

Original Article

## Dementia screening of geriatric patients by implementing an informant-based Alzheimer's disease eight-item tool in KSA

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### المخلص

**أهداف البحث:** يعد فحص الخرف بين كبار السن ضروريا لتحديد الحالات المحتملة، وتأكيده التشخيص ووضع العلاج والتخطيط لاستراتيجيات رعاية الأسرة المستقبلية. هدفت هذه الدراسة إلى الكشف عن الخرف بين مرضى الشيخوخة في منطقة القصيم باستخدام أداة الخرف ذات الثماني بنود للكشف عن مرض الزهايمر القائم على المخبر.

**طرق البحث:** أجريت دراسة مقطعية على مرضى الشيخوخة في القصيم في مستشفيات مختارة خلال الفترة من ديسمبر إلى مارس 2019-2020. وتمت مقابلة مقدمي الرعاية لـ 100 من مرضى الشيخوخة باستخدام أداة الخرف ذات الثماني بنود للكشف عن مرض الزهايمر.

**النتائج:** بين المئة مريض، كانت أعمار 43% من المشاركين بين 65-75 عاما، وكان الذكور 52% والإناث 48%. وكان متوسط العمر 78 عاما لكلا الجنسين. وكان مرض السكري أكثر الأمراض المزمنة (68%) يليه تاريخ لمرض الأوعية الدموية الدماغية (52%). وفقد 41% أكثر من أربعة ولكن أقل من نصف الأسنان بينما ذكر 10% تعدد الأدوية. وكان الخرف إيجابيا في 74% وترتبط إحصائيا بشكل كبير بتاريخ السكتة الدماغية، وعدد الأسنان المفقودة وعدد الأدوية التي يتم تناولها. وأظهر نموذج الانحدار اللوجستي الثنائي المجهز للتنبؤ بالخرف استنادا إلى تأثير تاريخ السكتة الدماغية، وعدد الأسنان المفقودة والأدوية المعطاة أن المرضى المصابين بالسكتة الدماغية لديهم 1.43 عدد مرات احتمالية الإصابة بالخرف من أولئك الذين ليس لديهم تاريخ مرضي سابق بالسكتة الدماغية.

**الاستنتاجات:** ينتشر الخرف بين مرضى الشيخوخة في منطقة القصيم، وكانت عوامل خطر الخرف شائعة بين المشاركين. كما ارتبط الفحص الإيجابي للخرف

بتاريخ السكتة الدماغية، وعدد الأسنان المفقودة، وتعدد الأدوية والعمر. تقلل الوقاية من السكتة الدماغية والعلاج المبكر من احتمالية حدوث الخرف.

**الكلمات المفتاحية:** أداة المسح ذات الثماني بنود للكشف عن مرض الزهايمر؛ فقدان الذاكرة؛ الشيخوخة؛ المملكة العربية السعودية؛ القصيم؛ الكشف

### Abstract

**Objectives:** The screening of dementia among geriatrics is necessary to identify probable cases, confirm diagnosis, institute treatment, and plan for future family caregiving strategies. This study aimed to screen the incidence of dementia among geriatric patients using the informant-based Alzheimer's disease eight-item tool for dementia (AD8) in a KSA region.

**Methods:** A cross-sectional study was conducted among geriatric patients in the KSA region at selected hospitals from December 2019 to March 2020. The caregivers of 100 geriatric patients were interviewed using the AD8.

**Results:** Among the 100 patients, 43% were 65–75 years old, 52% were men, and 48% were women, mean age was (78) for both genders. Diabetes mellitus was the most reported chronic illness, found in 68% of the patients, followed by a history of cerebrovascular disease (52%). Loss of more than four but less than half of the teeth was reported in 41% of the patients, while 10% were reported to be undergoing polypharmacy. Dementia was diagnosed in 74% of patients and had a statistically significant association with a history of stroke ( $p < 0.001$ ), number of teeth lost ( $p = 0.02$ ), and number of drugs administered ( $p = 0.006$ ). A binary logistic regression model fitted to predict dementia based on the effect of a stroke history, number of missing teeth, and number of drugs administered showed that patients with stroke were

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1.43 (95% CI 1.4–4.2) times likely to develop dementia than those with no history of stroke.

**Conclusion:** Cases of dementia are frequent among geriatric patients in the Qassim region of KSA. A dementia positive screening is correlated with a history of stroke, number of lost teeth, polypharmacy, and age. Stroke prevention and early treatment can potentially reduce the likelihood of dementia occurrence.

**Keywords:** AD8; Dementia; Geriatrics; KSA; Qassim; Screening

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## Introduction

Dementia has been considered a global health priority, as evident in the World Health Organisation 2017–2025 Global Action Plan on the Public Health Response to Dementia. This plan provides lawmakers with a complete diagram of activity across several regions: making dementia a general wellbeing need, increasing awareness of dementia to reduce its risk; providing diagnosis, treatment, and caregiving to reduce the danger of dementia, supporting dementia caregivers, establishing initiatives; creating information systems for dementia, and engaging in ongoing research and innovation.

On the worldwide reconnaissance stage, the Global Dementia Observatory has been established for the creators of these approaches and analysts to encourage confirmation and sharing of data on the infrastructure and administration of dementia healthcare and current research on the disease.<sup>1</sup>

Dementia is not a natural part of the ageing process, although it often affects the elderly.<sup>2</sup> The prevalence of the disease increases with age, ranging from 5 to 7% at age >60 years to 20% at >85 years.<sup>3</sup> Many studies have shown that cognitive impairment remains unrecognised in 27–81% of affected patients in primary care.<sup>4</sup>

Dementia screening has not been identified as a common practice in the primary care setting for numerous reasons, including lack of time during the patient appointment, insufficient reimbursement for cognitive work, doubt about the significance of early diagnosis, and the lack of brief, sensitive, and predictive detection tools that reliably distinguish healthy older adults from those with mild dementia. The evaluation of dementia typically consists of objective testing of the patient and, if available, interviewing a reliable informant.<sup>5</sup>

*Cognitive functioning* refers to several mental skills, including learning, thinking, reasoning, memorising, problem-solving, choice-making, and attention. It is expensive to administer current advances in pharmaceutical management. In contrast, prevention strategies have a lower financial burden and can be applied at a larger scale, thereby providing the maximum benefits of available therapies through earlier identification of cases.<sup>6</sup>

Mild cognitive impairment can be assessed objectively using cognitive tests, and this type of impairment is considered insufficient to interfere with an individual's daily living activities and independence.<sup>7</sup> In contrast, Alzheimer's disease (AD) is thought to be the most frequent cause of dementia. A German psychiatrist, Alois Alzheimer, first described this disease in 1906 based on observations at a Frankfurt asylum of a 51-year-old woman who had short-term memory loss and behavioural symptoms.<sup>8</sup>

An eight-item assessment for AD (AD8) has been used as a tool to distinguish between individuals who have dementia and those who do not. This assessment is an *informant-based tool*. In this approach, the patient's informant (usually a spouse, child, or non-family caregiver) is interviewed to evaluate whether the individual has experienced an alteration in the past few years in some regions of cognition and functioning, including memory, orientation, executive functioning, and interest in daily activities.

The informant-AD8 (i-AD8) is a practical, sensitive test for screening cognitive impairment and dementia in tertiary and primary healthcare settings. Although AD8 was initially validated as an informant-based interview,<sup>5</sup> it is now recommended as a critical diagnostic tool in primary care. It has been argued to be more appropriate for routine use in primary care. Patients with positive screening results on AD8 will require further assessment, including history taking, physical examination, standard cognitive assessment, laboratory investigation, and brain radiography to establish a formal dementia diagnosis.<sup>5</sup>

The age of the population in KSA is shifting upwards, towards an older adult population. In 2016, the number of people aged >60 years was at 1.3 million (6.5%), and this number is expected to grow to >10 million (25%) by 2050.<sup>9</sup> Meanwhile, life expectancy is anticipated to be longer, from 74 to 82 years. With this rise, the risk of developing cognitive impairment is also expected to increase.<sup>10</sup> Moreover, the prevalence of dementia worldwide is expected to increase threefold over the next two decades.<sup>11</sup>

This study was designed in response to the growing geriatric population, the developing world health plan, and the need for screening in the primary care setting. It aimed to screen for dementia among geriatric patients in the Qassim region using the AD8 tool and assuming that dementia is frequent among geriatric patients in the region, as there is no sufficient available evidence published in the literature.

## Materials and Methods

This cross-sectional study was conducted in the Qassim region of KSA at two hospitals from December 2019 to March 2020. The sample size was calculated using the electronic Raosoft software calculator (version 2.3, Raosoft, Inc., Seattle, USA), at a 5% margin of accepted error and 95% confidence interval. Data collection was conducted from patients who were conveniently available to participate in the study. The study team interviewed 100 informants for 100 patients. For both hospitals at the time of data collection, all stable geriatric patients aged ≥60 years who were not previously diagnosed with dementia and who had an available caregiver were invited to participate in the study throughout the different departments and outpatient clinics.

Ethical approval of the study was secured from the local Qassim Research Ethics Committee. After describing the purpose of the study, participating informants signed an informed consent form. The interview data collection sheet was composed of two sections; the first section, which was aimed to find out general information about the participating patients, contained questions about socio-demographics, history of chronic disease, and illness. The second set of questions assessed patients' neurocognitive function using the Alzheimer's eight-item screening tool consisting of Yes/No questions: (1) repeats self (memory); (2) reduced interest in hobbies and activities (apathy); (3) trouble with judgment (executive function); (4) trouble operating appliances (executive function); (5) forgets correct month/year (orientation); (6) trouble with finances (executive function); (7) forgets appointments (memory); and (8) daily problems with memory/thinking (general). The test yields a score from 0 to 8, based on the number of positive

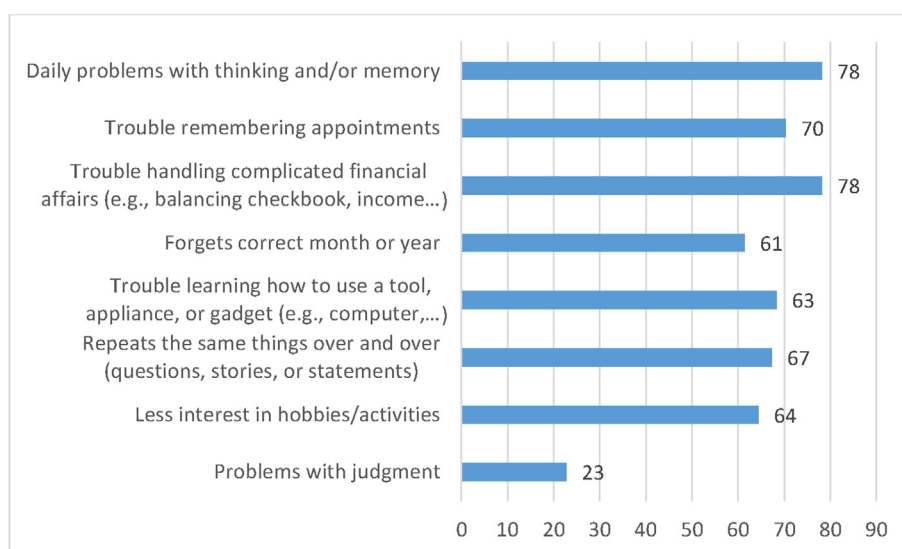
responses. A score of  $\geq 2$  indicates dementia.<sup>5</sup> Data were entered into an Excel spreadsheet (Excel, Microsoft Corporation, Redmond, WA, USA), then coded and exported to SPSS (version 21, IBM). Patient scoring was performed based on the test cut point. Analyses of frequencies, cross-tabulation, and correlation with demographic data were run. The prevalence of Screened Dementia was calculated and a bimodal logistic regression was performed to ascertain the effect of age, history of stroke, number of missing teeth, and the number of administered drugs on the likelihood that a geriatric patient is screened positive for dementia.

## Results

Of the 100 patients who participated in this study, the patient informant—participants produced the following patient data: 43% were aged 65–75 years; 52% were male;

**Table 1: General characteristics of patients who participated in the study.**

<b>Age (years)</b>	
65–75	43% (43)
75–85	38% (38)
85–95	13% (13)
More than 95	6% (6)
<b>Sex</b>	
Male	52% (52)
Female	48% (48)
<b>Risk factors</b>	
Hypertension	60% (60)
Stroke	52% (52)
Diabetes	68% (68)
History of head trauma	26% (26)
History of smoking	21% (21)
<b>Number of teeth lost</b>	
Four or fewer teeth	29% (29)
More than four but fewer than half of the teeth	41% (41)
More than half of the teeth	30% (30)
<b>Number of drugs administered</b>	
From 1 to 5 drugs	42% (42)
From 5 to 10 drugs	46% (46)
More than 10 drugs	12% (12)



**Figure 1:** Reported positive responses (%) on AD8 questions by caregivers/informants. AD8: Alzheimer's disease eight-item assessment.

**Table 2: AD8 screening bivariate correlation with the general characteristics of patients who participated in the study using spearman's correlation.**

		Positive	Negative	P-value
<b>Age (years)</b>				
65–75	43% (43)	30	13	.07
75–85	38% (38)	30	8	
85–95	13% (13)	9	4	
More than 95	6% (6)	5	1	
<b>Sex</b>				
Male	52% (52)	40	12	.493
Female	48% (48)	34	14	
<b>Risk factors</b>				
Hypertension	60% (60)	45	15	.150
Stroke	52% (52)	47	5	.000
Diabetes	68% (68)	49	19	.542
History of head trauma	26% (26)	20	6	.696
History of smoking	21% (21)	15	6	.765
<b>Number of teeth lost</b>				
Four or fewer teeth	29% (29)	14	15	.002
More than four but fewer than half of the teeth	41% (41)	35	6	
More than half of the teeth	30% (30)	25	5	
<b>Number of drugs administered</b>				
From 1 to 5 drugs	42% (42)	24	18	.006
From 5 to 10 drugs	46% (46)	41	5	
More than 10 drugs	12% (12)	9	3	

AD8: Alzheimer's disease eight-item assessment.

median age was approximately equal for males (1.80) and females (1.83). Out of the total, more than 50% were receiving care in the medicine department, and 14% were surgical patients; 68% had diabetes, which was the most common chronic illness; 52% had a history of cerebrovascular disease/stroke; 41% had lost more than four but less than half of their teeth; and 64% were taking 5–10 drugs (Table 1).

The most common reported dementia symptoms were daily problems in thinking and memory and problems in daily financial activities, such as handling complex financial affairs (e.g., balancing the checkbook, filing income taxes, paying bills) (78%), followed by problems remembering appointments (70%) (Figure 1).

Patients were classified into positive and negative using the AD8 tool for the screening of dementia. The results showed that 74% were positive for dementia screening. The normality test showed that the data were not normally distributed. Bivariate correlations among AD8 screening results, which were performed using the non-parametric Spearman's correlation test, yielded statistically significant positive correlations between age ( $p = 0.07$ ), a history of stroke ( $p < 0.001$ ), number of lost teeth ( $p = 0.02$ ), and polypharmacy ( $p = 0.006$ ) (Table 2).

The model of the binary logistic showed that Nagelkerke R<sup>2</sup> of the variance in the development of dementia is 44.4% and correctly classified 84% of the cases (those screened

**Table 3: Binary logistic regression analysis of predictors of dementia.**

Variables in the Equation		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 <sup>a</sup>	Age			1.594	3	.661			
	65–75	-.582	1.288	.204	1	.651	.559	.045	6.982
	75–85	.105	1.277	.007	1	.935	1.110	.091	13.578
	85–95	.560	1.643	.116	1	.733	1.750	.070	43.796
	History of stroke	-1.945	.646	9.051	1	.003	.143	.040	.508
	Number of lost teeth			5.310	2	.070			
	Four or fewer teeth	-.947	.786	1.452	1	.228	.388	.083	1.811
	More than four but fewer than half of the teeth	.643	.787	.668	1	.414	1.903	.407	8.897
	Number of administered drugs			6.754	2	.054			
	From 1 to 5 drugs	-.197	.912	.047	1	.829	.821	.137	4.906
From 5 to 10 drugs	1.478	.972	2.315	1	.128	4.386	.653	29.453	
Constant	2.093	1.429	2.143	1	.143	8.105			

<sup>a</sup> Variable(s) entered in Step 1: age, history of stroke, number of lost teeth, number of drugs administered.

positive for dementia). The logistic regression model was statistically significant:  $\chi^2(8) = 36.079$ , ( $p < 0.05$ ).

Of the four predictor variables involved in the model (age, a history of stroke, number of missing teeth, and number of administered drugs), a history of stroke was significant at the 5% level, Wald = 9.051,  $p = 0.003$  ( $<0.05$ ); number of administered drugs, Wald = 6.754,  $p = 0.034$  ( $<0.05$ ). The odds ratio (OR) for a stroke history is .143 (95% CI .040-.508) (Table 3).

## Discussion

Dementia is a serious public health problem that remains under-recognised and underdiagnosed in the community among the geriatric population due to the misconception that it is an inevitable consequence of ageing. Diagnostic neuropsychological investigations for dementia are time-consuming, expensive, and not readily available to all patients. Therefore, screening is needed to identify patients in need of diagnosis and determine the leading pathological cause of dementia.<sup>11</sup>

Our findings showed a high prevalence of dementia among geriatric patients (74.7%), which was found to be higher than what was reported by a similar 2014 Singaporean study using the AD8 tool for patients aged  $\geq 65$  years (29.6%).<sup>12</sup> The lower percentage may be due to patients' involvement in the interviews without informants, which might have negatively affected their results, showing a lower percentage of dementia compared with the current study.

A previous Saudi study conducted using the Montreal Cognitive Assessment (MoCA) test showed cognitive impairment in 45% of the patients.<sup>13</sup> This lower prevalence might be due to the inclusion of illiterate patients in the study, yet the correct administration of the MoCA requires literate participants. Therefore, the results showed that age was significantly correlated with positive dementia screening among geriatric patients, thus substantiating the claim that, with ageing, the probability of dementia increases based on the combination of increasing disease prevalence and hospital admissions. Among this population, approximately 25% of older hospitalised adults are diagnosed with dementia.<sup>14</sup>

More than 50% of the 100 patients who participated in the current study were male, which is consistent with a Saudi Arabian study that had a 56% male and 43.3% female distribution, compared with a pilot study of AD8, which had a predominantly female population (68.3%).<sup>13</sup> A study by Köhler et al. was designed to determine the correlation between newly diagnosed hypertension and cognitive impairment development. The results showed that prevention and early control of hypertension can reduce the risk of dementia.<sup>15</sup> Diabetes is one of the risk factors for developing dementia as reported in the literature, with increases in glycated haemoglobin, thus creating a greater risk of developing diabetes complications; therefore, diabetes control is an important preventive measure for better cognitive function.<sup>16</sup>

Although approximately 66% of the study patients had diabetes, no significant correlation between diabetes and dementia screening was determined. This finding was similar

to what was reported from a large sample of autopsy cases that assessed diabetes and dementia.<sup>17</sup> In comparison, a Saudi study conducted in outpatient clinics focused on diabetes and obesity as alarming risk factors for impaired cognitive functions.<sup>18</sup> This current study's findings may reflect good control of glycated haemoglobin for the study patients involved.

Results have shown a correlation between a history of stroke and dementia, supporting the findings in a review by Casolla et al. Based on claims that stroke would raise the risk of dementia by twofold, dementia screening in stroke patients is important because it carries a worse prognosis and higher risk for disabilities, morbidity, and mortality.<sup>19</sup>

Different studies have reported that the number of teeth lost is associated with impaired memory, highlighting that those with a high number of residual teeth have 50% less chance to develop dementia.<sup>20</sup> Similar to these studies, the current investigation found that the number of lost teeth was significantly correlated with dementia. This finding may reflect the importance of dental care, oral hygiene, and dental prostheses for the geriatric population in a Korean study on the number of missing teeth related to chewing efficiency. The study group with  $\geq 13$  teeth lost was considered to have impaired chewing; this impairment increased for the age groups 60–69 years and  $\geq 80$  years and was higher in male than female patients.<sup>21</sup> The link between the number of lost teeth and chewing efficacy as an increased risk for dementia requires further examination in the future.

Polypharmacy among older adults has been described by different studies as a predisposing factor that increases the risk of developing dementia among the geriatric population. The current study results showed a positive correlation between the number of administered drugs and positive dementia screening, consistent with the results from similar studies that focused on this point.<sup>22,23</sup> The number of drugs prescribed must be considered in the geriatric population to reduce the risk of developing dementia. In addition, unnecessary prescriptions need to be avoided to ensure better prognosis.

The limitations of this study were the small sample size due to the limited availability of the patient–caregivers/informants (100) and the participation of more closely involved caregivers/informants. Another factor was the informants' availability and the attendance of the more closely related caregiver of the patients, besides refusal to participate because of the misconception about dementia and the associated social stigma.

## Conclusions

It can be concluded that the screening of dementia among geriatrics patients in the Qassim region of KSA shows an alarming prevalence for dementia and its risk factors. Positive screening of dementia was positively correlated with a history of stroke, lost teeth, polypharmacy, and age. More than half of the participants were experiencing polypharmacy, and two-thirds claimed the loss of more than four but less than half of their teeth. We found that a history of stroke strongly correlated with dementia positive screening

and that early prevention and management of stroke helps to minimise dementia occurrence.

### Recommendations

We recommend that dementia screening should be included in the clinical assessment protocol for geriatric patients in hospitals for the early detection of cases and further diagnostic investigations. Raising the awareness of geriatrics to follow a healthy lifestyle and dietary counselling to control the predisposing factors of cerebrovascular disease and chronic illness. Moreover, the endorsement of regular dental oral and care among geriatrics can significantly promote dementia prevention.

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### Conflict of interest

The authors have no conflicts of interest to declare.

### Ethical approval

The study was approved by the local research ethics committee with registration number 1441–797873 on December 11, 2019.

### Authors' contributions

AI conceived and designed the study. NA, RA, FA conducted the interviews. AI analysed and interpreted the data. All the authors wrote the initial and the final drafts of the article and provided logistical support. All the authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

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