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RESEARCH ARTICLE

Young-onset dementia in memory clinics in the Netherlands: Study design and description of PRECODE-GP

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Abstract

The disease trajectory and healthcare requirements of patients with young-onset dementia (YOD) differ from those of older patients. Accurate data about YOD is crucial to improve diagnosis and optimize care. PRECODE-GP aims to set up a prospective national database of patients with YOD to gain insight into the occurrence and characteristics of patients with YOD in memory clinics in the Netherlands.

The national database includes data from dementia patients aged <70 years at diagnosis, collected by local memory clinics (MCs). Data included demographic information, clinical variables, and (etiological) diagnoses.

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Between July 2019 and December 2022, 781 patients with a mean age of 62±6y at diagnosis (range 37 to 69y) were included from 39 MCs. Most (n = 547,70%) were diagnosed with dementia due to Alzheimer's disease (AD). Patients with Frontotemporal lobe dementia (FTD, n = 87, 11%) were youngest (61±6.0y). Over half (55%) of patients were experiencing symptoms for ≥2 years.

We initiated a Dutch national YOD database to improve diagnosis and care for this underrepresented and vulnerable patient group. The database provides a basis for future in-depth studies on YOD.

KEYWORDS
care, diagnosis, register, young-onset dementia

1 | INTRODUCTION

Although the prevalence of dementia increases with age, a substantial proportion of patients develop the disease at a younger age.[1] To distinguish young-onset dementia (YOD) from late-onset dementia (LOD), a relative consensus exists to use the age of 65 at symptom onset as the cutoff age.[2,3] Information on the epidemiology and incidence of YOD is scarce.[4] However, according to a recent study, the worldwide prevalence of YOD is 119 per 100,000, projecting a total of 3.9 million people living with YOD worldwide.[5] The latter stresses the importance of a dedicated focus on YOD, as this patient group faces several diagnostic and post-diagnostic challenges.

In YOD cases, dementia due to Alzheimer's disease (AD) is the most prevalent diagnosis, followed by vascular dementia (VaD) and frontotemporal lobe dementia (FTD).[5] Yet, rare forms of dementia are relatively more common at a young age. Patients with YOD often present with atypical symptoms such as neuropsychiatric or non-amnestic cognitive complaints, making differential diagnosis challenging.[3,6,7] Furthermore, psychiatric misdiagnosis is common in patients with YOD, specifically patients with FTD, and complicates a timely diagnosis.[8,9] Younger age of onset is the main predictor of a prolonged time-to-diagnosis of dementia. Patients with YOD experience an average of 4.4 years between symptom onset and diagnosis, compared to 2.8 years in LOD.[10] This delay is caused by a prolonged time between symptom onset and the first consultation by a physician and a longer time to obtain a diagnosis after this first consultation.[9,10]

A timely and precise diagnosis is a prerequisite for adequate coping and care planning.[11] Younger patients with dementia encounter different problems in their daily lives compared to older patients, such as difficulties at work and disrupted family life. As a result, YOD patients and their caregivers have information and support needs that differ from patients with LOD.[12] The diagnostic delay leads to a delay in initiating this appropriate support. On top of that, support is currently suboptimal for YOD patients, and specialized services and support (facilities) are largely lacking in most countries.[12]

The Dutch PRECODE project (for "Prevalence, Recognition, and Care pathways in young-onset Dementia") was established to address the above-mentioned challenges in YOD by (1) providing insight into the prevalence of YOD in the Netherlands, (2) improving pre-diagnostic recognition, and (3) gaining insight into post-diagnostic care pathways. The main purpose of the current study, PRECODE-"GP" (a collaboration of memory clinics [*geheugenpoliklinieken*; GP]) is to leverage the Dutch memory clinic infrastructure to set up a national database of patients with YOD, to provide accurate data on the occurrence and characteristics of YOD and provide a basis for future in-depth studies on YOD. Here, we describe the study design, procedures, and cross-sectional evaluation of the first 781 patients in the PRECODE-GP database.

2 | METHODS

2.1 | PRECODE-GP study design

The study design of PRECODE-GP consisted of the establishment of a prospective nationwide database of patients diagnosed with YOD in Dutch memory clinics. All memory clinics were identified and approached using the Dutch Memory Clinic Network (Nederlands Geheugenpoli Netwerk) website (www.geheugenpoliklinieken.nl) and existing relationships. Memory clinics not affiliated with the Dutch Memory Clinic Network were identified online. To date, 55 outpatient memory clinics from 46 hospitals (academic and non-academic) participated in the study (Figure 1), of which 39 hospitals included patients (Table S1). Participating clinics reported a median of 15 (interquartile range [IQR] 7-49) patients aged < 70 diagnosed with dementia on an annual basis.

The VUmc Medical Ethical committee approved the study. Subsequent approval procedures for the local memory clinics differed per site. Memory clinic clinicians obtained informed consent from all patients or legal representatives for collecting data, linking with other datasets, and sharing their data with other parties.

2.2 | Consent statement

All patients provided informed consent for their data to be used for research purposes.

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RESEARCH IN CONTEXT

1. **Systematic Review**: Patients with young-onset dementia (YOD) face several diagnostic and post-diagnostic challenges. Information on the epidemiology and incidence of YOD is scarce, and there is a need for accurate data on the occurrence and characteristics of these patients in order to improve pre-diagnostic recognition and post-diagnostic care.
2. **Interpretation**: We established a prospective nationwide database (PRECODE-GP) of patients diagnosed with YOD in Dutch memory clinics. To date, 781 patients, with a mean age at diagnosis of 62 ± 6 years, were included by clinicians at 40 different memory clinics. In line with existing literature, the most prevalent etiological diagnosis among patients with YOD in our cohort is Alzheimer's disease, followed by frontotemporal lobe dementia. More than half of the patients were experiencing symptoms for at least two years before diagnosis.
3. **Future Directions**: PRECODE-GP provides a cohort of YOD patients that can be used as starting point for further research in this specific patient group.

2.3 | Prospective national database

Patients have been registered since July 2019, and registration is ongoing. All patients diagnosed with dementia (all etiologies) aged <70 years were eligible for inclusion in the study. In this study, we take the average of 3.8 years between symptom onset and diagnosis into account and hence included patients younger than 70 to capture all YOD patients.[9,10] Exclusion criteria were subjective cognitive decline, mild cognitive impairment, or another diagnosis not being dementia. After inclusion, memory clinic clinicians were asked to store patient data in the cloud-based clinical data management platform Castor EDC (www.castordedc.com). The minimal dataset (Table 1), containing baseline characteristic variables and information on the diagnosis, was developed to make participation feasible for clinicians. Optionally, the data set could be expanded (Table S2). Duplicate cases (e.g., if a patient was seen in two participating hospitals due to a second opinion) were identified based on the date of birth and zip code and involved three patients.

2.4 | Analysis

Descriptive statistics are used for baseline characteristics and diagnostic information. Group differences in characteristics were tested using analysis of variance or Chi-square tests when appropriate. Associations between age-at-diagnosis (independent variable) and Mini-Mental State Examination (MMSE) scores were assessed using linear regression analyses (adjusted for sex and educational level). Significance was set at $P < 0.05$ for all analyses. All analyses were performed with SPSS version 28.

3 | RESULTS

3.1 | Cohort characteristics and diagnosis

Between June 2019 and December 2022, 781 patients were included in the study database, of which 56.5% were reported by seven academic hospitals and 43.5% by 33 local memory clinics (Table S1). Most of the patients ($n = 547$, 70%) were diagnosed with dementia due to AD, followed by FTD ($n = 87$, 11%), VaD ($n = 41$, 5%), and dementia with Lewy bodies (DLB, $n = 40$, 5%). Another 66 (8%) patients were categorized as "other," consisting of a heterogeneous group of diagnoses, including primary progressive aphasia (PPA) without information about the underlying pathology, progressive supranuclear palsy (PSP), and also multifactorial and (yet) unknown etiologies. Figure 2 shows the distribution of the etiological diagnoses.

Table 2 shows the baseline characteristics for the total group and per diagnosis. Age at diagnosis ranged from 37 to 69 years, with a mean age of 62 ± 6. Patients with FTD were younger at the time of diagnosis (61 ± 6.0) than AD patients (62 ± 6), VaD patients (64 ± 5.6), and DLB patients (65 ± 3.7) ($P < 0.05$). Patients with DLB were more often male ($n = 32$, 80%) compared to AD and FTD patients ($P < 0.05$), but not to VaD patients ($n = 29$, 71%).

Clinicians supplied more information about the clinical image or the diagnosis in a subset of $n = 202$ AD and $n = 69$ FTD patients (Figure 3). In 53% of these AD patients, an atypical presentation or mixed diagnoses had been described. A presenilin-1 (*PSEN1*) mutation was reported in two patients, and a mutation in the amyloid protein precursor (*APP*) gene was reported in one patient. In the FTD patients, behavioral variant FTD (bvFTD) was the most common ($n = 20$, 29%), followed by genetic FTD ($n = 13$, 19%), and semantic variant PPA ($n = 10$, 14%). For 12 of the 13 reported genetic FTD cases, the clinician provided information about the specific genetic cause of the disease (*C9orf72* [$n = 5$], TAR DNA binding protein 43 [*TDP-43*; $n = 4$], microtubule associated protein tau [MAPT; $n = 1$], Fused in sarcoma RNA binding protein [*FUS*; $n = 1$], and granulin precursor [*GRN*; $n = 1$] mutations).[16]

Additionally, for 570 patients, information on family history was supplied, showing that $n = 247$ (43%) had a first-degree family member with dementia (all causes) and $n = 167$ (29%) a second-degree family member. Patients with a first-degree family member with dementia involved mainly AD patients ($n = 181$) and FTD patients ($n = 27$, 37% of FTD cases). In $n = 91$ (16%) of all patients with family history, the family member received the dementia diagnosis before age 70. For $n = 129$ (23%), the family member was aged 70+ at diagnosis; in $n = 27$ (4%), age at diagnosis was unknown.

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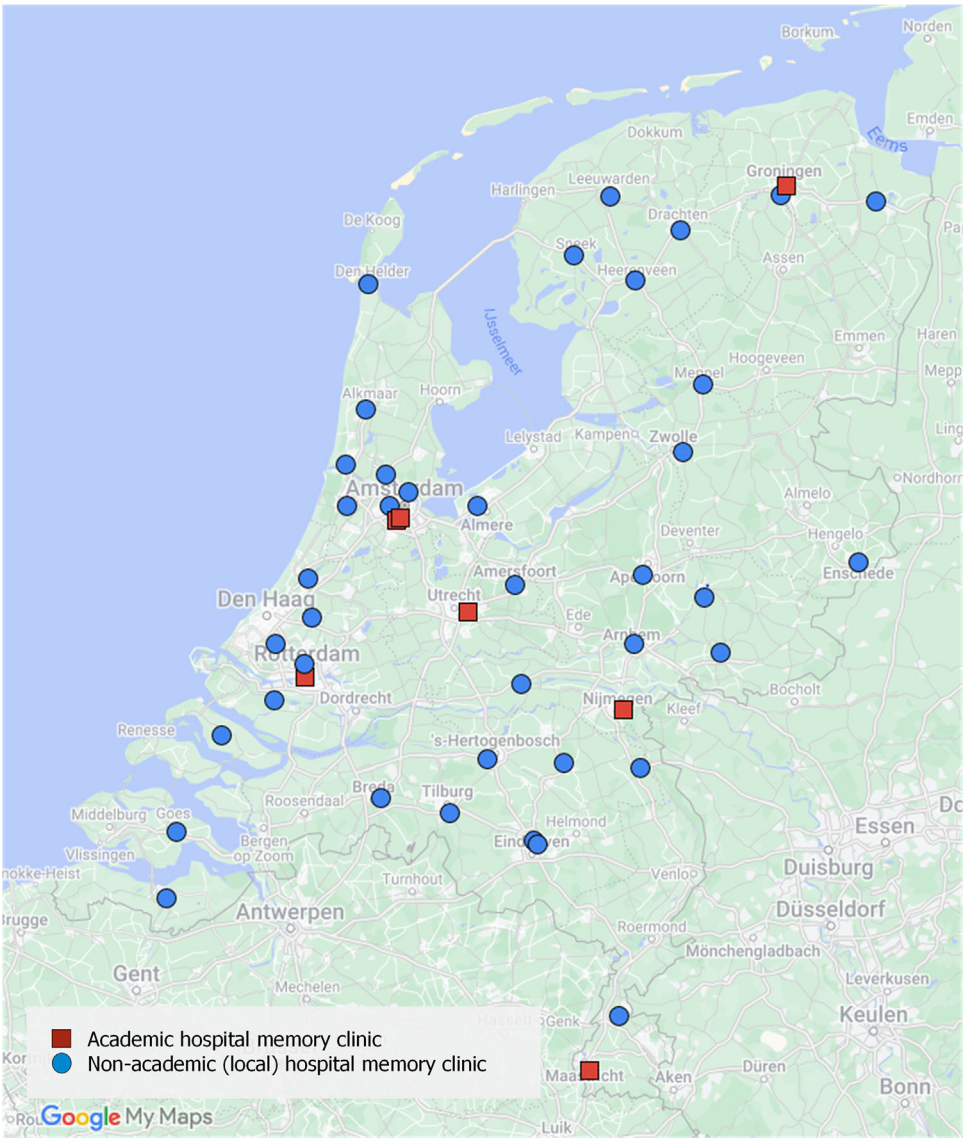

FIGURE 1 Overview of participating memory clinics in the PRECODE-GP study.

3.2 | Clinical features

Table 3 shows clinical features related to the diagnostic groups. Patients with FTD and DLB were more often included by an academic center than AD patients ($P < 0.05$). Patients with FTD were more often referred by a neurologist and seen for a second opinion than AD patients ($P < 0.05$). Patients with AD more often presented with memory complaints (73%) compared to patients with FTD (43%, $P < 0.05$). Of all AD patients, 45% presented with only amnestic symptoms and 28% presented without amnestic symptoms. Patients with FTD more often presented with behavioral changes (70%) than all other diagnoses ($P < 0.001$). Most patients (55%) were experiencing symptoms for 2 years or longer at diagnosis. Patients with AD scored lower (21 ± 5) on the MMSE than FTD patients (23 ± 4, $P = 0.019$). There was a trend towards a positive association between the MMSE score and age at diagnosis, indicating lower MMSE scores for younger ages for all diagnostic groups. However, this association was not significant for any of the diagnostic groups (AD: $\beta = 0.046$, $P = 0.383$, FTD: $\beta = 0.217$, $P = 0.074$, VaD: $\beta = 0.251$, $P = 0.273$, DLB: $\beta = 0.324$, $P = 0.05$).

Regarding additional diagnostic tests (Table S2), 581 (74%) patients received extended neuropsychological testing, and in 79% ($n = 617$), brain imaging was performed by either magnetic resonance imaging ($n = 584$, 95%) or computed tomography ($n = 33$, 5%).

4 | DISCUSSION

With PRECODE-GP, we established a nationwide database of patients aged <70 years at dementia diagnosis. The cross-sectional evaluation of the first 781 patients in the cohort confirmed that the most prevalent etiological diagnosis among patients with YOD is AD (70%), followed by FTD (11%), VaD (5%), and DLB (5%). Other causes for dementia were highly heterogeneous. PRECODE-GP provides a cohort

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TABLE 1 Minimal dataset.

Minimal dataset	Items
Information on informed consent	Approval of patient and date of signing
ID and demographics	Date of birth, sex, education, ethnicity, living situation, marital status
Information referral	Date and specialism of referring doctor, second opinion (yes/no)
Information on first visit	Date, duration of complaints, complaints at presentation MMSE[13] (0–30) and/or MoCA[14] (0–30)
Information on diagnosis	Date of diagnosis, etiological diagnosis, CDR[15] (0–3)

Abbreviations: CDR, Clinical Dementia Rating; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment.

of YOD patients that can be used as starting point for further research in this specific patient group.

The differential diagnosis of YOD is comprehensive, with multiple options.[17] A timely and accurate diagnosis is essential to provide patients with adequate care.[18] The most prevalent diagnoses of patients with YOD found in our study were largely in line with existing literature.[17,19,20] As in LOD, AD constitutes the most prevalent cause of YOD, with about one out of three YOD patients having a diagnosis other than AD. Within the subgroup of FTD patients, a diagnosis of bvFTD was most prevalent. Also, 12% of the FTD patients were diagnosed with right temporal variant FTD (rtvFTD). However, not all memory clinics might have considered this diagnosis because rtvFTD has only recently gained attention as a potentially unique clinical syndrome. In rtvFTD, besides behavioral problems, prosopagnosia and episodic memory impairment often occur.[21] Besides the most prevalent diagnoses, 8% of the patients within our cohort were categorized as having another disease underlying their dementia diagnosis. In 2% of cases, no cause has (yet) been found. Secondary causes of dementia were less common in our cohort compared to the literature, as only 0.5% had dementia due to traumatic injury and 0.3% to alcohol abuse.[20,22] This is probably because these patients are referred to specialized clinics rather than memory clinics in the Netherlands.

The clinicians' reported number of genetic bvFTD causes was in line with recent literature, as was the percentage of FTD patients with a positive family history of dementia.[16,23] A genetic cause had been described in only three patients with early-onset AD. This is probably an underestimation as literature shows a larger rate of autosomal dominant AD among YOD patients.[24] However, the number of relatives (first/second degree) with dementia aligned with former research.[24] These results emphasize the importance of both well-advised genetic testing in the diagnostic setting of YOD and family-based research toward genetic and biological mechanisms causing dementia.

Even though most AD patients presented with memory complaints, 28% presented without amnestic symptoms. Furthermore, in a subset of AD patients, 108 patients had an atypical disease presentation, such as PPA or posterior cortical atrophy. The frontal variant of AD and AD with psychiatric symptoms were also common. These numbers align with the current literature, stressing the importance of clinicians being aware of the less specific (non-amnestic) symptoms caused by AD, particularly in YOD.[7,25,26] This awareness could already start with general practitioners being aware of symptom combinations that have been shown sensitive and specific for YOD in the pre-diagnostic phase of the disease.[27]

Previous research showed that both young age and a diagnosis of FTD (independent of age) were associated with a longer duration between the onset of symptoms and a diagnosis than in patients with LOD, and indicated that both the younger age and non-memory presentations contribute to the diagnostic delay in younger patients.[10,19] Draper et al.[9] showed in 2016 that YOD patients, on average, had a delay of 2.3 years from symptom onset to presentation with a clinician. In our cohort, more than half of the patients were experiencing complaints for at least 2 years before diagnosis, indicating that this delay still exists. Furthermore, we found a positive, though not significant, association between age at diagnosis and scores on the MMSE in all diagnostic groups. This finding might establish the still existing diagnostic delay in YOD relative to LOD, as—somewhat counterintuitively—younger patients tended to score lower on the MMSE compared to older patients and thus might already be in a more advanced disease stage at the moment of diagnosis.

Although bedside cognitive examination such as the MMSE can be informative and might in the future be elaborated by web-based cognitive assessments,[28] the clinical workup in YOD must be structured with an elaborate cognitive assessment focusing on non-amnestic cognitive impairment to capture YOD patients and make an accurate diagnosis.[7,29] Most patients included in the current study were diagnosed based on elaborate neuropsychological testing. However, neuropsychological testing was performed in a clinical context, and in the Netherlands, there is considerable variation in practice in the use of the available diagnostic tests.[30] Diagnostic delay in YOD could also be explained by test batteries not being standardized and not appropriate or specific enough in capturing (nonspecific) symptoms of the different causes for YOD. As a result, there is a need for developing dedicated test batteries and harmonizing assessments for YOD.[29]

In the Netherlands, the launch of the Dutch Memory Clinics Network in 2016 was a first step towards facilitating the sharing of best practices among Dutch memory clinics. Furthermore, building the PRECODE-GP infrastructure and involving all memory clinics in the Netherlands in scientific research contributes to improving research in this important and vulnerable patient population. In addition, the recently estimated incidence of 370,000 YOD cases worldwide[4] highlights the need for policymakers to set up adequate diagnostic services focusing on YOD and encourage healthcare professionals to consider a diagnosis of YOD.

Strengths and limitations

In the PRECODE-GP study, we are taking the first step toward a national database for dementia patients. By including patients from all over the Netherlands, from academic and local memory clinics, we strive to set up a cohort of patients with YOD reflecting the actual, real-life population. Future linkage of our database to existing registries (e.g., Statistics Netherlands [CBS]) might lead to valuable insights into

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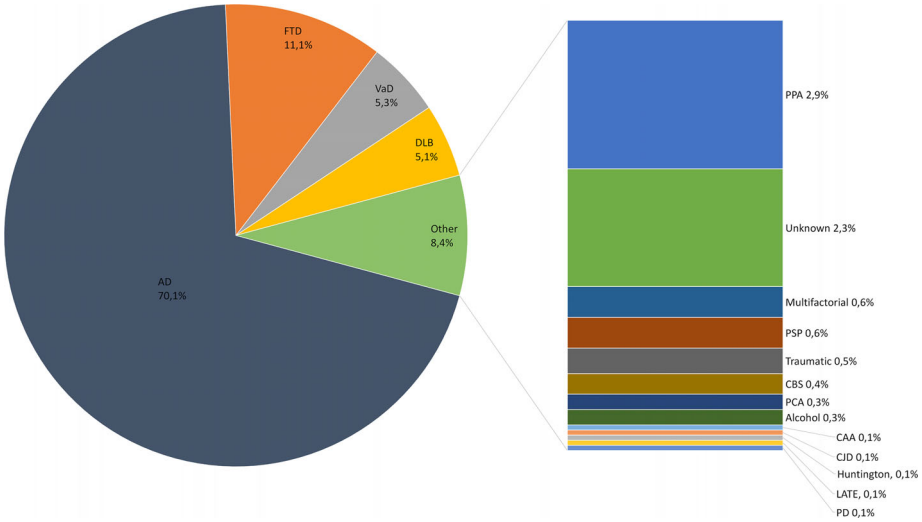

FIGURE 2 Distribution of etiological diagnoses in the PRECODE-GP cohort ($N = 781$). AD, Alzheimer's disease; CAA, cerebral amyloid angiopathy; CBS, corticobasal syndrome; CJD, Creutzfeldt-Jacob disease; DLB, dementia with Lewy bodies; FTD, frontotemporal lobe dementia; LATE, limbic-predominant age-related TDP-43 encephalopathy; PCA, posterior cortical atrophy due to Alzheimer's disease; PD, Parkinson's disease; PPA, primary progressive aphasia; PSP, progressive supranuclear palsy; VaD, vascular dementia.

TABLE 2 Baseline characteristics of the 781 included YOD patients in the national database.

	Total	Diagnosis				
	(*n* = 781)	AD *n* = 547 (70%)	FTD *n* = 87 (11%)	VaD *n* = 41 (5%)	DLB *n* = 40 (5%)	Other *n* = 66 (8%)
Age at diagnosis, y	63 ± 5.6	62 ± 5.6	61 ± 6.0	64 ± 5.6	65 ± 3.7	63 ± 5.5
Age at diagnosis, range	37–69	37–69	42–69	45–69	56–69	48–69
Sex, female	412 (53%)	318 (58%)	43 (49%)	12 (29%)	8 (20%)	31 (47%)
Caucasian	652 (84%)	463 (85%)	67 (77%)	33 (81%)	40 (78%)	58 (88%)
Education, y	10 ± 3.4	10 ± 3.4	11 ± 3.1	10 ± 3.3	11 ± 2.8	10 ± 3.7
Living situation						
Living alone	151 (21%)	111 (22%)	12 (16%)	8 (21%)	9 (25%)	11 (20%)
With spouse	444 (62%)	312 (61%)	49 (67%)	23 (59%)	25 (69%)	35 (63%)
With spouse and children	95 (13%)	68 (13%)	11 (15%)	6 (15%)	2 (6%)	8 (14%)
With children, without spouse	15 (2%)	13 (3%)	0	2 (5%)	0	0
Sheltered/nursing home/other	7 (1%)	4 (1%)	0	0	0	2 (4%)
Marital status						
Unmarried	66 (9%)	45 (9%)	8 (10%)	6 (15%)	3 (8%)	4 (6%)
Married/registered relationship	558 (75%)	391 (75%)	61 (77%)	29 (73%)	31 (78%)	46 (72%)
Widow/widower	32 (4%)	23 (4%)	2 (3%)	4 (11%)	1 (3%)	2 (3%)
Divorced	68 (9%)	50 (10%)	4 (5%)	0	4 (10%)	11 (17%)
Living (apart) together	19 (3%)	14 (3%)	5 (6%)	0	0	0

Note. Data represent mean ± SD or *n* (%). Missing data ranged from 4% (marital status) to 9% (living situation).
Abbreviations: AD, Alzheimer's disease; DLB, dementia with Lewy bodies; FTD, frontotemporal lobe dementia; VaD, vascular dementia; YOD, young-onset dementia.

the course of the disease, access to healthcare facilities, care pathways, and other related outcomes. We depended on memory clinic clinicians—who all have different working methods—to enter patient data, and we did not have insight into patient charts ourselves. Therefore, there might have been incomplete or unrepresentative sampling. Furthermore, we learned that the inclusion of YOD patients via their healthcare professionals is demanding and challenging, for example, due to the high workloads in their practices. In contrast, YOD patients

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TABLE 3 Clinical features related to the first visit to the memory clinic and diagnosis.

	AD *n* = 547 (70%)	FTD *n* = 87 (11%)	VaD *n* = 41 (5%)	DLB *n* = 40 (5%)	Other *n* = 66 (8%)
Included by					
Local memory clinic	270 (49%)	14 (16%)	20 (49%)	8 (20%)	28 (42%)
Academic hospital	277 (51%)	73 (84%)	21 (51%)	32 (80%)	38 (58%)
Referring physician					
General practitioner	324 (60%)	28 (32%)	20 (49%)	15 (39%)	27 (42%)
Neurologist	127 (23%)	39 (45%)	13 (32%)	15 (39%)	27 (42%)
Psychiatrist	18 (3%)	2 (2%)	1 (2%)	2 (5%)	2 (4%)
Internal/geriatric medicine	43 (8%)	11 (13%)	2 (5%)	2 (5%)	4 (6%)
Elderly care physician	16 (3%)	4 (5%)	1 (3%)	4 (10%)	1 (2%)
Other	16 (3%)	3 (3%)	3 (3%)	1 (3%)	4 (6%)
Second opinion (%)	168 (31%)	48 (55%)	11 (27%)	17 (44%)	29 (45%)
Screening test results					
MMSE (0–30)	21 ± 5	23 ± 5	23 ± 5	24 ± 4	23 ± 6
MoCA (0–30)	17 ± 5	19 ± 5	18 ± 6	18 ± 4	19 ± 5
Complaints at presentation					
Memory complaints	396 (73%)	37 (43%)	23 (58%)	24 (60%)	28 (42%)
Language difficulties	109 (20%)	22 (25%)	6 (15%)	7 (18%)	28 (42%)
Organizing/planning	66 (12%)	10 (12%)	10 (25%)	12 (30%)	5 (8%)
Attention/concentration	36 (7%)	6 (7%)	3 (8%)	4 (10%)	4 (6%)
Behavioral changes	55 (10%)	61 (70%)	8 (20%)	7 (18%)	18 (27%)
Duration of complaints					
<1 year	53 (10%)	4 (5%)	12 (29%)	2 (5%)	6 (9%)
1–2 years	185 (35%)	36 (43%)	9 (22%)	16 (41%)	18 (28%)
2–4 years	172 (32%)	23 (29%)	11 (27%)	13 (33%)	26 (40%)
≥4 years	127 (24%)	20 (25%)	9 (22%)	8 (21%)	15 (23%)

Note. Data represent mean ± SD or *n* (%).
Abbreviations: AD, Alzheimer's disease; DLB, dementia with Lewy bodies; FTD, frontotemporal lobe dementia; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; VaD, vascular dementia.

and their caregivers are highly willing if research is offered, illustrating the need to engage YOD patients and their caregivers to accelerate inclusion in YOD research.

5 | CONCLUSION

With the PRECODE-GP study, we took the first step forward in creating insight into numbers and characteristics of patients with YOD with memory clinic clinicians all over the Netherlands. By registering these patients into the study's database we built an infrastructure that provides a basis for future YOD research, for example, by linking these data to existing registries to study the disease course and care trajectories.

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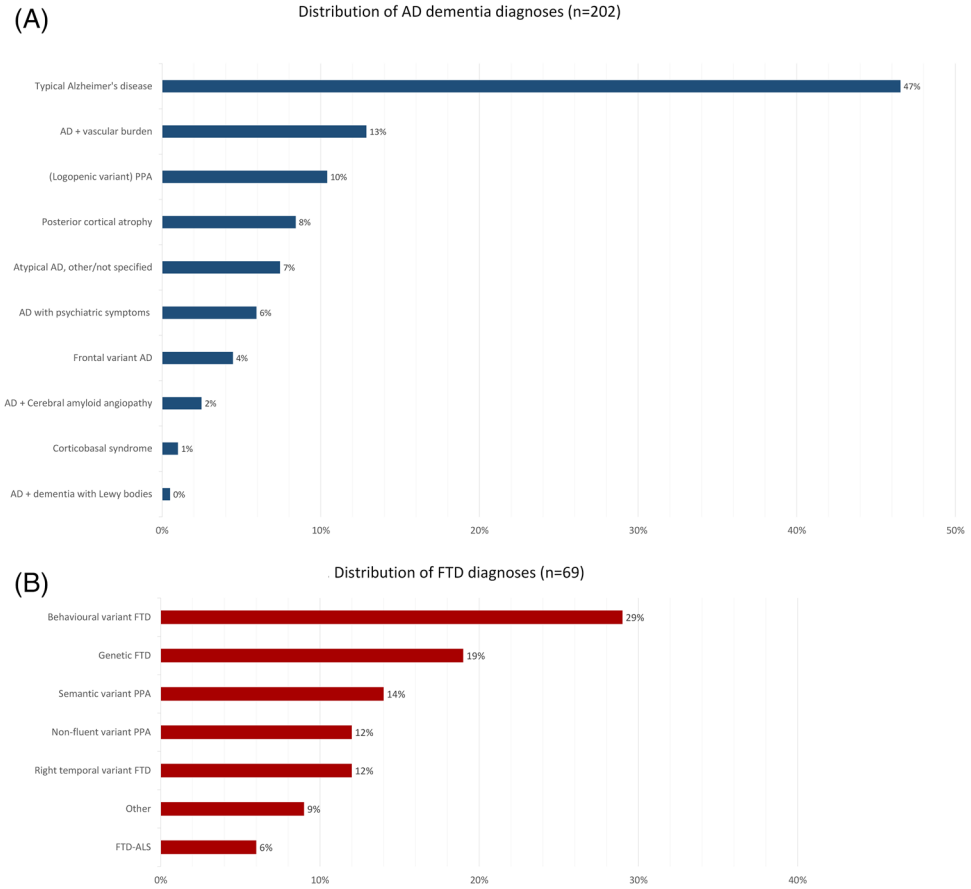

FIGURE 3 Distribution of Alzheimer's disease diagnoses among a subset of $n = 202$ patients (A), and distribution of frontotemporal lobe dementia diagnoses among a subset of $n = 51$ patients (B). AD, Alzheimer's disease; FTD, frontotemporal lobe dementia; FTD-ALS, frontotemporal lobe dementia–amyotrophic lateral sclerosis; PPA, primary progressive aphasia.

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CONFLICT OF INTEREST STATEMENT

H.R.M. performs contract research for Combinostics; all funding is paid to her institution. C.B. received grants from the Dutch Alzheimer Society, Gieskes Strijbis fund and the Dutch Young-onset Dementia Knowledge Study during the course of the study. All funds were paid to his institution. K.P. received grants from Alzheimer Netherlands, Gieskes-Strijbis Fund, and Dutch Knowledge Center Young Onset Dementia during the conduct of the study. All funding is paid to her institution. F.B. is chair of the Dutch Memory Clinic Network. F.B. has a collaboration contract with Biogen, Optina Dx, Optos, and Roche. Payments are made to the institution of VUMC. N.V. received funds from Het Medisch Specialistisch Bedrijf—Vrijgevestigd Collectief Leeuwarden/Medisch Centrum Leeuwarden and is member of the MODEMproject (ZonMW #10510032120006). M.d V. reported receiving grants from Alzheimer Netherlands, Gieskes-Strijbis Fund, and Dutch Knowledge Center Young Onset Dementia during the conduct of the study. All funding is paid to her institution. W.F. performs contract research for Biogen. Research programs of W.F. have been funded by ZonMW, NWO, EU-FP7, EU-JPND, Alzheimer Nederland, CardioVascular Onderzoek Nederland, Health~Holland, Topsector Life Sciences & Health, stichting Dioraphte, Gieskes-Strijbis fonds, stichting Equilibrio, Pasman stichting, stichting Alzheimer & NeuroPsychiatry Foundation, Philips, Biogen MA Inc, Novartis-NL, Life-MI, AVID, Roche BV, Fujifilm, Combinostics. W.F. holds the Pasman chair. W.F. is recipient of ABOARD, which is a public–private partnership receiving funding from ZonMW (#73305095007) and Health~Holland, Topsector Life Sciences & Health (PPP-allowance; #LSHM20106). W.F. has performed contract research for Biogen MA Inc, and Boehringer Ingelheim. W.F. has been an invited speaker at Boehringer Ingelheim, Biogen MA Inc, Danone, Eisai, WebMD Neurology (Medscape), Springer Healthcare. W.F. is consultant to Oxford Health Policy Forum CIC, Roche, and Biogen MA Inc. W.F. participated in advisory boards of Biogen MA Inc and Roche. All funding is paid to her institution. W.F. was associate editor of *Alzheimer's Research & Therapy* in 2020/2021. W.F. is associate editor at Brain. A.G. reports no conflicts of interest. All other authors reported no conflicts of interest. Author disclosures are available in the supporting information.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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