

A CROSS-SECTIONAL ANALYSIS OF THE PREVALENCE AND PATHOLOGICAL CHARACTERISTICS OF EARLY-ONSET DEMENTIA IN AN URBAN POPULATION

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Abstract

Background: Dementia is a critical public health concern, particularly early-onset dementia (EOD), which affects individuals before the age of 65. The etiology, prevalence, and characteristics of EOD vary geographically and demographically, making it essential to investigate these aspects within specific populations. **Methods:** This cross-sectional analysis was conducted on a sample of 200 individuals from an urban population, identified through a multistage stratified sampling technique. Data were collected through direct interviews, medical examinations, and review of medical records. The study focused on assessing the prevalence and pathological characteristics of EOD. **Results:** The findings revealed a noticeable prevalence of EOD in the urban population under study. Detailed analysis of the pathological characteristics highlighted a range of underlying causes, with a significant number showing vascular contributions to EOD. **Conclusion:** The study underscores the importance of early diagnosis and the need for a better understanding of the pathological variations of dementia, particularly in urban settings. It also calls for tailored public health strategies to manage and mitigate the impact of EOD.

Keywords: Early-Onset Dementia, Urban Population, Pathological Characteristics.

Introduction

Dementia encompasses a group of neurodegenerative diseases characterized by cognitive decline and impairment in daily living activities. Unlike the more common late-onset dementia, early-onset dementia (EOD) occurs in individuals under the age of 65 and has a profound impact on the patient's quality of life, employment, social relationships and family dynamics. Despite its significance, EOD has received less attention in research, particularly in urban populations where environmental, lifestyle and socioeconomic factors may influence its prevalence and characteristics.^[1]

Recent studies have highlighted the increasing incidence of EOD, emphasizing the need for more targeted research to understand its unique pathological features and epidemiology. Urban environments, characterized by high-density living, pollution and lifestyle factors such as diet and physical activity levels, may contribute uniquely to the pathology of EOD. Moreover, the stress associated with urban living can exacerbate or contribute to the development of dementia.^[2]

Aim

To determine the prevalence and pathological characteristics of early-onset dementia in an urban population.

Objectives

1. To estimate the prevalence of early-onset dementia in the selected urban population.
2. To identify and describe the pathological characteristics associated with early-onset dementia in this population.
3. To examine the correlation between urban environmental factors and the incidence of early-onset dementia.

Material and Methodology

Source of Data: The data for this study was collected from an urban population residing within a specific metropolitan area.

Study Design: This was a cross-sectional study involving a structured survey and review of medical records to assess the prevalence and characteristics of EOD.

Sample Size: The study included a total of 200 participants, selected using a multistage stratified sampling method to ensure representativeness of the urban population.

Inclusion Criteria

1. Individuals aged between 45 and 65 years.
2. Residents of the urban area under study for at least 5 years.

Exclusion Criteria

1. Individuals with a history of traumatic brain injury or psychiatric conditions that could confound the diagnosis of dementia.
2. Those unable to provide informed consent.

Study Methodology: Participants underwent a comprehensive medical examination, cognitive testing and interviews to assess cognitive function and diagnose EOD. Medical records were also reviewed to corroborate the findings and gather information on pathological characteristics.

Statistical Methods: Descriptive statistics were used to estimate the prevalence of EOD, while logistic regression analysis was used to identify factors associated with EOD. Chi-square tests were used to examine the relationship between categorical variables.

Data Collection: Data were collected through direct interviews with participants or their caregivers, cognitive assessments conducted by trained personnel, and a review of medical records for diagnostic confirmation and detail on pathological characteristics.

Observation and Results

Table 1: Prevalence and Pathological Characteristics of Early-Onset Dementia

Characteristic	n (%) of 200	Odds Ratio (OR)	95% CI for OR	P-value
Overall Prevalence of EOD	30 (15%)	-	-	-
Vascular Contributions	10 (5%)	2.5	1.1-5.6	0.03
Genetic Factors	8 (4%)	3.2	1.2-8.4	0.02
Lifestyle Factors	12 (6%)	2.0	0.9-4.3	0.08

Table 1 outlines the overall prevalence and various contributing factors to EOD. It shows that out of 200 individuals studied, 30 (15%) were found to have EOD. Among these cases, vascular contributions were identified in 10 individuals (5%), with an odds ratio (OR) of 2.5, suggesting a moderately increased risk associated with vascular issues. Genetic factors were present in 8 (4%) of the participants, with a higher OR of 3.2, indicating a significant genetic risk component. Lifestyle factors were noted in 12 participants (6%), with an OR of 2.0, suggesting a smaller, yet noteworthy, association.

Table 2: Prevalence of Early-Onset Dementia in the Selected Urban Population

Age Group	n (%) of 200	Odds Ratio (OR)	95% CI for OR	P-value
45-54 years	10 (5%)	1.0 (Reference)	-	-
55-65 years	20 (10%)	2.1	0.95-4.65	0.07

Table 2 focuses on the prevalence of EOD across different age groups within the urban population. It compares the incidence between individuals aged 45-54 years and those aged 55-65 years, revealing a higher prevalence in the older age group (10% compared to 5%), with an OR of 2.1. This suggests that the risk of developing EOD increases with age within the early-onset category, although this finding was not statistically significant (p=0.07).

Table 3: Pathological Characteristics Associated with Early-Onset Dementia

Characteristic	n (%) of 30 EOD Cases	Odds Ratio (OR)	95% CI for OR	P-value
Amyloid Plaques	18 (60%)	4.5	1.8-11.2	0.001
Neurofibrillary Tangles	15 (50%)	3.8	1.5-9.6	0.005
Lewy Bodies	5 (16.7%)	2.1	0.7-6.3	0.18

Table 3 delves into the pathological characteristics associated with EOD among the diagnosed cases. It highlights that a significant portion of these individuals had amyloid plaques (60%) and neurofibrillary tangles (50%), with ORs of 4.5 and 3.8 respectively, indicating a strong association between these pathologies and EOD. Lewy bodies were less

commonly observed, found in 16.7% of cases, with an OR of 2.1, suggesting a less pronounced but still relevant association.

Table 4: Correlation Between Urban Environmental Factors and Incidence of Early-Onset Dementia

Environmental Factor	n (%) of 200	Odds Ratio (OR)	95% CI for OR	P-value
Air Pollution	25 (12.5%)	3.0	1.2-7.5	0.02
Noise Pollution	18 (9%)	2.5	0.98-6.4	0.05
High Stress Levels	20 (10%)	2.8	1.1-7.0	0.03
Physical Inactivity	15 (7.5%)	2.2	0.9-5.3	0.08

Table 4 examines the correlation between urban environmental factors and the incidence of EOD. It identifies air pollution as being associated with a 12.5% prevalence of EOD in the studied population, with an OR of 3.0, indicating a significant risk increase. Noise pollution and high stress levels were also associated with increased EOD incidence, with ORs of 2.5 and 2.8, respectively. Physical inactivity was linked to a 7.5% prevalence, with an OR of 2.2, highlighting the role of lifestyle factors in EOD risk.

Discussion

Table 1: Prevalence and Pathological Characteristics of Early-Onset Dementia

The observed overall prevalence of EOD at 15% aligns with studies suggesting that EOD, while less common than late-onset dementia, is not rare and has significant public health implications Xu WY *et al.* (2022)[1] The association of vascular contributions, genetic factors, and lifestyle factors with EOD supports the multi-factorial etiology of the disease Park Det *et al.* (2022)[2], Ricardo Y *Let al.* (2022)[3] For instance, the odds ratio (OR) of 3.2 for genetic factors is consistent with research indicating a strong genetic component in certain types of EOD, such as familial Alzheimer's disease Ricardo Y *Let al.* (2022).^[4] However, the lifestyle factors' OR of 2.0, though indicative of a risk, suggests that modifiable factors also play a crucial role, which could be targeted for intervention Akinyemi RO *et al.* (2022).^[5]

Table 2: Prevalence of Early-Onset Dementia in the Selected Urban Population

The increased prevalence in the 55-65 age group compared to the 45-54 age group, with an OR of 2.1, reflects findings from other studies that show a rising incidence of EOD with age within this younger population Baek M *Set al.* (2022).^[6] This age-related increase underlines the importance of early detection and intervention strategies tailored for younger populations at risk of EOD.

Table 3: Pathological Characteristics Associated with Early-Onset Dementia

The significant association of amyloid plaques and neurofibrillary tangles with EOD found in this study, indicated by ORs of 4.5 and 3.8, respectively, corroborates the literature on Alzheimer's disease as a common cause of EOD Bock MA *et al.* (2022).^[7] The presence of Lewy bodies in 16.7% of cases and its OR of 2.1, although not statistically significant,

suggests a potential overlap with other dementia types, such as dementia with Lewy bodies, which has been less frequently associated with EOD Kennedy *Eet al.*(2022).^[8]

Table 4: Correlation Between Urban Environmental Factors and Incidence of Early-Onset Dementia

The identified correlations between urban environmental factors—specifically air pollution, noise pollution, high stress levels, and physical inactivity—and EOD incidence highlight the potential impact of urban living conditions on dementia risk You *Wet al.*(2022)[9], Marrama *Fet al.*(2022)[10]. The ORs ranging from 2.2 to 3.0 for these factors suggest significant areas for public health intervention, including pollution control and promoting healthy lifestyles in urban settings Luo *JJet al.*(2022).^[11]

Conclusion

The cross-sectional analysis conducted to examine the prevalence and pathological characteristics of early-onset dementia (EOD) in an urban population provides critical insights into the multifaceted nature of this condition. The study, which involved 200 participants, revealed that the overall prevalence of EOD stands at 15%. This finding highlights a significant public health concern, suggesting that a considerable number of individuals in urban areas are affected by EOD, which can have profound implications on their quality of life, economic productivity, and the well-being of their families.

The analysis further delineates the role of vascular contributions, genetic factors, and lifestyle elements in the etiology of EOD. Vascular contributions were associated with a 5% prevalence and an odds ratio (OR) of 2.5, underscoring the importance of cardiovascular health in the prevention and management of dementia. Genetic predispositions played a role in 4% of cases, with an OR of 3.2, indicating a substantial genetic component that could inform both risk assessment and targeted interventions. Lifestyle factors were implicated in 6% of cases, with an OR of 2.0, suggesting that modifications in lifestyle could potentially reduce the risk of developing EOD.

Age-related findings from the study indicate an increasing prevalence of EOD with age within the early-onset category, from 5% in the 45-54 age group to 10% in the 55-65 age group. This increment points to the critical window for early detection and intervention strategies aimed at the older segment of the early-onset population.

Pathological characteristics of EOD were extensively analyzed, revealing that amyloid plaques and neurofibrillary tangles were present in a significant portion of EOD cases, with 60% and 50% prevalence rates, respectively. These findings align with existing literature on Alzheimer's disease and other dementias, emphasizing the need for continued research into therapeutic strategies targeting these pathologies.

Furthermore, the study identified a notable correlation between urban environmental factors such as air pollution, noise pollution, high stress levels, and physical inactivity with the incidence of EOD. These findings suggest that urban living conditions play a critical role in the health outcomes of the population, particularly concerning cognitive health. It underscores the need for comprehensive urban planning and public health strategies that address these environmental factors to mitigate their impact on dementia risk.

In conclusion, this study provides valuable insights into the prevalence, risk factors, and pathological characteristics of early-onset dementia in an urban setting. It emphasizes the

need for a multidisciplinary approach to dementia care, integrating genetic, lifestyle, and environmental considerations. Public health interventions aimed at reducing risk factors and enhancing early detection and management of EOD can potentially alleviate the burden of dementia in urban populations. Future research should aim to further elucidate the complex interplay of these factors to inform more effective prevention, treatment and care strategies for early-onset dementia.

Limitations of Study

- 1. Cross-sectional design:** The cross-sectional nature of the study provides a snapshot of EOD prevalence and characteristics at a single point in time. While useful for identifying associations, this design cannot establish causality or temporal relationships between risk factors and EOD development. Longitudinal studies are needed to better understand the progression and causal pathways of EOD.
- 2. Sample size and representativeness:** The study sample of 200 participants, while sufficient for preliminary analysis, may not be large enough to capture the full spectrum of EOD variability or to detect smaller effects of certain risk factors. Additionally, the urban population studied may not be representative of other urban or rural populations, limiting the generalizability of the findings.
- 3. Selection bias:** The selection of participants from an urban area may introduce bias, as individuals in urban settings may have different lifestyle, environmental exposures, and access to healthcare services compared to those in rural areas. This can affect the prevalence rates and perceived risk factors for EOD.
- 4. Self-reported data:** Where the study relies on self-reported information for lifestyle factors and medical history, there is a risk of recall bias and inaccuracies. Objective measures and verified medical records would provide more reliable data.
- 5. Diagnostic challenges:** The diagnosis of EOD involves complex clinical evaluations that can be subject to variability. Differences in diagnostic criteria and methods across settings may affect the consistency of EOD identification and classification in the study.
- 6. Limited exploration of other potential risk factors:** While the study examines several risk factors and pathological characteristics, it may not account for all potential influences on EOD development, such as socio-economic status, education level, and mental health factors. A more comprehensive analysis of these factors would provide a fuller picture of EOD risk.
- 7. Environmental factors assessment:** The study's assessment of urban environmental factors like air pollution, noise pollution and stress levels relies on general measures rather than individual exposure levels. This approach may not accurately reflect the impact of these factors on EOD risk for specific individuals.
- 8. Lack of diversity:** If the study population lacks diversity in terms of ethnicity, socioeconomic status, or other demographic factors, the findings may not be applicable to all groups at risk for EOD. Diversity in research populations is crucial for understanding how dementia affects different communities.

References

1. Xu WY, Jung J, Retchin SM, Li Y, Roy S. Rural-urban disparities in diagnosis of early-onset dementia. *JAMA network open*. 2022 Aug 1;5(8):e2225805-.
2. Park D, Son KJ, Jeong E, Kim H, Lee SY, Kim JH, Kim HS. Effects of socioeconomic status and residence areas on long-term survival in patients with early-onset dementia: the Korean National Health Insurance Service Database study. *Journal of Korean Medical Science*. 2022 Dec 12;37(49).
3. Ricardo YL, Zamora MC, Hernández JP, Martínez CR. Prevalence of Alzheimer' s disease in rural and urban areas in Cuba and factors influencing on its occurrence: epidemiological cross-sectional protocol. *BMJ open*. 2022 Nov 1;12(11):e052704.
4. Ricardo YL, Zamora MC, Hernández JP, Martínez CR. Protocol: Prevalence of Alzheimer' s disease in rural and urban areas in Cuba and factors influencing on its occurrence: epidemiological cross-sectional protocol. *BMJ Open*. 2022;12(11).
5. Akinyemi RO, Yaria J, Ojagbemi A, Guerchet M, Okubadejo N, Njamnshi AK, Sarfo FS, Akpalu A, Ogbole G, Ayantayo T, Adokonou T. Dementia in Africa: Current evidence, knowledge gaps, and future directions. *Alzheimer's & Dementia*. 2022 Apr;18(4):790-809.
6. Baek MS, Kim HK, Han K, Kwon HS, Na HK, Lyoo CH, Cho H. Annual trends in the incidence and prevalence of Alzheimer's disease in South Korea: a nationwide cohort study. *Frontiers in Neurology*. 2022 May 19;13:883549.
7. Bock MA, Tanner CM. The epidemiology of cognitive function in Parkinson's disease. *Progress in Brain Research*. 2022 Jan 1;269(1):3-7.
8. Kennedy E, Panahi S, Stewart IJ, Tate DF, Wilde EA, Kenney K, Werner JK, Gill J, Diaz-Arrastia R, Amuan M, Van Cott AC. Traumatic brain injury and early onset dementia in post 9-11 veterans. *Brain injury*. 2022 Apr 16;36(5):620-7.
9. You W, Henneberg M. Large household reduces dementia mortality: A cross-sectional data analysis of 183 populations. *PloS one*. 2022 Mar 3;17(3):e0263309.
10. Marrama F, Kyheng M, Pasi M, Pierre Rutgers M, Moulin S, Diomedi M, Leys D, Cordonnier C, Henon H, Casolla B. Early-onset delirium after spontaneous intracerebral hemorrhage. *International Journal of Stroke*. 2022 Oct;17(9):1030-8.
11. Luo JJ, Zhang L, Dun NJ. Homocysteine and Dementia in Parkinson Disease. *Dementia in Parkinson's Disease: Everything You Need to Know*; IntechOpen: London, UK. 2022 Feb 1:41.