpreted with caution, since the number of answers (n = 399) was rather limited. Moreover, as the majority of respondents (57%) were active in Europe, the answers may not reflect the knowledge and practice patterns of nephrologists from other parts of the world; especially North America in which the prevalence of obesity is markedly higher and practice patterns may differ markedly due to different Health Care policies.

**SUMMARY AND CONCLUSIONS**

The results of this survey indicate that despite the perception that obesity prevalence is increasing in CKD patients, especially in those with advanced disease, important gaps of
knowledge regarding its actual definition, assessment and implications exist. There are also no established guidelines for weight management in CKD patients with obesity or at risk for weight gain. This could be related to both the obvious lack of knowledge and limited institutional resources available to assist practitioners. The treatment of obesity requires a multifaceted approach including, but not limited to, weight reduction and physical exercise programs. A multidisciplinary approach with other healthcare providers is of paramount importance. Well-designed prospective observational studies as well as adequately powered randomized trials are desperately needed to understand and manage obesity in CKD patients.

REFERENCES


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