Diet and indicators for chronic kidney disease

Victorian Health Monitor 2009–10 supplementary report

Department of Health & Human Services

State Government Victoria

Diet and indicators for chronic kidney disease

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Summary

Summary

Between 2009 and 2010, the Victorian Department of Health and Human Services conducted the Victorian Health Monitor (VHM), a statewide cross-sectional health measurement survey. The VHM collected food and nutrition information, as well as biomarkers for a range of chronic conditions, including chronic kidney disease (CKD). This report presents dietary results from the survey for people with an indicator for early CKD (9.0 per cent of all survey participants). The results represent all adults in Victoria aged 18–75 years.

Protein

Mean dietary protein intake (1.3 g/kg/day) for respondents with an indicator for early CKD was higher than the proposed target (0.75–1.0 g/kg/day). However, for respondents with an indicator for early CKD, mean protein intake as a percentage of total energy was below the upper limit recommended for all Australians (19.1 per cent, compared with 25.0 per cent).

Sodium

Three-quarters (75.1 per cent) of all respondents with an indicator for early CKD had a level of sodium intake above the recommended upper limit (2.3 g/day). The mean level of intake for males (3.4 g/day) was higher than the level for females (2.4 g/day) with an indicator for early CKD.

Potassium

More than half (54.8 per cent) of all respondents with an indicator for early CKD had a level of potassium intake above the reference values for adequate intake (males: 3.8 g/day, females: 2.8 g/day). When 95 per cent confidence intervals are considered, the mean levels of potassium intake for males (3.5 g/day) and females (3.4 g/day) were sufficient to meet the reference values for adequate intake.

Water

The mean daily intake for drinking water was 775 mL per day for respondents with an indicator for early CKD. More than half (55.5 per cent) consumed less than 1,000 mL (1 litre or 4 cups) of water per day as drinking water.

Total water intake includes water consumed as drinking water and water consumed in other beverages (tea, coffee etc) and food. When 95 per cent confidence intervals are considered, the mean daily intake for total water was sufficient for both males (3,306.0 mL) and females (2,898.2 mL) to meet the reference values for adequate intake (males: 3,400 mL/day, females: 2,800 mL/day). However, about half (50.6 per cent) of all respondents with an indicator for early CKD had a total water intake below the reference values for adequate intake.

Carbonated beverages

Almost half (48.4 per cent) of all respondents with an indicator for early CKD reported drinking carbonated beverages. The median daily intake for respondents with an indicator for early CKD who consumed carbonated beverages was 206 mL. Although the cola component of this estimate was not calculated, it is lower than the 250 mL per day limit for cola in the proposed Kidney Health Australia–Caring for Australians with Renal Impairment guidelines.

1. Introduction

1. Introduction

This report contains information from the Victorian Health Monitor (VHM), a statewide cross-sectional, health measurement survey (Department of Health 2012a). The VHM was conducted between 2009 and 2010 by the Department of Health and Human Services in Victoria. The survey collected baseline physical and biomedical measurement data to produce estimates of the prevalence of diabetes, heart disease, obesity, dyslipidaemia and hypertension, from a representative sample of Victorian adults aged 18–75 years. Biomarkers for chronic kidney disease (CKD)[1] were also collected and nutrition information was obtained from three dietary recall interviews held with each survey respondent over a six-week period (Department of Health 2012b).

CKD refers to all conditions of the kidney and includes kidney damage and reduced kidney function, lasting for three months or more. During the survey, a single fasting blood and urine sample were collected from each respondent. The estimated glomerular filtration rate (eGFR), which indicates kidney function, was determined from serum creatinine levels; urine samples were tested for albuminuria, which indicates kidney damage. All eGFR results from the survey were calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD–EPI) formula (White et al. 2010). Ideally, each respondent would have been followed up after three months to determine whether any symptoms of kidney damage or reduced kidney function were ongoing (chronic), but this was beyond the scope of the study.

CKD can be categorised into stages (stages 1–5) based on the presence of kidney damage (albuminuria) and level of kidney function—with or without a reduced eGFR. A matrix was developed that aligns disease management with different levels of patient risk, based on levels of kidney function and kidney damage (Kidney Health Australia (KHA) 2012a) (Table 1):

1. Clinical biomarkers for CKD included measures of kidney function and measures of kidney damage. Serum creatinine levels were used to estimate glomerular filtration rate, which is a measure of kidney function. Kidney damage was ascertained based on the presence or absence of albuminuria, defined as a urine albumin:creatinine ratio (ACR) ≥2.5 mg/mmol for males or ≥3.5 mg/mmol for females.

Table 1: Classification of chronic kidney disease

Classification of chronic kidney disease					
KDOQI stage of kidney function			Albuminuria stage		
		Kidney function	Normal (urine ACR mg/mmol)	Microalbuminuria (urine ACR mg/mmol)	Macroalbuminuria (urine ACR mg/mmol)
Stage	Description	eGFR (mL/min/1.73m^2)	Male: < 2.5 Female: < 3.5	Male: 2.5–25 Female: 3.5–35	Male: > 25 Female: > 35
1	Kidney damage with normal GFR	≥ 90	Not CKD unless haematuria, structural or pathological abnormalities present		
2	Kidney damage with mild ↓ GFR	60–89			
3a	Moderate ↓ GFR#	45–59			
3b	Moderate ↓ GFR#	30–44			
4	Severe ↓ GFR#	15–29			
5	Kidney failure#	< 15 or on dialysis			

Source: Johnson et al. 2012; KHA 2012a

Subjects may or may not have evidence of kidney damage.

KDOQI: Kidney Disease Outcomes Quality Initiative

Green: Normal kidney function with no evidence of kidney damage based on an eGFR ≥60 mL/min/1.73m^2 with normoalbuminuria.

Yellow: Normal to mild reduction in kidney function with kidney damage based on an eGFR ≥60 mL/min/1.73m^2 with microalbuminuria or a moderate reduction in kidney function with no evidence of kidney damage based on an eGFR 45–59 mL/min/1.73m^2 with normoalbuminuria.

Orange: Moderate reduction in kidney function with/without evidence of kidney damage based on an eGFR 30–44 mL/min/1.73m^2 with normoalbuminuria or an eGFR 30–59 mL/min/1.73m^2 with microalbuminuria.

Red: Severe reduction in kidney function to kidney failure based on an eGFR <30 mL/min/1.73m^2 irrespective of albuminuria status or macroalbuminuria present irrespective of eGFR.

In this report, survey respondents with an indicator for CKD that categorises them between stages 1 and 3 were defined as having an indicator for early CKD.[2] The survey results showed that about 9.0 per cent of respondents aged 18–75 years had an indicator for early CKD (Department of Health 2013). The analysis in the report excludes respondents with an indicator for CKD at stages 4–5 because the survey identified only 0.1 per cent of respondents with severely reduced kidney function or kidney failure (stages 4–5). Respondents with an eGFR ≥60 mL/min/1.73m^2 with no indication of albuminuria were defined as having no CKD.

Dietary requirements for people with CKD differ according to the stage of their disease. Although everyone with CKD should follow a diet in line with the Australian dietary guidelines (National Health and Medical Research Council (NHMRC) 2013), people with progressive CKD and anyone who is overweight or obese with CKD are advised to consult an accredited practising dietician to develop a suitable eating plan (Dieticians Association of Australia 2006, KHA-CARI unpublished). The proposed Kidney Health Australia–Caring for Australians with Renal Impairment (KHA-CARI) guidelines (KHA 2012a) specify nutritional targets for people with early CKD (Table 2):

Table 2: Nutrition targets for people with early CKD

Parameter	Target
Protein	0.75–1.0g/kg/day (no restriction necessary).
Salt	No greater than 100 mmol/day (or 2.3 g sodium or 6 g salt per day). Avoid salt substitutes that contain high amounts of potassium salts.
Phosphate	No restriction necessary.
Potassium	If persistent hyperkalaemia present, consult accredited practising dietician regarding restricting intake and avoiding foodstuffs high in potassium.
Fluid	Drink water to satisfy thirst. Increased fluid intake is not necessary.
Carbonated beverages	Minimise intake to no greater than 250 mL cola per day.

Source: KHA 2012a

Information about protein, sodium, potassium, water and softdrink intake was derived from the dietary recall interviews conducted during the VHM survey. Phosphate was not explored because there is no restriction on intake for people with early CKD, although there is a restriction on cola intake, and cola drinks have a high phosphate content. The information was assessed against the proposed KHA-CARI guidelines for people with early CKD, Australian reference values (NHMRC 2006), and the Australian dietary guidelines, where appropriate. The information is presented for respondents with an indicator for early CKD and respondents with no indicator for CKD.

2. Progressive CKD (stages 4–5) is defined as having an eGFR <30 mL/min/1.73m^2. Early CKD (stages 1–3) is defined as having an eGFR 30–59 mL/min/1.73m^2 or eGFR ≥60 mL/min/1.73m^2 with albuminuria (albumin:creatinine ratio for males ≥2.5 mg/mmol or ≥3.5 mg/mmol for females).

How to interpret the survey findings

Percentages and means (averages) in this report are age standardised to eliminate the effect that any differences in age structure may have on estimates from different population groups (that is, those with an indicator for early CKD versus those with no indicator for CKD).

Estimates can be expressed as a single value, known as a point estimate. However without knowing the margin of error around a point estimate, it is not possible to make comparisons between two point estimates. Information is therefore incomplete unless it comes with a range of values, known as the confidence interval. The confidence interval gives an estimated range of values that is likely to include the true value in a population.

Statistical significance is determined by comparing the confidence intervals of percentages and means. A difference between two point estimates is deemed statistically significant if the two confidence intervals associated with each point estimate do not overlap. Where they overlap, they are deemed to be similar, or not statistically different from each other.

Median values are presented for drinking water and carbonated beverage intake. They represent the 50^{th} percentile for the range of values observed, and are calculated excluding respondents who reported not drinking any water or not drinking carbonated beverages, where relevant. The interquartile range is also presented, which corresponds to the 25^{th} and 75^{th} percentiles for the range of values observed.

The reliability of estimates is determined using relative standard errors and all of the estimates in this report have a relative standard error less than 25 per cent.

Further information

For further information on chronic kidney disease and the Victorian Health Monitor:
<www.health.vic.gov.au/healthstatus/survey/vhm>

For further information on chronic kidney disease and renal health:
<www.health.vic.gov.au/renalhealth>
<www.health.vic.gov.au/clinicalnetworks/renal>
<www.kidney.org.au>

2. Protein

Protein

Key results

- The mean protein intake for respondents with an indicator for early CKD was above the proposed nutrition target (0.75–1.0 g/kg/day) at 1.3 grams, per kilogram of bodyweight, per day.
- Eleven per cent of respondents with an indicator for early CKD had a level of protein intake below the lower limit of the proposed nutrition target (<0.75 g/kg/day).
- Mean protein intake as a percentage of total energy was lower for respondents with an indicator for early CKD (19.1 per cent) than the upper limit recommended for all Australians (25 per cent).

Introduction

The body requires protein for building muscle, tissue repair and fighting infection (KHA 2012b). It is possible to consume more protein than the body requires and when this occurs, the kidneys filter excess protein, which is then excreted in urine. Protein is found in both animal and plant foods including meat, poultry and fish, dairy foods, cereals and cereal-based products. Many of these foods have a high fat and high cholesterol content, which raises concerns about cardiovascular disease risk.

People with early CKD generally require adequate protein in their diet to maintain these body functions, without excess that can place their kidneys under pressure and progress disease (Fouque et al. 2006; Lentine & Wrone 2004; Mandayam & Mitch 2006). By contrast, people with end stage CKD need more protein and therefore are advised to seek dietary counselling to ensure their dietary protein choices minimise their risk of cardiovascular disease (KHA 2012a; 2012b).

The proposed KHA-CARI guidelines recommend people with early CKD have a protein intake of 0.75–1.0 grams, per kilogram of bodyweight, per day (KHA-CARI unpublished). However, the current recommendation for all Australians is that proteins comprise no more than 25 per cent of total energy intake each day (NHMRC 2006).

Results

Table 3 presents mean daily dietary protein (excluding protein from supplements) intake in grams, per kilogram of bodyweight, by age group, sex and CKD status (anti-logged geometric means). Adults with an indicator for early CKD had a mean protein intake of 1.3 grams, per kilogram of bodyweight, per day. There was no significant difference in the results for males and females with an indicator for early CKD, or between age groups. In addition, there was no significant difference in results between respondents with an indicator for early CKD and respondents without an indicator for CKD.

The mean protein intake for adults with an indicator for early CKD (1.3 g/kg/day) was higher than the nutrition target recommended in the proposed KHA-CARI guidelines (0.75–1.0 g/kg/day). However, 11 per cent (95%CI: 7.4–16.2) of all respondents with an indicator for early CKD had a level of protein intake below the lower limit of the proposed nutrition target (<0.75 g/kg/day), which is similar to the result for those without an indicator for CKD (7.8 per cent, 95%CI: 6.0–9.9).

Table 3: Mean protein intake, by CKD status, age group and sex, Victoria, 2009–10

Age group (years)	Early CKD Mean (g/kg bodyweight/day)	Early CKD 95% CI (g/kg bodyweight/day)	No CKD Mean (g/kg bodyweight/day)	No CKD 95% CI (g/kg bodyweight/day)
Males				
18–54	1.4	1.1 – 1.7	1.4	1.4 – 1.5
55–75	1.1	1.0 – 1.3	1.3	1.3 – 1.4
Total	**1.3**	**1.2 – 1.5**	**1.4**	**1.3 – 1.4**
Females				
18–54	1.3	1.1 – 1.5	1.3	1.2 – 1.3
55–75	1.1	1.0 – 1.2	1.2	1.1 – 1.2
Total	**1.3**	**1.2 – 1.4**	**1.3**	**1.2 – 1.3**
Persons				
18–54	1.3	1.2 – 1.5	1.3	1.3 – 1.4
55–75	1.1	1.1 – 1.2	1.2	1.2 – 1.3
Total	**1.3**	**1.2 – 1.4**	**1.3**	**1.3 – 1.4**

Nutrition target for early CKD: 0.75–1.0g/kg/day, no restriction necessary (KHA-CARI unpublished).

95%CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated resident population of Victoria and totals are age standardised to the 2006 Victorian population.

Early CKD includes all respondents with an indicator for CKD at stages 1–3. Data excludes respondents with an indicator for CKD at stages 4–5 (there were <10 respondents at stages 4–5).

Data for protein intake are expressed in grams, per kilo of bodyweight, per day and excludes intake from supplements.

The means are anti-logged geometric means.

Adults with an indicator for early CKD had a mean protein intake as a percentage of total energy of 19.1 per cent (Table 4) (anti-logged geometric means). This was lower than the upper limit for intake recommended for all Australian adults (25 per cent). The majority of survey respondents (83.9 per cent, 95%CI: 73.0–90.9) with an indicator for early CKD had a level of daily protein intake, relative to total energy, that was lower than the 25 per cent limit recommended. There was no significant difference in the results for males and females with an indicator for early CKD, or between age groups. In addition, there was no significant difference in results between respondents with an indicator for early CKD and respondents without an indicator for CKD.

Table 4: Mean protein intake as a percentage of total energy intake, by CKD status, age group and sex, Victoria, 2009–10

Age group (years)	Early CKD Mean (% of total energy intake)	Early CKD 95% CI (% of total energy intake)	No CKD Mean (% of total energy intake)	No CKD 95% CI (% of total energy intake)
Males				
18–54	18.7	16.4 – 21.3	18.5	18.0 – 19.1
55–75	20.1	19.2 – 21.1	18.8	18.3 – 19.3
Total	**18.3**	**17.5 – 19.2**	**18.6**	**18.1 – 19.0**
Females				
18–54	19.4	17.5 – 21.4	18.9	18.5 – 19.3
55–75	20.0	19.1 – 20.9	19.6	19.1 – 20.1
Total	**20.1**	**19.0 – 21.2**	**19.1**	**18.8 – 19.4**
Persons				
18–54	19.1	17.6 – 20.7	18.7	18.4 – 19.1
55–75	20.0	19.3 – 20.8	19.2	18.9 – 19.6
Total	**19.1**	**17.9 – 20.4**	**18.8**	**18.6 – 19.1**

Upper limit for protein intake recommended for all Australian adults is 25 per cent of total energy intake (NHMRC 2006).

95%CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated resident population of Victoria and totals are age standardised to the 2006 Victorian population.

Early CKD includes all respondents with an indicator for CKD at stages 1–3. Data excludes respondents with an indicator for CKD at stages 4–5 (there were <10 respondents at stages 4–5).

Protein intake is expressed as a percentage of total energy intake per day and excludes intake from supplements.

The means are anti-logged geometric means.

3. Sodium

Sodium

Key results

The mean sodium intake for respondents with an indicator for early CKD (2.9 g/day) was above the proposed nutrition target and the upper limit recommended for all Australians (2.3 g/day).

- The mean sodium intake level for male respondents with an indicator for early CKD (3.4 g/day) was higher than the level of intake for females (2.4 g/day).
- Three-quarters (75.1 per cent) of all respondents with an indicator for early CKD had a level of sodium intake above the proposed nutrition target and the upper limit recommended for all Australians (2.3 g/day).
- All survey respondents with an indicator for early CKD had a sodium intake above the lower limit of the reference value for adequate intake in Australia (<0.46 g/day).

Introduction

Excess sodium intake is associated with water retention and a range of cardiovascular conditions, including hypertension. For people with CKD, hypertension increases the risk of further renal damage and other cardiovascular conditions. Evidence suggests a diet low in sodium, combined with anti hypertensive medication, can reduce the risk of water retention and hypertension in people with CKD (CARI 2005). However, restricting dietary sodium intake is difficult because sodium occurs naturally in food, it is present in high amounts in table salt, and most processed foods contain large amounts of added salt (KHA 2012b).

The proposed KHA-CARI guidelines recommend people with early CKD have a sodium intake no greater than 100 mmol per day (2.3 g of sodium or 6 g of salt per day). They are also advised to avoid salt substitutes that contain high amounts of potassium salts (KHA-CARI unpublished). The upper limit for sodium intake recommended for all Australian adults is also 100 mmol per day (2.3 g of sodium or 6 g of salt per day) (NHMRC 2006). Adequate intake of sodium for adults is 0.46–0.92 grams per day (NHMRC 2006). This is the average level of intake observed in healthy populations, with the higher levels more appropriate for individuals in warmer climates and for those who engage in high levels of physical activity.

Results

Adults with an indicator for early CKD had a mean daily sodium intake of 2.9 g, which was higher than the level of intake recommended in the proposed KHA-CARI guidelines (Table 5) (anti-logged geometric means). Three-quarters (75.1 per cent, 95%CI: 65.3–82.9) of all respondents with an indicator for early CKD had a level of sodium intake above the level of intake recommended, similar to the result for those without an indicator for CKD (71.9 per cent, 95%CI: 70.1–73.7). Fewer than 10 respondents had a level of sodium intake below the lower limit for adequate intake (<0.46 g/day), none of whom had an indicator for early CKD.

Males with an indicator for early CKD had a significantly higher mean level of intake than did females. Although there was no significant difference in mean intake between age groups overall, intake levels for sodium in respondents with an indicator for early CKD peaked at 3.4 g per day for males in the younger age group (18–54 years).

Table 5: Mean sodium intake, by CKD status, age group and sex, Victoria, 2009–10

Age group (years)	Early CKD Mean *(g/day)*	Early CKD 95% CI	No CKD Mean *(g/day)*	No CKD 95% CI
Males				
18–54	3.4	3.0 – 3.9	3.5	3.3 – 3.6
55–75	2.8	2.6 – 3.1	3.2	3.1 – 3.3
Total	**3.4**	**3.1 – 3.7**	**3.4**	**3.3 – 3.5**
Females				
18–54	2.5	2.0 – 3.3	2.6	2.5 – 2.7
55–75	2.3	2.1 – 2.6	2.3	2.2 – 2.4
Total	**2.4**	**2.2 – 2.6**	**2.5**	**2.4 – 2.6**
Persons				
18–54	2.9	2.4 – 3.4	3.0	2.9 – 3.1
55–75	2.6	2.4 – 2.7	2.7	2.6 – 2.8
Total	**2.9**	**2.6 – 3.2**	**2.9**	**2.8 – 3.0**

Nutrition target for early CKD: No greater than 100 mmol/day (or 2.3g sodium or 6g salt per day). Avoid salt substitutes that contain high amounts of potassium salts (KHA-CARI unpublished).

Australian reference value for adequate intake for sodium for adults is 0.46–0.92 g/day (NHMRC 2006).

95%CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated resident population of Victoria and totals are age standardised to the 2006 Victorian population.

Early CKD includes all respondents with an indicator for CKD at stages 1–3. Data excludes respondents with an indicator for CKD at stages 4–5 (there were <10 respondents at stages 4–5).

Data for sodium intake is expressed in grams per day.

The means are anti-logged geometric means.

4. Potassium

Potassium

Key results

- When 95 per cent confidence intervals are considered, the mean potassium intake for both male (3.5 g/day) and female (3.4 g/day) respondents with an indicator for early CKD was sufficient to meet the reference values for adequate intake (males: 3.8 g/day; females: 2.8 g/day).
- More than half (54.8 per cent) of all respondents with an indicator for early CKD had a level of potassium intake above the value for adequate intake.

Introduction

Potassium is an electrolyte that complements the role of sodium in muscular and heart function (CARI 2005). The kidneys regulate potassium levels in the blood and a range of factors influence requirements: the intake of other electrolytes, climate, and levels of physical activity (NHMRC 2006). Foods that are high in potassium include leafy green vegetables and vine fruit such as spinach, cabbage, tomatoes and cucumbers. Bananas and apples are high in potassium, and milk products, such as yoghurt and milk, are also a good source of dietary potassium.

The Australian reference value for adequate intake of potassium in adults is 3.8 grams per day for males and 2.8 grams per day for females (NHMRC 2006). This is the average level of intake observed in healthy populations.

There is no upper limit for dietary intake of potassium, although elevated serum potassium levels (hyperkalaemia) can cause tiredness, muscle weakness and cardiac arrhythmia, especially in renal patients (Rado & Haris 1999). The VHM collected information on dietary intake of potassium and blood samples were taken, but serum potassium levels were not assessed. The proposed KHA-CARI guidelines recommend people with early CKD see an accredited practising dietician if potassium levels are elevated to optimise dietary potassium (KHA-CARI unpublished).

Results

The mean daily intake for potassium from dietary sources (excluding supplements) in respondents with an indicator for early CKD was 3.4 grams, which was similar to the mean for those without an indicator for CKD (3.1 g) (Table 6) (anti-logged geometric means).

More than half (54.8 per cent, 95%CI: 45.8–63.5) of all respondents with an indicator for early CKD had a level of potassium intake below the national reference value for adequate intake, similar to the result for those without an indicator for CKD (59.3 per cent, 95%CI: 55.2–63.2). The mean daily intake for females (3.4 g) with an indicator for early CKD met the national reference value for adequate intake. When the 95 per cent confidence interval is considered, the mean daily intake for males was also sufficient (3.5 g).

Table 6: Mean potassium intake, by CKD status, age group and sex, Victoria, 2009–10

	Early CKD		No CKD	
Age group (years)	Mean *(g/day)*	95% CI	Mean *(g/day)*	95% CI
Males				
18–54	3.5	2.8 – 4.2	3.7	3.6 – 3.9
55–75	3.4	3.1 – 3.9	3.9	3.8 – 4.1
Total	**3.5**	**3.1 – 3.9**	**3.8**	**3.7 – 3.9**
Females				
18–54	3.3	2.8 – 3.9	3.1	3.0 – 3.2
55–75	3.2	3.0 – 3.4	3.3	3.2 – 3.4
Total	**3.4**	**3.1 – 3.6**	**3.1**	**3.0 – 3.3**
Persons				
18–54	3.4	3.0 – 3.8	3.4	3.3 – 3.5
55–75	3.3	3.1 – 3.5	3.6	3.5 – 3.7
Total	**3.4**	**3.2 – 3.7**	**3.5**	**3.4 – 3.5**

Nutrition target for early CKD: If persistent hyperkalaemia is present, consult an accredited practising dietician about restricting intake and avoiding foodstuffs high in potassium (KHA-CARI unpublished).

Australian reference value for adequate intake of potassium in adults is 3.8 g/day for males and 2.8 g/day for females (NHMRC 2006).

95%CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated resident population of Victoria and totals are age standardised to the 2006 Victorian population.

Early CKD includes all respondents with an indicator for CKD at stages 1–3. Data excludes respondents with an indicator for CKD at stages 4–5 (there were <10 respondents at stages 4–5).

Data for potassium intake is expressed in grams per day and excludes intake from supplements.

The means are anti-logged geometric means.

5. Water

Water

Key results

- The mean daily intake for drinking water was 775.0 mL for respondents with an indicator for early CKD.
- When 95 per cent confidence intervals are considered, the mean daily intake for total water, for both male (3,306.0 mL) and female (2,898.2 mL) respondents with an indicator for early CKD met the reference values for adequate intake (males: 3,400 mL; females: 2,800 mL).
- About half (50.6 per cent) of all respondents with an indicator for early CKD had a total water intake below the reference values for adequate intake.

Introduction

The VHM collected information on drinking water and total water intake. While drinking water includes water that is consumed as drinking water, total water includes water consumed as drinking water, water consumed in beverages such as tea and coffee, and water consumed in foods.

The proposed KHA-CARI guidelines recommend people with early CKD drink sufficient water to satisfy thirst; increased fluid intake is not necessary (KHA-CARI unpublished). There is no upper limit for water in the *Nutrient reference values for Australians* (NHMRC 2006), but there is no evidence to support a health benefit with excessive water intake, beyond that required to satisfy thirst.

An adequate intake reference value for total water was established to prevent dehydration in the population: 3,400 mL per day for adult males and 2,800 mL for adult females (NHMRC 2006). This is not a specific requirement for individuals; physically active people and people living in warmer environments may require more water to remain hydrated. These values represent the average levels of intake observed in healthy populations.

Results

Almost all (96.5 per cent, 95%CI: 94.3–97.9) survey respondents with an indicator for early CKD reported drinking water, which was similar to those without an indicator for CKD (96.3 per cent, 95%CI: 95.2–97.1). More than half (55.5 per cent, 95%CI: 42.3–68.0) of all respondents with an indicator for early CKD drank less than 1,000 mL of water per day. Again, this result was similar to the result for those without an indicator for CKD (53.3 per cent, 95%CI: 50.7–55.9).

Table 7 shows median drinking water intake per day for Victorian adults, by CKD status, age group and sex (based on those respondents who reported drinking water in the survey). Those with an indicator for early CKD had a median daily intake of 775.0 mL. Males and females with an indicator for early CKD had median daily intakes of 811.7 mL and 706.7 mL respectively. The median for people 18–54 years of age with an indicator for early CKD was 1,000 mL, whereas the median for the older age group (55–75 years) was 722.0 mL per day.

Table 7: Median drinking water intake, by CKD status, age group and sex, Victoria, 2009–10

Age group (years)	Early CKD Median (mL/day)	Early CKD IQR	No CKD Median (mL/day)	No CKD IQR
Males				
18–54	1,001.7	456.7 – 1,858.3	1,018.3	600.0 – 1,593.3
55–75	649.2	375.0 – 1,206.7	600.0	320.0 – 953.3
Total	**706.7**	**400.0 – 1,282.7**	**928.3**	**490.0 – 1,500.0**
Females				
18–54	1,000.0	498.3 – 1,456.7	1,100.0	675.0 – 1,648.3
55–75	775.0	508.3 – 1,208.3	795.0	508.3 – 1,275.0
Total	**811.7**	**500.0 – 1,325.0**	**1,033.3**	**616.7 – 1,552.5**
Persons				
18–54	1,000.0	498.3 – 1,470.0	1,058.3	640.0 – 1,621.7
55–75	722.0	426.7 – 1,206.7	688.3	400.0 – 1,133.3
Total	**775.0**	**456.7 – 1,321.7**	**981.7**	**568.3 – 1,508.3**

Nutrition target for early CKD: Drink water to satisfy thirst. Increased fluid intake is not necessary (KHA-CARI unpublished).

IQR = interquartile range (25th and 75th percentiles)

Data are weighted to the age and sex distribution of the 2008 estimated resident population of Victoria.

Early CKD includes all respondents with an indicator for CKD at stages 1–3. Data excludes respondents with an indicator for CKD at stages 4–5 (there were <10 respondents at stages 4–5).

Data for water intake is expressed in millilitres per day and includes drinking water and mineral water consumed.

The medians are calculated for those respondents who reported drinking water and/or mineral water—they exclude respondents who did not consume water as drinking water.

The mean daily intake for total water for respondents with an indicator for early CKD was 3,085.3 mL, which was similar to the mean for those without an indicator for CKD (3,040.6 mL) (Table 8) (anti-logged geometric means). Those with an indicator for early CKD consumed 30.3 per cent of total water as drinking water and 69.7 per cent was consumed in beverages and food.

About half (50.6 per cent, 95%CI: 42.0–59.3) of all respondents with an indicator for early CKD had a total water intake below the national reference value for adequate intake, similar to the result for those without an indicator for CKD (50.5 per cent, 95%CI: 47.7–53.3). Despite this, the mean daily intake for females (2,898.2 mL) with an indicator for early CKD met the national reference value for adequate intake (2,800 mL/day). When the 95 per cent confidence interval is considered, the mean daily intake for their male counterparts (3,306.0 mL) also met the national reference value for adequate intake (3,400 mL/day).

Table 8: Mean total water intake, by CKD status, age group and sex, Victoria, 2009–10

Age group (years)	Early CKD Mean *(mL/day)*	Early CKD 95% CI	No CKD Mean *(mL/day)*	No CKD 95% CI
Males				
18–54	3,473.9	2,976.6 – 4,054.3	3,235.6	3,122.1 – 3,353.2
55–75	2,790.7	2,562.8 – 3,038.8	2,955.6	2,867.3 – 3,046.6
Total	**3,306.0**	**3,051.0 – 3,582.2**	**3,154.3**	**3,068.2 – 3,242.7**
Females				
18–54	2,753.7	2,465.8 – 3,075.1	2,952.6	2,874.8 – 3,032.5
55–75	2,785.4	2,623.4 – 2,957.4	2,874.2	2,784.3 – 2,967.0
Total	**2,898.2**	**2,727.2 – 3,080.1**	**2,929.1**	**2,871.0 – 2,988.3**
Persons				
18–54	3,043.8	2,835.9 – 3,266.9	3,092.0	3,021.9 – 3,163.8
55–75	2,788.2	2,643.0 – 2,941.3	2,912.3	2,837.1 – 2,989.5
Total	**3,085.3**	**2,955.8 – 3,220.5**	**3,040.6**	**2,989.2 – 3,092.9**

National reference value for adequate intake for total water for adults is 3,400 mL/day for males and 2,800 mL/day for females (NHMRC 2006).

95%CI = 95 per cent confidence interval

Data are weighted to the age and sex distribution of the 2008 estimated resident population of Victoria and totals are age standardised to the 2006 Victorian population.

Early CKD includes all respondents with an indicator for CKD at stages 1–3. Data excludes respondents with an indicator for CKD at stages 4–5 (there were <10 respondents at stages 4–5).

Data for total water intake is expressed in millilitres per day and includes plain water and all moisture consumed in fluids and foods.

The means are anti-logged geometric means.

6. Carbonated beverages

Carbonated beverages

Key results

- Almost half (48.4 per cent) of all respondents with an indicator for early CKD reported drinking carbonated beverages.
- The mean daily intake for respondents with an indicator for early CKD who consumed carbonated beverages (316.5 mL) was higher than the mean for respondents without an indicator for CKD (216.7 mL).
- The median daily intake for respondents with an indicator for early CKD who consumed carbonated beverages (206.0 mL) was lower than the 250 mL limit for cola in the proposed KHA-CARI guidelines.

Introduction

Several studies show an association between carbonated beverages and CKD, with mixed results for sugary versus artificially sweetened beverages (Saldana et al. 2007; Shoham et al. 2008). The mechanism leading to kidney damage and loss of function with consumption of carbonated beverages is not yet clearly understood (Bray et al. 2004; Wang & Hoy 2006). However, the proposed KHA-CARI guidelines for people with early CKD recommend limiting cola drinks, which are high in phosphate, to no greater than 250 mL per day (KHA-CARI unpublished).

The softdrinks and flavoured mineral waters that were consumed by respondents were included as carbonated beverages in the results shown in Table 9:

Table 9: Carbonated beverages

Softdrinks and flavoured mineral waters
• Softdrinks, non-cola
• Softdrinks, non-cola, intense sweetened
• Softdrinks, cola, caffeinated
• Softdrinks, cola, intense sweetened, caffeinated
• Softdrinks, cola, decaffeinated
• Softdrinks, cola, intense sweetened, decaffeinated
• Flavoured mineral waters
• Flavoured mineral waters, intense sweetened

Results

Almost half (48.4 per cent, 95%CI: 37.3–59.6) of all respondents with an indicator for early CKD reported drinking carbonated beverages, which was similar to the result for those without an indicator for CKD (48.0 per cent, 95%CI: 44.4–51.6). Those with an indicator for early CKD who consumed carbonated beverages had a significantly higher mean daily intake (316.5 mL, 95%CI: 265.6–377.2) than did those without an indicator for CKD (216.7 mL, 95%CI: 200.5–234.1) (anti-logged geometric means).

Table 10 presents the median carbonated beverage intake per day for Victorian adults, by CKD status, age group and sex. The medians in the table are based on those respondents who reported drinking carbonated beverages. Respondents with an indicator for early CKD who consumed carbonated beverages had a median daily intake of 206.0 mL. The median for males was 206.0 mL, whereas the median for females was 208.0 mL per day. Although the cola component of these estimates was not calculated, the medians for carbonated beverages (which include cola) were lower than the 250 mL per day limit for cola in the proposed KHA-CARI guidelines.

Table 10: Median carbonated beverage intake, by CKD status, age group and sex, Victoria, 2009–10

	Early CKD		No CKD	
Age group (years)	Median *(mL/day)*	IQR	Median *(mL/day)*	IQR
Males				
18–54	416.7	138.7 – 1,153.1	260.0	130.0 – 515.0
55–75	131.2	104.0 – 286.0	209.7	104.0 – 354.0
Total	**206.0**	**108.3 – 793.3**	**260.0**	**130.0 – 482.7**
Females				
18–54	358.3	146.4 – 358.3	215.0	104.0 – 381.3
55–75	136.0	91.0 – 260.0	131.9	87.5 – 270.8
Total	**208.0**	**113.3 – 358.3**	**208.0**	**104.0 – 365.3**
Persons				
18–54	358.3	146.4 – 572.0	232.2	125.0 – 443.3
55–75	136.0	100.0 – 286.0	173.3	100.0 – 303.3
Total	**206.0**	**113.3 – 411.7**	**221.7**	**125.0 – 411.7**

Nutrition target for early CKD: Minimise intake to no greater than 250 mL cola per day (KHA-CARI unpublished).

IQR = interquartile range (25th and 75th percentiles)

Data are weighted to the age and sex distribution of the 2008 estimated resident population of Victoria.

Early CKD includes all respondents with an indicator for CKD at stages 1–3. Data excludes respondents with an indicator for CKD at stages 4–5 (there were <10 respondents at stages 4–5).

Data for carbonated beverage intake is expressed in millilitres per day and includes carbonated softdrinks and flavoured mineral waters.

The medians are calculated for those respondents who reported having consumed carbonated beverages—they exclude respondents who did not consume carbonated beverages.

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