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Abstract

Objective. To estimate the prevalence of alarm symptoms for breast, colorectal, urinary tract, and lung cancer in the general population. *Design.* Cross-sectional questionnaire survey. *Setting.* The former County of Funen, Denmark, with 480 000 inhabitants. *Participants.* A total of 13 777 randomly selected persons aged 20 years and older. *Main outcome measures.* Prevalence estimates of having experienced cancer alarm symptoms during the past 12 months: a lump in the breast, blood in bowel movements, blood in urine, or coughing for more than six weeks. The number of alarm symptoms experienced within the past 12 months was also calculated. *Results.* With a response rate of 69%, 3.3% of responders (95% CI 2.9% to 3.7%) reported a lump in their breast, 5.7% (5.2% to 6.3%) reported blood in bowel movements, 2.2% (1.9% to 2.5%) reported blood in urine, and 6.5% (6.1% to 7.5%) reported coughing for more than six weeks within the past 12 months. Overall, 15.3% (95% confidence interval 14.3% to 16.3%) of the females and 12.7% (11.6% to 13.7%) of the males reported having experienced at least one cancer alarm symptom within the past 12 months. *Conclusion.* Alarm symptoms of breast, colorectal, urinary tract, and lung cancer are common in the general population and approximately 15% of the population have experienced at least one of these cancer alarm symptom within the past 12 months.

Key Words: *Breast cancer, colorectal cancer, cross-sectional survey, health surveys, lung cancer, signs and symptoms, urinary tract cancer*

In order to reduce cancer mortality and morbidity, health care systems have primarily focused on prevention and treatment strategies [1,2]. However, in recent years focus has also been on reducing the time span from when a person experiences a symptom that could potentially be caused by cancer, until the diagnosis has been made [3,4]. One approach has been that patients presenting with cancer alarm symptoms should promptly be referred for clinical investigations [1,2] and many campaigns aim to encourage people to contact their general practitioner immediately when experiencing alarm symptoms [5]. Furthermore, in many countries alarm symptoms give access to the fast track cancer diagnostic pathways [1]. Studies have been made with general practice patients [6]. It is the general practitioner who decides which patients warrant referral, but little is known about the prevalence of cancer alarm symptoms in the population.

If alarm symptoms are frequent in the general population, the positive predictive values for cancer alarm symptoms would be low and many healthy people might become unduly worried about having cancer and be investigated for cancer [7]. Hence, prevalence estimates of cancer alarm symptoms are important. Can we actually base our referral guidelines on alarm symptoms of cancer? For most general practitioners the prevalence of alarm symptoms of cancer will be tacit knowledge. We therefore aimed to determine the prevalence of cancer alarm symptoms of common cancers in the general population.

Material and methods

Study design

A cross-sectional questionnaire survey based on an age- and gender-stratified random sample of the general population.

Alarm symptoms of cancer are used as quick access to the fast-track cancer diagnostic pathways. The prevalence of cancer alarm symptoms in the general population is largely unknown.

- Prevalence of alarm symptoms of breast, colorectal, urinary tract, and lung cancer in the general population within the past 12 months are high.
- Approximately 15% of the population have experienced at least one of these cancer alarm symptom within the past 12 months.

Setting

The former County of Funen, Denmark, with 480 000 inhabitants, comprising 9% of the total Danish population [8]. All Danish citizens are registered in the civil registration with a unique personal identification number, used in all national registers and enabling accurate linkage between all of them [9].

Sampling

The survey comprised a questionnaire sent to a sample of 20 000 people aged 20 years or older. The sample was randomly selected from the Danish Civil Registration Number register, stratified by gender and age, half of them women and half of them men, so that for each gender only 1000 subjects under the age of 40 years were included. A postage paid envelope and a covering letter containing information on the study were enclosed with each questionnaire. Telephone numbers were provided so that the subject could get in touch with the investigators if further clarification was needed. The questionnaire was to be returned within one week. A reminder was sent two weeks later to those who had not yet returned their questionnaire.

The questionnaire

The questionnaire concerned four types of cancer: breast, colorectal, urinary tract, and lung cancer. For each cancer type, there was one question on whether the person had experienced a symptom presumed to be highly related to that particular cancer. These four cancers were chosen because they were the most common cancer forms in Denmark [10] and because their symptoms are well described in the literature [11–14].

Items were phrased to be readily understandable so that persons regardless of literacy skills would be able to answer, without difficulty and within a short time. Subjects were asked whether they within the past 12 months had: "Felt a lump in your breast?", "Seen blood in your bowel movements?", "Seen blood in your urine?", or "Coughed for more than six weeks?" Questionnaire response status was registered in the database as "immediate responder", "late responder" (i.e. after a reminder), and "non-responder".

The questionnaire was field tested before use. As a first step, 10 subjects were interviewed regarding their understanding of the questions. Then the questionnaire was completed twice by 200 subjects aged 40 years and older, with the objective of analysing how the questionnaire was perceived by recipients and to test its reproducibility. The testing led to minor changes, namely removing of two questions on testes cancer.

Statistical analysis

Prevalence estimates of each cancer alarm symptom in the population within the past 12 months stratified by gender and age as well as number of cancer alarm symptoms experienced within the past 12 months were reported. Estimates were reported as percentages (%) with 95% confidence intervals, based on the binominal distribution for the proportion of responders reporting the particular symptom. The effect of age was initially explored by dividing people into five-year age categories, but as results indicated estimates to be homogeneous within 20-year age categories, we present results only in 20-year age categories.

A "yes" response to one of the listed symptoms was considered a positive response. The answer "no" and not answering an item were considered negative responses. Estimates of questionnaire returning status were reported with percentages (%) and 95% confidence intervals.

Since the age and gender composition of the source population is known [8], estimates for overall symptom prevalence, questionnaire returning status, and number of alarm symptoms experienced, across age and gender, were obtained by simple weighting with inverse sampling probabilities [15]. Data were analysed using STATA 10.0 software.

Ethical considerations

According to the Scientific Ethics Committee for the County of Funen, the Biomedical Research Ethics Committee System Act does not apply to this project. The study was approved by the Danish Data Protection Agency.

An alarm symptom is by definition a feature that could potentially be a sign of cancer. Confronting people with questions dealing with cancer alarm

Sampling frame:

Randomly selected citizens living in the former County of Funen, Denmark aged 20 years or older.
(n = 20000, men = 10000, women = 10000)

Excluded (n = 144)

Unknown home address or dead (n = 144)

Eligible (n = 19856)

Immediate responders (n = 10020)

Late responder (n = 3757)

Non-responders (n = 6079)

Will not participate (n = 96)

Suffering from illness or having linguistic problems (n = 36)

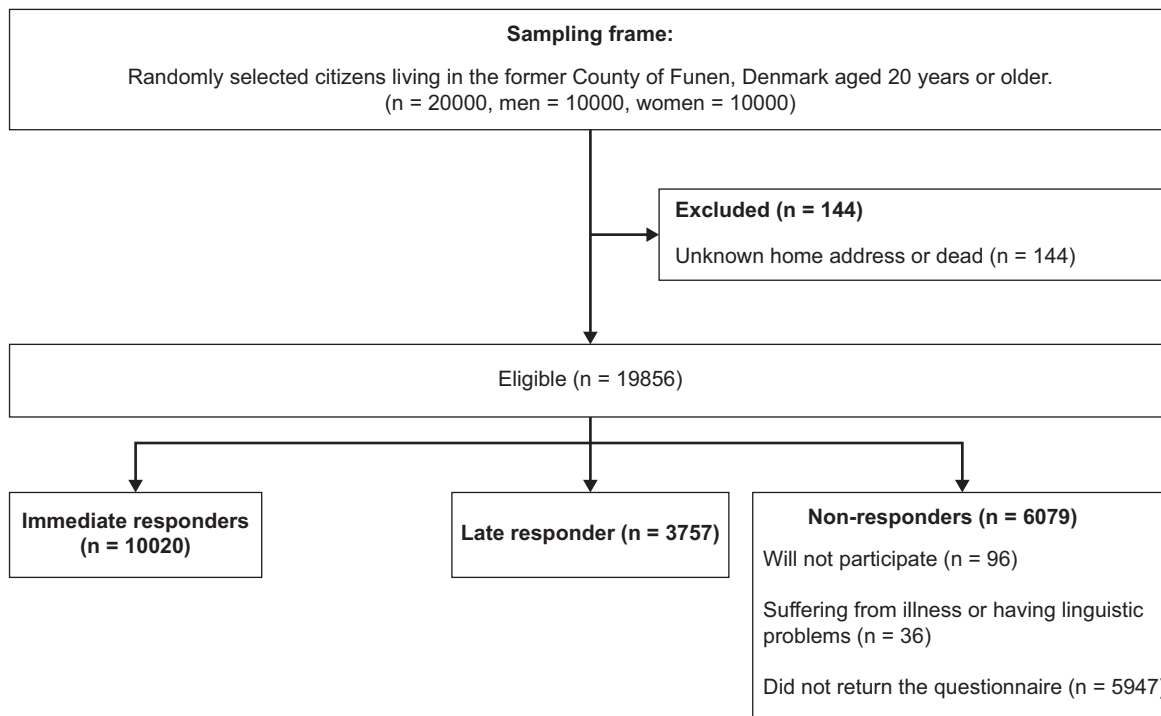Did not return the questionnaire (n = 5947)

Figure 1. Study sample.

symptoms may cause anxiety [7]. To minimize undue anxiety, we provided an information letter, and the respondents were encouraged to contact us by phone if they needed clarification or had any further questions. The respondents were informed that their responses were confidential.

Results

Participants/descriptive data

Of the 20 000 subjects identified, 144 (0.7%) were not eligible because they were either dead or could not be reached (wrong address). Of the 19 856 subjects eligible, 36 subjects could not participate because they were suffering from dementia or had language problems. In total 13 777 subjects (of the 18 856 subjects eligible) returned the questionnaire, yielding an overall response rate of 69.4% (47.4% male and 52.6% female) (Figure 1). Overall, 3.3% of respondents (n = 411) reported a lump in their breast, 5.7% (n = 713) reported blood in bowel movements, 2.2% (n = 307) reported blood in urine, and 6.5% (n = 940) reported coughing for more than six weeks within the past 12 months.

Table I shows that prevalence estimates of cancer alarm symptoms were slightly different when stratified by gender and age. Frequency of a lump in the breast decreased with age for women and frequency of seeing blood in the stools decreased with age for both men and women.

Overall, 15.3% (95% confidence interval 14.3% to 16.3%) of the females and 12.7% (11.6% to 13.7%) of the males reported having experienced at least one cancer alarm symptom within the past 12 months (Table II).

Questionnaire response status

Of the 13 777 responders, 10 020 subjects (72.8%) returned the questionnaire after the first mail-out (immediate responders) and 3757 subjects (27.3%) returned it after the second mail-out (late responders). Males had a tendency to respond later, as 46.0% of immediate responders were males, while 51.4% of late responders and 55.9% of non-responders were males. No age gradient was observed with regard to response status.

Response status (immediate or late responder) showed no significant association with reports of a cancer alarm symptom within the past 12 months (15.8% vs. 15.4%).

Discussion

Summary and main findings

We found a high prevalence of alarm symptoms for breast, colorectal, urinary tract, and lung cancer. Within the past 12 months 12.7% men and 15.3% women reported having experienced at least one alarm symptom.

Table I. Age- and sex-specific prevalences of cancer alarm symptoms.

Age group (years)	Felt a lump in your breast? One-year prevalence					Seen blood in your stools? One-year prevalence					Seen blood in your urine? One year prevalence					Coughed for more the six weeks? One year prevalence				
	n	Women	n	Men	Total, weighted	n	Women	n	Men	Total, weighted	n	Women	n	Men	Total, weighted	n	Women	n	Men	Total, weighted
20–39	42	7.0 (5.1–9.3)	4	0.8 (.2–2.0)	4.1 (1.2–3.0)	44	7.3 (5.4 to 9.7)	44	8.8 (6.4–11.6)	8.0 (6.5–9.7)	17	2.8 (1.7–4.5)	4	0.8 (.2–2.0)	1.9 (1.2 to 2.9)	36	6.0 (4.2–8.2)	24	4.8 (3.1–7.0)	5.4 (4.2–6.9)
40–59	223	6.6 (5.8–7.5)	36	1.2 (.8–1.6)	4.1 (3.7 to 4.7)	173	5.1 (4.4 to 5.9)	234	7.7 (6.–8.7)	6.3 (5.7–6.9)	74	2.2 (1.7–2.7)	46	1.5 (1.1–2.0)	1.9 (1.6 to 2.3)	251	7.4 (6.6 to 8.4)	190	6.3 (5.4–7.2)	6.9 (6.3–7.6)
60–79	68	2.5 (1.9–3.1)	21	0.8 (.5–1.2)	1.7 (1.4 to 2.1)	81	3.0 (2.4 to 3.7)	115	4.4 (3.6–5.2)	3.6 (3.2–4.2)	56	2.1 (1.6–2.7)	86	3.3 (2.6–4.0)	2.6 (2.2 to 3.1)	216	7.9 (6.9–9.0)	183	7.0 (6.0–8.0)	7.5 (6.8–8.2)
80–99	12	2.3 (1.2–3.9)	5	1.3 (.4–3.0)	1.9 (1.2 to 3.0)	13	2.5 (1.3 to 4.2)	9	2.3 (1.1–4.4)	2.4 (1.6–3.6)	11	2.2 (1.0 to 3,7)	13	3.4 (1.8–5.7)	2.6 (1.8 to 3.9)	25	4.7 (3.1–6.9)	15	3.9 (2.2–6.4)	4.4 (3.2–5.9)
Total, both gender weighted					3.3 (2.9–3.7)					5.7 (5.2–6.3)					3.3 (2.9 – 3.7)					6.5 (6.1–7.5)

Note: Figures are percentages (95% CI) unless stated otherwise.

Limitations and strengths

This study aimed to describe the prevalence of alarm symptoms of the four most prevalent cancer forms: breast, colorectal, urinary tract, and lung cancer. It is likely that the overall prevalence of all cancer alarm symptoms is considerably higher.

Selection bias was reduced by randomly selecting participants by means of the Danish Civil Registration Number system. The large sample ensured a high statistical precision of our estimates, supported by the high overall participation rate of 69.4%. As late responders essentially had the same prevalence as immediate responders, we believe that non-responders can reasonably be expected to also have a similar prevalence. The estimate of cancer alarm symptoms may represent minimum prevalences, as patients who are already dead or very ill with a cancer disease cannot participate. Further, our re-scoring of the missing values to the response category "no" would tend to underestimate the cancer alarm symptom prevalence.

The questionnaire's topic was: "Signs of Cancer", which may have influenced the way people interpreted the questions, meaning that some people may have noticed the symptoms described but as they had never had cancer they answered "no" to the questions, confirming an underestimate of symptom prevalence.

Asking people retrospectively about symptoms may have induced recall bias. However, this was probably rather limited, as we had restricted the time span to 12 months. Further, recall bias would probably lead to underestimation of the prevalence of alarm symptoms, as a symptom showing up to be harmless is likely to be quickly forgotten and some people cannot remember symptoms that they experienced a long time ago.

The population-based approach, the large sample and the high response rate make our results generalizable to the Danish population due to the demographic similarity between the County of Funen and the rest of Denmark. Indeed, the 480 000 inhabitants of the county effectively comprise a representative 9% sample of the total Danish population [8], and the cancer incidence of Funen is similar to that of Denmark as a whole [16]. Furthermore, we believe that our results are generalizable to other Western countries with similar health care systems and morbidity patterns.

Comparison with existing literature

Previous studies have focused on alarm symptoms of cancer in the general population [17], but our study is the first large, epidemiological study which provides precise estimates of alarm symptoms of breast, colorectal, urinary tract, and lung cancer in a general population. We have not found other studies on breast and lung cancer symptoms in an unselected population.

Table II. Sex- and age-specific description of how many alarm symptoms of cancer the sample have experienced within the last year.

Age group (years)	Gender	n	n	Have not experienced any symptoms	n	Have experienced one symptom	n	Have experienced two symptoms	n	Have experienced three or more symptoms
20–39	Women	603	483	80.1 (76.7–83.2)	102	16.9 (14.0–20.2)	17	2.8 (1.7–4.5)	1	0.2 (0.0–0.9)
	Men	502	431	85.9 (82.5–88.8)	66	13.1 (10.3–16.4)	5	1.0 (0.3–2.3)	0	0 (0–0.7)*
40–59	Women	3379	2742	81.1 (79.8–82.5)	562	16.6 (15.4–17.9)	66	2.0 (1.5–2.5)	9	0.3 (0.1–0.5)
	Men	3024	2571	85.0 (83.7–86.3)	408	13.5 (12.3–14.8)	39	1.3 (0.9–1.8)	6	0.2 (0.1–0.4)
60–79	Women	2733	2354	86.1 (84.8–87.4)	341	12.5 (11.3–13.8)	34	1.3 (0.9–1.7)	4	0.1 (0.0–0.4)
	Men	2624	2277	86.8 (85.4–88.0)	293	11.2 (10.0–12.4)	50	1.9 (1.4–2.5)	4	0.2 (0.0–0.4)
80–99	Women	528	474	89.8 (86.9–92.2)	47	8.9 (6.6–11.7)	7	1.3 (0.5–2.7)	0	0 (0–0.7)*
	Men	384	347	90.4 (87.0–93.1)	33	8.6 (6.0–11.9)	3	0.8 (0.2–2.3)	1	0.3 (0.0–1.4)
Total	Women	7243	5912	83.6 (82.7–84.4)	1052	14.8 (14.0–15.7)	124	1.7 (1.4–2.1)	14	0.2 (0.1–0.3)
	Men	6534	5489	86.1 (85.2–86.9)	800	12.5 (11.7–13.3)	97	1.5 (1.2–1.8)	9	0.2 (0.1–0.3)
Total weighted	Women			82.6 (81.5–83.6)		15.3 (14.3–16.3)		2.0 (1.5–2.4)		0.2 (0.1–0.3)
	Men			85.8 (84.7–86.9)		12.7 (11.6–13.7)		1.4 (1.1–1.7)		0.1 (0.1–0.2)
Total, weighted estimate	Both genders			84.3 (83.6–85.1)		13.8 (13.1–14.6)		1.7 (1.4–2.0)		1.6 (0.1–0.3)

Notes: Figures are percentages (95% CI) unless stated otherwise. *One-sided ANOVA.

When Buntinx carried out a systematic review of published reports in 1997 on the diagnostic value of macroscopic haematuria he could not find a single population-based study or primary care study [18]. We have not been able to identify any reports on macroscopic haematuria in the general population published since then.

In contrast to other population-based studies, we found that only 5.7% had experienced blood in their bowel movements in the past 12 months. Rectal bleeding within the past year was reported by 14–19% in UK surveys, but new onset of bleeding within the past year was reported by only 2.2% [19–21]. Another recently published, Australian population-based study (n = 440) found that 18.3% (95% CI 14.3 to 22.9) reported blood in the stools within the previous 12 months and it was similar among men and women [22].

Implications of the study

In this population-based study we found a high prevalence of all four cancer alarm symptoms across all ages and for both genders. By looking at four different cancer forms we found that many people had actually noticed at least one alarm symptom within the past 12 months. If all these patients should follow the fast-track recommendations for cancer alarm symptoms and undergo further clinical investigations [1], the health care systems may not have the capacity to examine all of them in a timely fashion – and those with a real need for fast-track diagnostic pathways may not benefit [23]. Furthermore, many patients may be unnecessarily bothered and worried about having cancer.

GPs face an important diagnostic challenge and cannot rely solely on one alarm symptom. In order to decide who should be referred promptly for further diagnostic investigations and who could undergo watchful waiting, the GP should include knowledge on symptom complexes, patient characteristics, and patients' narratives [24].

Conclusion

Alarm symptoms of breast, colorectal, urinary tract, and lung cancer are common in the general population and approximately 15% of the population have experienced at least one of these cancer alarm symptom within the past 12 months.

Acknowledgements

Contributors

BLH and HS had the original idea for the overall study and they designed it together with JK. The plan of analysis for this sub-study was developed by RPS in collaboration with HS, JK, JS, and DEJ, who all participated in the extraction of data and interpretation of results. RPS drafted the manuscript and conducted all statistical analyses under the supervision of HS, JK, JS, and DEJ. All authors contributed to the final version. RPS is the guarantor.

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