

Prevalence, Types and Different Predictors of Dementia among Elderly, a Community-based Study, Egypt

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Abstract:

Introduction: Dementia is one of the most crucial public health issues due to its increased prevalence among the elderly population worldwide. It is a disorder caused by a variety of progressive illnesses that affect perception, memory, behavior and the ability to perform daily activities. The aim of this study is to estimate the prevalence of Dementia and to recognize its predictors in Sharkia Governorate, Egypt.

Method: The study was conducted between December 2018 and June 2019. During this period, 1820 individuals were interviewed at one of five sectors in Zagazig city at Sharkia governorate by the research team who visited the field 2–4 days per week. The study was conducted in two phases: (1) screening, (2) clinical diagnosis. **Results** 1820 elderly individuals were included in the study, 108 of them were dementia symptomatic based on the screening test. Most of them were females, more than 80 years old. 43.5% of neurodegenerative dementia were of moderate degree. It was found that the most significant predictors of neurodegenerative dementia were 1) age \geq 80 years (O.R=18.7, $p<0.05$), 2) lonely aging: being single or widow or divorced (O.R=1.98, $p<0.05$), 3) illiteracy (O.R=6.7, $p<0.05$), 4) low social class (O.R=8.8, $p<0.05$), 5) smoking (O.R=3.03, $p<0.05$), 6) irregular mental and social activities (O.R=2.2, 1.3 respectively, $p<0.05$), 7) hypertension and diabetes (O.R=4.7, $p<0.05$), 8) Hyperlipidemia (O.R=2.5, $p<0.05$), 9) Occupations or Environmental exposures (O.R=10.3, $p<0.05$), 10) Living alone (O.R=2.07, $p<0.05$) and 11) Family history of dementia (O.R=7.7, $p<0.05$).

Key words: Dementia, elderly people, Alzheimer disease, predictor factors

Introduction:

Dementia is one of the most crucial public health issues due to increased prevalence among the elderly population worldwide. It is a disorder caused by a variety of progressive illnesses that affect perception, memory, behavior and the ability to perform daily activities. It usually begins after the age of 65, however 2 - 10% of all cases are likely to begin before this age. The liability doubles

with increase in age *every* five years.⁽¹⁾

Alzheimer' disease (AD) is still the most common antecedent and causes 50-70% of dementia, and 80-90% of cases are caused by a combination of Alzheimer's disease and vascular dementia.⁽²⁾ Alzheimer is associated with gradual progressive loss of brain function including memory loss, confusion, disorientation, mood, personality changes, speech problems, and paranoia.⁽³⁾ Vascular dementia,

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frontotemporal dementia, Lewy body dementia, and mixed dementia (a mix of Alzheimer's disease and vascular dementia) are other subtypes of dementia.⁽⁴⁾ Nearly one third of Alzheimer's cases of dementia could be caused by seven probably modifiable risk factors: smoking, hypertension, diabetes, obesity, depression, low educational achievement, and cognitive inactivity.⁽⁵⁾ In developing countries, elderly people with dementia do not often use health care services, and the health care system is often unable to provide them with high quality services.⁽⁶⁾ Delaying or preventing the clinical presentation of dementia can have a significant impact on disease prevalence.⁽⁷⁾ In Sharkia Governorate, the total population is 1227717, and about 4% of them are 60 years and older.⁽⁸⁾ Therefore, the objective of this study to estimate the prevalence of dementia in Sharkia Governorate and to recognize its predictor factors.

Methods:

Study design and setting: a community based cross sectional study was conducted in Zagazig city. The study was conducted between December 2018 and June 2019. All individuals aged 60 years or older of both sexes agreed to take part in the study.

Participants could not respond due to the presence of severe sensory disability (blindness, deafness) were withdrawn from the study.

Sample size: The sample size was calculated using Epi info version 6 software program, using the following data; total number of the population in the Zagazig city 1227717 and about 4% above 60 years so total number of population above 60 years 49.109, prevalence of dementia 5%, with power 80%, the sample size was 1759. Accounting for a non-response rate of 20%, the sample size reached 2111.

The sample was chosen using multistage random sampling technique as follows:-

- Zagazig city was chosen randomly from Sharkia Governorate then divided into five sectors; one of them was chosen randomly, the sample collected from the chosen sector.
- The total screened population was 1820 participants, with the exception of 291 individuals who refused to participate in the study. The main reasons for refusing to participate were illiteracy and lack of knowledge, which is common in such communities.

Phases and tools of the study: The study was conducted in two phases:

1-Screening phase: subjects were reached at their homes. If they were not available at the time of the visit, they were revisited at a different time (capture–recapture method). The researchers visited the field 2–4 days per week throughout the study. The population aged 60 years or older was examined by using the updated Mini-Mental State Examination (MMSE),⁽⁹⁾ to pick up suspected cases of dementia.

The 2 points for testing reading and writing in MMSE were excluded if the subject was illiterate, and the full score was calculated as 28 instead of 30 points; hence, the cutoff point for diagnosis of the suspected dementia was 21 instead of 23 points. Staging of dementia was also categorized according to the results of MMSE: mild (score of 17–21), moderate (score of 9–16) and severe degree of dementia (less than 9).

These values correspond to the values of 19–23, 11–18, and less than 11 for mild, moderate, and severe dementia on a scale of 30 points.

Diagnostic phase: The population diagnosed as suspected dementia (MMSE \leq 23 or $<$ 21 for illiterate subjects) were asked to visit psychiatric

or neurologic outpatient clinics at Zagazig University Hospital. Case ascertainment and typing of dementia were done through full clinical and psychiatric history, full examination especially neurological examination and mental state examination. The following tools were used:

- Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision,(DSM-IV-TR) criteria to confirm the diagnosis and differentiate different types of dementia.
- Cognitive Abilities Screening Instruments, which have a cutoff point of 67 or fewer for dementia.
- Instrumental Activities of Daily Living Scale, which provides a measure of social and occupational functioning that is used as a threshold for accepting a cognitively impaired subject as being demented.
- Geriatric Depression Scale for diagnosis of co-morbid depression.
- Hachinski Ischemic Score for vascular dementia destination from other forms of dementia (a score of 7 or higher suggests vascular dementia, a score of 5 or 6 suggests mixed dementia, and a score lower than 5 suggests AD).

- The weight and height were measured using an electronic scale and standard measuring tape. The weight was measured in Kilogram (Kg) and the height was measured in centimeter then BMI was calculated.
- Risk factors questionnaire: It was developed by the researchers and included closed-ended questions to identify risk factors including:
 - 1-Socio-demographic variables including (age, gender, marital status, education, current job state, social class).
 - 2-Lifestyle (smoking, following of low fiber diet or high cholesterol diet, regular mental, physical and social activities).
 - 3-Chronic health problems including (high blood pressure, diabetes mellitus, hyperlipidemia).
 - 4-Occupational and environmental exposures including (Toxic heavy metals, Pesticides, Diesel motor exhaust, Electromagnetic fields, Excessive noise, dyes, Paints, fuels, Solvents, Liquid plastics/rubbers, Vibratory tools, Radiation)
 - 5-Life pattern (either Living alone or living with others)
 - 6-Family history of dementia

Statistical analysis: SPSS program version 20.0 was used to calculate frequencies and perform the appropriate statistical tests including the chi-square test, and multiple regression analysis.

Administrative Design and Ethical Aspects:

- The necessary official permission from the manager of outpatient clinics at Zagazig University Hospital was obtained to perform the study.
- Informed written consent was obtained from each patient or caregiver according to the ethics committee of the Faculty of Medicine, Zagazig University.
- Participants were free to withdraw from the research at any stage without incurring any consequences.
- They were reassured about the strict confidentiality of any obtained information, and the study result will be used only for purpose of research.

Results:

The Flow chart for dementia diagnosis & screening (**Fig. 1**) reveals that MMSE was positive for 108 out of 1820 elderly subject. Neurodegenerative dementia prevalence was 4.9% and reversible dementia was 0.3%. Most positive

MMSE were females, older than 80 years (**Table 1**). Alzheimer's disease was found to be the most common type of neurodegenerative dementia (55.6%) and the most common type of reversible dementia was depression (42.9%). 43.5 percent of neurodegenerative dementia was of moderate severity (**Fig. 2**). **Table (2)** shows risk factors for neurodegenerative dementia, dementia was significantly greater among single, illiterate, elderly females of low social class. In Addition, family history of dementia, smoking, living alone, obesity, high cholesterol diet, hyperlipidemia, hypertension, diabetes were significant risk factors.

On Multiple regression analysis; (**Table 3**) it was found that the most significant predictors of neurodegenerative dementia were 1) age \geq 80 years (O.R=18.7, $p<0.05$), 2) lonely aging: being single or widow or divorced (O.R=1.98, $p<0.05$), 3) illiteracy (O.R=6.7, $p<0.05$), 4) low social class (O.R=8.8, $p<0.05$), 5) smoking (O.R=3.03, $p<0.05$), 6) irregular mental and social activities (O.R=2.2, 1.3 respectively, $p<0.05$), 7) hypertension and diabetes (O.R=4.7, $p<0.05$), 8) Hyperlipidemia (O.R=2.5, $p<0.05$), 9) Occupations or Environmental exposures (O.R=10.3,

$p<0.05$), 10) Living alone (O.R=2.07, $p<0.05$) and 11) Family history of dementia (O.R=7.7, $p<0.05$).

Discussion:

By MMSE, 108 of the 1820 studied subjects screened were positively tested for suspect dementia. In a study conducted in 2014 by El Tallawy et al in Al-Quseir city Red Sea Governorate, Egypt to measure the prevalence of dementia, 106 out of 4329 studied subjects' over 50 years were positive by MMSE. The variation between the two studies was due to various settings and the population age and size.⁽¹⁰⁾ Most of MMSE positive cases in the current study revealed that they were older than 80 years of age. As age is the well-recognized risk factor for dementia.

This result is fairly predictable. Population-based researches in the general population have reported a strong relation between age and MMSE scores.⁽¹¹⁾ In addition, MMSE positive participants were mostly females, which could be explained by the fact that women have a longer life expectancy than men do. Furthermore, at a more advanced stage of the disease, women are more likely to be diagnosed than men are. In the current study, the prevalence of neurodegenerative dementia recorded was 4.9%. This result

was almost similar to many studies done in other Egyptian areas such as Al Kharga District (4.45%) and Assiut (4.5%).⁽¹²⁻¹³⁾

Dementia prevalence varies significantly between countries, from very low (0.62%) in Kolkata, India, for those 50 years and older, to very high in Israel (19.2%) in those 65 years and older.⁽¹⁴⁻¹⁵⁾ This difference was due to geographical and social factors as simple daily activities, minimal technology-based environment, and unreported functional impairment by members of the family.⁽¹⁶⁾ And variation in lifespan and genetic factors.⁽¹⁷⁾

The most common type of neurodegenerative dementia was Alzheimer (55.6%), then vascular dementia (18.9%). This is a consistent with classification of dementia in most literatures where it is divided into subtypes.

The AD accounts for approximately half of the affected subjects followed by vascular dementia (20 to 25%) and mixed dementia (5-10%).⁽¹⁸⁾ The mild, moderate, and severe rates of dementia were 34.3%, 43.5%, and 22.2%, respectively. These findings were in line with El Tallawy et al in 2014 who announced that the

degrees of dementia were 33.3%, 48.3%, and 18.4%, respectively.⁽¹⁰⁾ Reversible dementia prevalence was 0.03%.

The most common causes of it were depression and vitamin D deficiency. In line with these results, in 2003 Clarfield stated that the prevalence of dementia due to reversible causes ranges from (0- 23%).⁽¹⁹⁾ Piccini et al in 1998 also reported that the most common causes were alcohol and medication-related dementia, depression induced cognitive impairment and vitamin B12 deficiency.⁽²⁰⁾ Age 80 years or more was the strongest predictor for dementia in the current study. This may be attributed to aging associated factors as : loss of sex hormones after mid-life, increased cardiovascular diseases risk , nerve cells, DNA and cell structure changes, and changes in the immune system.

Similarly Harvey et al in 2003 found that age is the best known risk factor for dementia and the chances of developing dementia increase markedly with age (dementia affect one out 14 people older than 65 and one out six older than 80 years, however, but few data on the prevalence in younger age).⁽²¹⁾

The study also showed that although there was a statistically significant association between sex and dementia, sex was not a predictor of dementia. This may be interpreted by several factors that could complicate this association, e.g. sex hormones, ethnicity, lifestyle, and genetic polymorphisms of sex-related genes. Consistently, Fratiglioni et al 2000 mentioned that there has been some evidence that women are more likely to develop Alzheimer's disease, but more research is still needed.⁽²²⁾

Another strong predictor of dementia was marital status. Similarly Sundström et al 2015 found that unmarried, widowed and divorced individuals have an increased risk of dementia even after several potential confounders have been adjustment.⁽²³⁾ Illiteracy was one of the dementia's predictors. The European Studies of Dementia (EURODEM) analysis reported that a low education level increased the risk of AD.⁽²⁴⁾

Dementia was significantly higher in subjects with a low social class. Jones 2015 tried to refer the link between dementia and low social class to the level of education, access to care and treatment.⁽²⁵⁾ Smoking was a predictor of dementia in our study. Which can be

explained by the fact that smoking is a well-known cardiovascular risk factor, oxidative stress and inflammation raise the risk for neurodegeneration. A meta-analysis of 19 prospective studies examined the association between smoking, dementia and cognitive decline.⁽²⁶⁾ Strong predictors of dementia were mental and social activities. Sorman et al noted 2014 that social support and social activities are linked to better cognitive performance and social activities once per week could reduce the risk of dementia.⁽²⁷⁾

In addition, activities that require mental energy, board games, reading, crosswords or Sudoku puzzles, can have a protective effect. Such activities may stimulate more connections between brain cells.⁽²⁸⁾ Karp et al 2006 found that physical activity is correlated with a decrease of (30 to 50 %) in cognitive decline.⁽²⁹⁾ Chronic health problems particularly hypertension, diabetes and hyperlipidemia have been strongly linked to higher dementia risk. Tu 2010 consistently reported that hypertension was considered the most prominent risk factor for stroke globally and was recognized as a dementia risk factor.⁽³⁰⁾ Maki et al 2005 also found that midlife hyperlipidemia portends dementia later in life.⁽³¹⁾

A study indicated that older women with high fasting glucose had poor cognitive functions compared to others with normal glycemia.⁽³²⁾ Significantly, it has been found that most people with dementia exposed to pollutants, a moderate evidence that air pollution, silicon, aluminum, selenium, insecticides, and electromagnetic fields are risk factors for dementia.⁽³³⁾ Living alone is an important dementia risk factor for as mentioned in the current study; another study showed that loneliness and social isolation associated with poor health outcomes as dementia.⁽³⁴⁾

Everybody in our study who proven that they have a dementia family history was found suffering from it. Scarabino et al 2016 found that dementia family history identified risk factor for developing Alzheimer's disease and affect disease severity (age at onset and cognitive impairment).⁽³⁵⁾

Conclusion: Dementia is prevalent among elderly, particularly illiterate, low social class, obese females, suffering from chronic diseases, no physical, social and mental activities. Alzheimer was the commonest type of neurodegenerative dementias. Thought following a healthy lifestyle many risk factors for dementia can be improved.

Recommendations: risk factors for Dementia can be improved through the decrease tobacco use and early diagnosis and control of diabetes, hypertension, and other cardiovascular risk factors. Public health promotion programs as anti-tobacco or non-communicable disease awareness should include brain-health promotion messages. Creation of geriatric health care services and education in geriatric medicine for health care providers. Further studies are needed to explore this problem in our community.

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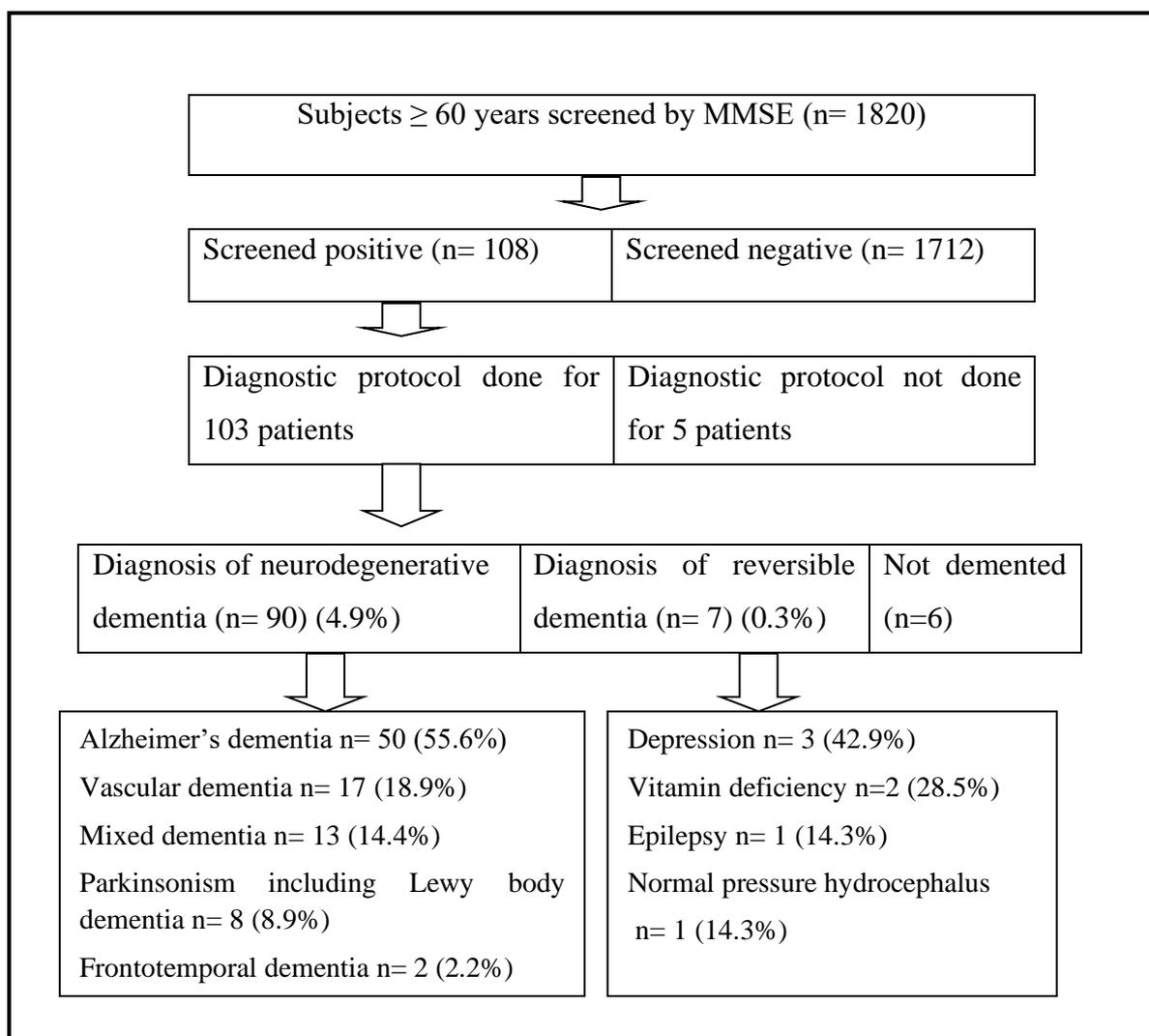


Fig (1): Flow chart for screening and diagnosis of dementia

Table (1): Relationship between gender of the studied group of elderly and MMSE results

	Full sample No (%) (n=1820)	MMSE +ve No (%) (n=108)	MMSE -ve No (%) (n=1712)	P-value
Gender				
▪ Male	801	37 (4.6)	764 (95.4)	0.035*
▪ Female	1019	71 (7.0)	948 (93.0)	

*Statistically Significant (p<0.05).

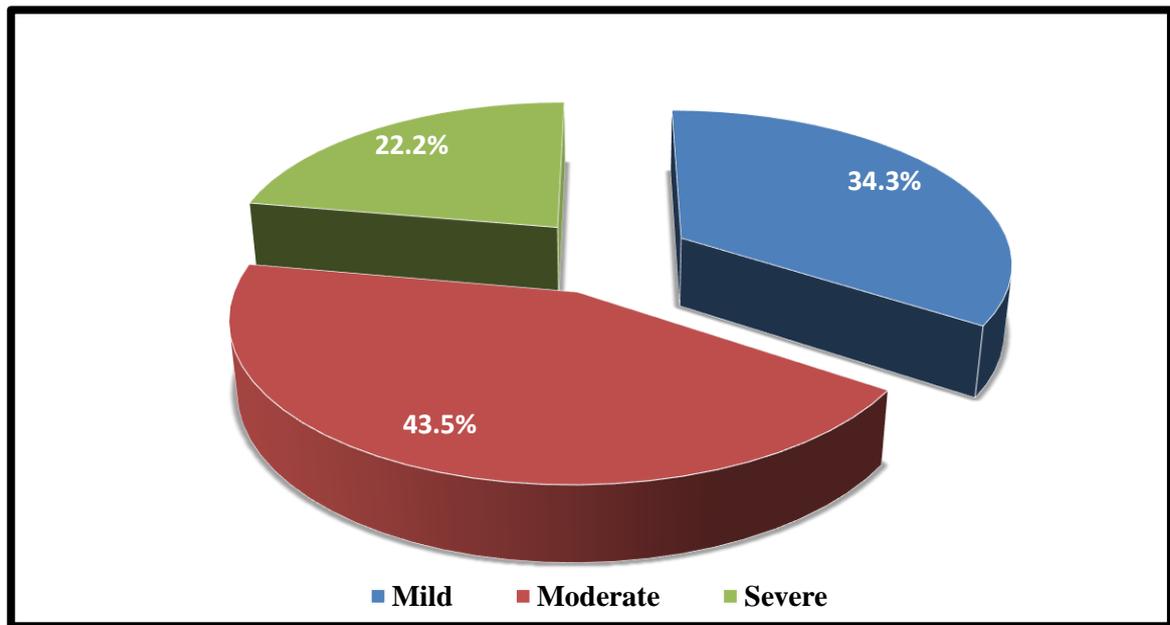


Fig (2): Degrees of neurodegenerative dementia (n= 90)

Table (2): Relationship between the studied risk factors and neurodegenerative dementia

Risk factors	Demented n=90 (%)	Not demented n=6 (%)	P-value
Age (years)			
▪ 60-69	7 (53.8)	4 (46.2)	0.000**
▪ 70-79	30 (96.8)	1 (3.2)	
▪ ≥80	53 (98.1)	1 (1.9)	
Gender			
▪ Male	24 (85.7)	4 (14.3)	0.037*
▪ Female	66 (73.3)	2 (33.3)	
Education			
▪ Illiterate	53 (58.9)	1 (16.7)	0.044*
▪ Literate	37 (97.0)	5 (3.0)	
Current Job status			
▪ Not-working	59 (65.6)	1 (16.7)	0.017*
▪ Working	31 (34.4)	5 (83.3)	
Social class			
▪ Low	58 (98.3)	1 (1.7)	0.020*
▪ Moderate or High	32 (86.5)	5 (13.5)	
Smoking			
▪ Non-smoker	53 (89.9)	6 (10.1)	0.045*
▪ Smoker	37 (100.0)	0 (0.0)	
Diet			
▪ Low fiber diet	44 (91.7)	4 (8.3)	0.399
▪ High cholesterol diet	67 (97.1)	2 (2.9)	0.030*
Regular activity			
▪ Mental	22 (81.5)	5 (18.5)	0.002**
▪ Physical	36 (87.8)	5 (12.2)	0.038*
▪ Social	37 (86.0)	6 (14.0)	0.005**
BMI (kg/m²)			
▪ Underweight or Normal	25 (86.2)	4 (13.8)	0.045*
▪ Overweight or Obese	65 (97.0)	2 (3.0)	
Chronic health problems:			
▪ HPN	66 (97.0)	2 (3.0)	0.037*
▪ DM	54 (98.2)	1 (1.8)	0.038*
▪ Hyperlipidemia	67 (97.1)	2 (2.9)	0.030*
Occupations or Environmental exposures	67 (97.1)	2 (2.9)	0.030*
Life pattern			
▪ Living alone	38 (100.0)	0 (0.0)	0.041*
▪ living with others	52 (89.7)	6 (10.3)	
Family history of dementia	38 (100.0)	0 (0.0)	0.041*

* Statistically Significant (p<0.05). ** Highly statistically significant (P<0.01)

Table (3): Multiple regression analysis showing the most important predictors of neurodegenerative dementia

Independent Factors	B	S.E	Wald	O.R (95% CI)	P-value
Age \geq 80 years	2.88	1.22	7.45	18.73(2.28-153.3)	0.001**
▪ Female gender	1.11	0.49	6.30	3.04 (1.27-7.27)	0.072
▪ Single or widow or divorced	0.687	0.376	3.33	1.98 (1.05-4.15)	0.041*
▪ Illiteracy	1.90	0.48	14.65	6.71 (2.53-17.79)	0.033*
▪ Not-working	0.687	0.376	3.33	1.98(1.05-4.15)	0.041*
▪ Low social class	2.17	0.49	19.79	8.84 (3.34-23.40)	0.042*
▪ Smoking	0.10	0.407	7.41	3.03 (1.36-6.74)	0.038*
▪ High cholesterol diet	2.53	0.77	10.60	1.97 (1.07-3.36)	0.088
▪ Irregular mental activity	1.30	0.389	11.16	2.20 (1.12-3.58)	0.046*
▪ Irregular physical activity	0.744	0.211	12.44	1.95 (1.01-3.71)	0.061
▪ Irregular social activity	0.317	0.094	11.32	1.35 (1.14-2.60)	0.041*
▪ Overweight or obesity	1.26	0.27	21.38	2.24 (1.56-3.73)	0.064
▪ HPN	1.53	0.414	13.77	4.65 (2.06-10.48)	0.000**
▪ DM	1.55	0.817	3.618	4.72 (1.05-23.43)	0.001**
▪ Hyperlipidemia	0.59	0.26	4.17	2.55 (1.32-3.92)	0.012*
▪ Occupations/Environmental exposures	2.33	1.07	4.76	10.35(1.27-84.46)	0.023*
▪ Living alone	1.16	0.57	4.07	2.07 (1.95-6.20)	0.044*
▪ Family history of dementia	4.32	1.66	6.77	7.74 (1.69-35.35)	0.043*

B: estimated logit coefficient; S.E.: standard error of the coefficient; Wald: $[B/S.E.]^2$

* Statistically Significant ($p < 0.05$). ** Highly statistically significant ($P < 0.01$).

الملخص العربي

معدل انتشار أمراض الخرف وأنواعها وتنبؤاتها المختلفة بين كبار السن، دراسة مجتمعية،

مصر

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المقدمة: الخرف من أكثر قضايا صحة العامة وذلك لزيادة معدل انتشار المرض بين كبار السن في جميع أنحاء العالم. ينجم عن مجموعة متنوعة من الأمراض التقدمية المؤثرة على الإدراك والذاكرة والسلوك والقدرة على أداء الأنشطة اليومية. وكان الهدف من الدراسة هو تقدير معدل انتشار الخرف والتعرف على تنبئها في محافظة الشرقية. **الطريقة:** بدأت ديسمبر 2018 إلى يونيو 2019. تمت مقابلة 1820 شخصًا في قطاع واحد من 5 قطاعات في مدينة الزقازيق في محافظة الشرقية من قبل فريق البحث الذي زار الحقل من 2 إلى 4 أيام في الأسبوع. وأجريت على مرحلتين: (1) الفحص، (2) التشخيص السريري.

النتيجة تضمين 1820 من الأفراد الأكبر سنا في الدراسة، 108 إيجابيين عن طريق اختبار الفحص. معظمهم من الإناث، أكثر من 80 سنة. 43.5٪ من الخرف العصبي التنفسي من درجة معتدلة. وقد وجد أن أهم تنبئ للخرف العصبي التنكسي كانوا تتراوح أعمارهم بين 80 عامًا، عازب أو أرملة أو مطلق، أمي، طبقة اجتماعية منخفضة، تدخين، نشاطات عقلية واجتماعية غير منتظمة، ارتفاع ضغط الدم ومرض السكري، فرط شحميات الدم، المهن أو التعرضات البيئية، العيش بمفرده، والتاريخ العائلي للخرف.

التوصيات يمكن تحسين عوامل خطر الإصابة بالخرف من خلال تقليل استخدام التبغ والتشخيص المبكر والسيطرة على مرض السكري وارتفاع ضغط الدم وعوامل الخطر القلبية الوعائية الأخرى.