Digestive symptoms in older adults: Prevalence and associations with institutionalization and mortality

Turki AlAmeel MBBS, FRCPC\(^1\), Mohammed Basheikh MBBS FRCPCE\(^2\), Melissa K Andrew MD PhD FRCP\(^3\)

BACKGROUND: Digestive symptoms are common in adults. However, little is known about their prevalence in older adults and the association of digestive symptoms with institutionalization and mortality in community-dwelling older adults.

OBJECTIVE: To determine the prevalence of digestive symptoms among older adults in Canada and whether they are associated with increased risk of institutionalization and mortality, independent of the effect of potential confounders.

METHODS: The present study was a secondary analysis of data collected from community-dwelling participants 65 years of age and older in the Canadian Study of Health and Aging. Measures included age, sex, presence of digestive symptoms, cognition, impairment in activities of daily living (ADL) and self-reported health. Outcome measures included death or institutionalization over the 10 years of follow-up.

RESULTS: Digestive symptoms were found in 2288 (25.6%) of the 8949 subjects. Those with digestive symptoms were older, with a mean difference in age of six months (P=0.007). Digestive symptoms were more common among women (28.4%) than men (20.3%), among individuals with poor self-reported health and those with an increased number of impairments in their ADLs (P<0.001). The presence of digestive symptoms was associated with higher mortality (HR 1.15 [95% CI 1.05 to 1.25] adjusted for age, sex, cognitive function and ADL impairment); however, this association was not statistically significant after adjusting for self-reported health.

CONCLUSION: Although digestive symptoms were associated with increased mortality independent of age and sex, cognition and function, this association was largely explained by poor self-assessed health. Digestive symptoms were not associated with institutionalization.

Key Words: Activities of daily living; Aged; Digestive symptoms; Epidemiology; Institutionalization; Mortality

We conducted the present study to determine the prevalence of digestive symptoms and their association with institutionalization and mortality in community-dwelling older adults.

METHODS

The present study was a secondary analysis of the Canadian Study of Health and Aging (CSHA), a national, population-based, longitudinal, multicentre cohort study whose original objectives were to determine and investigate the prevalence, incidence and risk factors for dementia and the earlier stages of cognitive impairment. Supplementary objectives covered broader aspects of health and disability among elderly Canadians (11).

The CSHA began in 1991 (CSHA-1), when representative samples of Canadians 65 years of age were randomly drawn in 39 urban communities in Canada.
and surrounding rural areas in the 10 Canadian provinces. Subjects were ≥65 years of age at the time of the first survey. Sampling was stratified according to age group, with over-sampling of those 75 to 84 years of age (two times) and ≥85 years of age (2.5 times). Those with life-threatening illnesses (eg, on life support measures or with terminal cancer) were excluded. Individuals who declined to participate or who could not be contacted were replaced by others of the same sex, age group and region.

To make population estimates, sample weights were derived to correct for the different populations in each sampling area and for the oversampling of the older groups (12).

The full CSHA study involved 9008 individuals from the community and 1255 from long-term care institutions. The same individuals were contacted again in 1996 (CSHA-2) and 2001 (CSHA-3). The community sampling frame was based on the Canadian provincial universal health insurance plans, with the exception of Ontario, where technical limitations with the health insurance plan list prevented its use at the time. Here, the Enumeration Composite Record was used, which was a composite list of all citizens in Ontario based on electoral lists, updated between elections from information such as property sales. The response rate in the community was 72.1%. The present study included the 8949 community dwellers who were administered the relevant section of the screening questionnaire.

The CSHA screening interview included questions regarding demographics, general health and psychometric tests for cognitive impairment. The interviewers were instructed to collect collateral information from family members or proxy respondents when recording the data, particularly in cases of cognitively impaired respondents in whom personal accounts may have been unreliable.

The question used to determine the presence of digestive symptoms was: “In the past year have you had troubles with your stomach or digestive system? You can just answer Yes or No.” Cognitive function was based on the score from the Modified Mini-Mental Status (3MS) examination (13). The 3MS is a validated cognitive screening instrument with a possible score of 0 to 100 that tests orientation, immediate and remote memory, attention and concentration, language and naming, verbal fluency and executive function. The respondents were categorized as cognitively normal (3MS score ≥78) or impaired (3MS score <78).

Self-rated health was assessed using a 5-point scale ranging from very good to poor; this was taken from the Older American Resources Utilization Study (14).

For these analyses, self-rated health was dichotomized as either good (combining ‘very good’ or ‘good’ responses) or poor (in which ‘fair’, ‘poor’ and ‘very poor’ responses were combined). Self-rated health status was missing for 18 individuals (0.002%).

Functional status was based on self-report and was assessed using the Activities of Daily Living (ADL) scale from the Older American Resources Utilization Study (14). For our analyses, each of five functional items (eating, dressing, grooming, bathing and toileting) was scored either as 1 (can perform without help) or 0 (needs assistance or unable to perform.)

Participants were categorized according to the number of impairments they reported: no impairments in ADL, one impairment, and two or more impairments in ADL. Nineteen individuals were missing data for one of the five ADL; these individuals were included in the analysis according to the sum of their nonmissing impairments.

Marital status was classified as either married (subjects who were currently married or living in common-law relationships) or unmarried (widowed, divorced, separated and previously married). Marital status data were missing for two individuals.

The CSHA was approved by local ethics committees at all participating study sites.

Outcome measures
For participants who died during the 10-year follow-up, survival time was calculated as the time between the baseline interview at CSHA-1 and the date of death. Ten-year mortality was coded as either 1 (deceased by the end of CSHA-3) or 0 (alive by the end of CSHA-3). Similarly, institutionalization was coded as 1 (institutionalized by the end of CSHA-3) or 0 (remained in the community). In Canada, it is very rare for institutionalized elderly people to return to the community.

Statistical methods
All subjects for whom complete data were available were included in the analysis. In all analyses, proportional weights were used to account for sampling methodology (15).

The baseline characteristics of the subjects with digestive symptoms and the asymptomatic group were compared using the χ² test for proportions and Student’s t test for continuous variables. In all analyses, having digestive symptoms was specified as the independent variable, with mortality or institutionalization as dependent variables. The potential confounders (age, sex, self-rated health, ADL dependence and cognitive impairment) were included as covariates in the regression models.

Survival analyses
Cox proportional hazard regression was used to investigate whether having digestive symptoms was associated with survival, adjusting for potential confounding factors including age, sex, 3MS score, self-rated health and number of impairments in ADL. The results of the Cox regression were reported as HRs with 95% CIs.

Institutionalization analyses
Multivariable logistic regression models were used to control for potential confounding variables and to determine the independent association between digestive symptoms and incident institutionalization. All analyses were performed using STATA version 8.1 (Stata Corp, USA) and were weighted to account for the sampling methodology.

RESULTS
Data regarding digestive symptoms of 25 subjects were missing and were necessarily excluded from the analysis. Because of their small number, their exclusion is unlikely to have significantly affected the results.

Of the 8949 participants included, 2288 (25.6%) reported having difficulty with their stomach or digestive system in the past year. More women (28.4%) complained of digestive symptoms than men (20.3%; P<0.001). Participants >75 years of age were more likely to report symptoms (P=0.04) and the mean age of subjects with digestive symptoms was six months older than those without symptoms (P=0.007).

The percentage of subjects complaining of digestive symptoms was similar between those who were single (25.9%) at the time of the survey and those who were married (24.2%).

Digestive symptoms were found more frequently among subjects with cognitive impairment as defined by a 3MS score <78, those with poor self-reported health and patients with an increased number of impairments in ADLs (all P<0.001; χ² test) (Table 1).

The presence of digestive symptoms was associated with higher mortality (unadjusted HR 1.19 [95 % CI 1.06 to 1.34]). The relationship between mortality and digestive symptoms remained statistically significant after adjusting for age, sex, cognitive function and ADL impairment (HR 1.15 [95% CI 1.05 to 1.25]). However, after adjusting for self-reported health, mortality was similar between those with and without digestive symptoms (HR 1.03 [95% CI 0.96 to 1.15]) (Table 2).

There was no association between digestive symptoms and institutionalization.

DISCUSSION
The present study was one of the first to report on the prevalence of gastrointestinal symptoms in community-dwelling elderly Canadians. More than 25% of Canadians ≥65 years of age complained of digestive symptoms. At the time of CSHA data collection, this corresponded to more than 740,000 affected individuals in Canada. Digestive symptoms were more prevalent among subjects with advanced age and functional or cognitive impairments.
Digestive symptoms in older adults

The prevalence of gastrointestinal symptoms in our study (25%) was similar to what has been reported in previously published studies. In a general population study conducted in Canada (1), the prevalence of upper gastrointestinal symptoms was 28.6%. Abdominal pain in the preceding year was reported by 25.2% of subjects in a British elderly population (9) and 24.3% of seniors living in Olmsted County, Minnesota (USA) (10). Upper dyspeptic symptoms, defined as epigastric pain, heart burn or acid reflux, was found in 25.7% of men and 32.5% of women in a Danish elderly population (8).

In the present study, women reported more digestive symptoms than men, a finding shared by other epidemiological studies involving elderly populations (8) and adults in general (10,16). In a previous Canadian study, patients were surveyed and their symptoms were classified based on Rome II classification: more women reported functional abdominal pain, bowel and anorectal disorders, while functional esophageal and gastroesophageal disorders were more prevalent in men (17). Several lines of inquiry have attempted to explain this sex-related difference in functional gastrointestinal disorders on the basis of behavioural, hormonal, psychological and motility factors. However, the exact reason for the difference remains elusive (18,19).

In population-based studies of seniors, few have examined the differences in the prevalence of digestive symptoms among different age groups. Our results showed that subjects >75 years of age were more likely to report having digestive symptoms. Others have reported different results. Data from the United States revealed that the prevalence of dyspepsia in the elderly was similar among age groups (20). This variability may have been due to the difference in the question asked or due to the smaller number of subjects in that study (n=1375), which made it more difficult to detect difference in prevalence according to age.

To our knowledge, the present study was the first to examine the association between digestive symptoms and other important aspects of assessing older adults such as cognitive function and ability to perform ADLs. Impairment in cognitive function was associated with a greater prevalence of digestive symptoms, as were poor self-reported health and impairments in ADLs.

In the present study, we found that the presence of digestive symptoms was associated with higher mortality even after adjusting for age, sex, and cognitive function and ADL impairment. Nevertheless, the increased mortality was statistically insignificant after adjusting for self-reported health. This suggests that the presence of digestive symptoms may be a marker of deterioration in health, cognitive and/or functional status rather than a risk factor for mortality in itself. Another possibility is that digestive symptoms contribute importantly

### Table 1
Baseline characteristics of individuals with and without digestive symptoms (weighted n=8917)

<table>
<thead>
<tr>
<th>Digestive symptoms</th>
<th>Yes (n=2288 [25.6%])</th>
<th>No (n=6636 [74.4%])</th>
<th>P</th>
<th>P (adjusted for age)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years, mean (95% CI)</td>
<td>75.5 (74.7–76.2)</td>
<td>72.9 (72.8–73.1)</td>
<td>&lt;0.001</td>
<td>0.04</td>
</tr>
<tr>
<td>65–74</td>
<td>1528 (24.1)</td>
<td>4801 (75.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥75</td>
<td>965 (26.3)</td>
<td>2705 (73.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Male</td>
<td>870 (20.3)</td>
<td>3422 (79.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1623 (28.4)</td>
<td>4084 (71.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td>0.13</td>
<td>–</td>
</tr>
<tr>
<td>Married/common-law</td>
<td>1377 (24.2)</td>
<td>4312 (75.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced/separated/widowed/single</td>
<td>1116 (25.9)</td>
<td>3195 (74.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-rated health</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Good</td>
<td>1544 (21.2)</td>
<td>5728 (78.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not good</td>
<td>740 (45.3)</td>
<td>894 (54.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic activities of daily living impairment</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>0</td>
<td>1843 (24.0)</td>
<td>5840 (76.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>336 (35.8)</td>
<td>606 (64.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥2</td>
<td>107 (36.0)</td>
<td>190 (64.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3MS score, mean (95% CI)</td>
<td>83.9 (82.6–85.3)</td>
<td>87.3 (87.0–87.5)</td>
<td>0.008</td>
<td>0.008</td>
</tr>
<tr>
<td>Impaired (&lt;78)</td>
<td>391 (28.3)</td>
<td>990 (71.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal (≥78)</td>
<td>2102 (24.4)</td>
<td>6517 (75.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data presented as n (% [percentages calculated by row]) unless otherwise indicated. 3MS Modified Mini-Mental Status questionnaire

### Table 2
Outcomes (mortality and institutionalization) in individuals with digestive symptoms compared with those without

<table>
<thead>
<tr>
<th>Digestive symptoms model</th>
<th>1 (Unadjusted)</th>
<th>2 (Adjusted for age, sex)</th>
<th>3 (Adjusted for age, sex and cognition)</th>
<th>4 (Adjusted for age, sex, cognition and ADLs)</th>
<th>5 (Adjusted for age, sex, cognition, ADLs and SRH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR (95% CI), P</td>
<td>1.19 (1.06–1.34); 0.004</td>
<td>1.27 (1.11–1.46); &lt;0.001</td>
<td>1.26 (1.10–1.45); 0.001</td>
<td>1.20 (1.04–1.37); 0.11</td>
<td>1.06 (0.92–1.22); 0.42</td>
</tr>
<tr>
<td>HR (95% CI), P</td>
<td>1.14 (1.04–1.25); 0.005</td>
<td>1.19 (1.09–1.29); &lt;0.001</td>
<td>1.18 (1.09–1.29); &lt;0.001</td>
<td>1.15 (1.05–1.25); 0.002</td>
<td>1.05 (0.96–1.15); 0.31</td>
</tr>
<tr>
<td>Odds of institutionalization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR (95% CI), P</td>
<td>1.08 (0.89–1.31); 0.45</td>
<td>1.05 (0.86–1.29); 0.64</td>
<td>1.04 (0.85–1.28); 0.71</td>
<td>0.96 (0.78–1.19); 0.71</td>
<td>0.88 (0.71–1.10); 0.26</td>
</tr>
</tbody>
</table>

Digestive symptoms (Yes/No), age (years), sex, number of basic activity of daily living (ADL) impairments, and self-rated health (SRH, good versus not good). Mortality was modelled using Cox regression. Results are presented as HRs, and OR with logistic regression. ORs for institutionalization were derived from logistic regression models.
to people’s self-perception of their health status. Marital status at the
time of the survey had no effect on the prevalence of digestive symp-
toms and digestive symptoms did not predict institutionalization.

The major strength of the present study is that the data were
derived from a population-based survey generating a large repre-
sentative sample of community-dwelling elderly people with 10-year follow-up of individual subjects and robust measures of cognition
and function. One of the advantages of an epidemiological approach
to digestive symptoms is the ability to study patients with variable
symptom severity including those who had not sought medical advice
(21). Other studies have shown that, in elderly populations, only 18%
to 23% had sought health care for their gastrointestinal complaints in
the previous year (10). The decision to consult health care providers is
probably affected by the frequency and severity of symptoms (9).

Nevertheless, our study has limitations. Our survey was based on
self-reported data, which can be affected by recall bias and may under-
estimate the prevalence of digestive symptoms (22). Another concern is
misreporting if the subject was very cognitively impaired, although
collateral information from proxy respondents was taken into account
as much as possible in such cases. The state of health was also self-
reported and its reflection of the patient’s true health status is subject
to personal subjective judgement. Accordingly, self-assessed health has
been shown to correlate well with objective measures of health and
mortality, and is a commonly used and well-validated measure (23).
We relied on the subject’s own assessment of severity by asking about
“troubles with digestive system or stomach”. Other epidemiological
studies have used a similar approach (21). There is considerable vari-
ability in the type of question subjects were asked to investigate dys-
pepsia among different epidemiological studies. Among the most
commonly used criteria in the functional gastrointestinal disorders
literature are the Rome criteria (24). At the time of our baseline sur-
vey in 1991, the Rome criteria were not widely used. The elderly
bowel symptom questionnaire (25) is another validated score that was
published after our survey was conducted. The definition chosen for
the present study, based on a broad self-report question, was designed
to be as inclusive as possible of any symptoms suggestive of dyspepsia.

CONCLUSION
The present large epidemiological study showed that digestive
symptoms affected more than 25% of elderly Canadians. Digestive
symptoms were associated with higher mortality; however, this
association was largely explained by poor self-assessed health.

ACKNOWLEDGEMENTS: The data reported in this article were col-
clected as part of the Canadian Study of Health and Ageing. The core study
was funded by the Seniors’ Independence Research Program, through the
National Health Research and Development Program (project no 6606-
3954-MIC[S]). The CSHA data are held in-house at the Geriatric Medicine
Research Unit, Dalhousie University. The sponsor had no role in these
analyses. Melissa Andrew was supported by a clinical research initiative
fellowship from the Canadian Institutes for Health Research and by a
Killam Scholarship.

AUTHOR CONTRIBUTIONS: TA: Designed the study, reviewed the
literature and prepared the manuscript except for the results section. MB:
Reviewed the literature and edited the manuscript. MA: Performed the sta-
tistical analysis, wrote the results section and edited the manuscript.

DISCLOSURES: The authors have no financial disclosures or conflicts of
interest to declare.

REFERENCES
gastrointestinal symptoms in the Canadian population: Findings
from the DIGEST study. Domestic/International Gastroentrology
functional gastrointestinal disorders. Prevalence, sociodemography,
4. Agréus L. Socio-economic factors, health care consumption and
rating of abdominal symptom severity. A report from the abdominal
5. Talley NJ, Weaver AL, Zinsmeister AR. Impact of functional
6. Holtmann G, Goebbell H, Talley NJ. Dyspepsia in consultants and
non-consultors: Prevalence, health-care seeking behaviour and risk
7. Everhart JE, Ruhl GE. Burden of digestive diseases in the United
States part I: Overall and upper gastrointestinal diseases.
8. Kay L. Prevalence, incidence and prognosis of gastrointestinal
symptoms in a random sample of an elderly population.
gastrointestinal symptoms and associated consultation behaviour in
a British elderly population determined by face-to-face interview.
gastrointestinal symptoms and associated consultation behaviour in
a British elderly population determined by face-to-face interview.
11. Canadian Study of Health and Aging: Study methods and
Canadian Study of Health and Aging: Study methods and
Canadian Study of Health and Aging: Study methods and
14. Fillenbaum GG. Multidimensional functional assessment of older
adults: The Duke Older Americans Resources And Services
15. Rockwood K, Wolfson C, McDowell I. The Canadian Study of
Health and Aging: Organizational lessons from a national,
multicenter, epidemiologic study. Int Psychogeriatr
16. Shaib Y, El-Serag HB. The prevalence and risk factors of functional
dyspepsia in a multiethnic population in the United States.
disorders in Canada: First population-based survey using Rome II
criteria with suggestions for improving the questionnaire.
18. Chang L, Toner BB, Fukudo S, et al. Gender, age, society, culture,
and the patient’s perspective in the functional gastrointestinal
disorders. Gastroenterology 2006;130:1435-46.
19. Chang L, Heinikemper MM. Gender differences in irritable bowel
antiinflammatory drugs and dyspepsia in the elderly. Dig Dis Sci
and dyspepsia: A population-based study. Gastroenterology
2002;123:1686-701.
22. Fillenbaum GG. Multidimensional functional assessment of older
adults: The Duke Older Americans Resources And Services
23. Idler EL, Benyamini Y. Self-rated health and mortality: A review of
statistical analysis, wrote the results section and edited the manuscript.

DISCLOSURES: The authors have no financial disclosures or conflicts of
interest to declare.