Diagnostic Assessment & Prognosis

Mild cognitive impairment and dementia prevalence: The Atherosclerosis Risk in Communities Neurocognitive Study

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Abstract

Introduction: We examined prevalence of mild cognitive impairment (MCI) and dementia in the Atherosclerosis Risk in Communities (ARIC) Neurocognitive study.

Methods: Beginning in June, 2011, we invited all surviving ARIC participants to undergo cognitive, neurologic, and brain imaging assessments to diagnose MCI or dementia and assign an etiology for the cognitive disorder.

Results: Of 10,713 surviving ARIC participants (age range, 69–88 years), we ascertained cognitive diagnoses in 6471 in person, 1966 by telephone interviews (participant or informant), and the remainder by medical record review. The prevalence of dementia was 9.0% and MCI 21%. Alzheimer's disease (AD) was the primary or secondary etiology in 76% of dementia and 75% of MCI participants. Cerebrovascular disease was the primary or secondary etiology in 46% of dementia and 32% of MCI participants.

Discussion: MCI and dementia were common among survivors from the original ARIC cohort. Nearly 30% of the ARIC cohort received diagnoses of either dementia or MCI, and for the majority of these individuals, the etiologic basis was attributed to AD.

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Keywords: Alzheimer's disease; Cerebrovascular disease; Dementia; Mild cognitive impairment; Epidemiology; Prevalence

1. Introduction

The prevalence of dementia has been extensively studied over the past 25 years [1]. Although there are fewer prevalence studies in African-Americans [2,3], those studies are generally concordant with those from European or European-American cohorts. Of the many prevalence studies, only a few (Framingham [4], Honolulu [5]) recruited persons at middle age and examined them in later life for dementia. Among the major contributions of the investigations

begun in midlife has been the documentation of the importance of midlife vascular risk factors and midlife cognition for later life risks for cognitive impairment.

In 1987–1989, the Atherosclerosis Risk in Communities (ARIC) study recruited a bi-racial group of 15,792 individuals, ages of 45 and 64 years, from four US communities in Maryland, North Carolina, Mississippi, and Minnesota. Cognitive assessments were introduced in the second ARIC examination in 1990–1992. A comprehensive dementia surveillance was performed at the fifth ARIC examination, the Atherosclerosis Risk in Communities Neurocognitive Study (ARIC-NCS), in 2011–2013. The goals of ARIC-NCS were to study the relationships between midlife health and later-life cognitive impairment. We report here on the prevalence of clinical diagnoses of mild cognitive impairment (MCI), dementia, and their attributed etiologies. We also describe the methodological bases of ARIC-NCS to facilitate future ARIC-NCS publications.

2. Methods

2.1. Participants

The ARIC study was initiated in 1987. A random sample of individuals between 45 and 64 years were recruited from four communities: Washington County Maryland, Forsyth County North Carolina, Jackson Mississippi, and suburban Minneapolis Minnesota [6]. The overall goals of the ARIC study were to assess the role of midlife cardiovascular risk factors on health outcomes. An extensive cardiovascular examination was carried out at the initial visit (ARIC visit 1, "v1"). From the beginning of the study in 1987, participants were interviewed annually by phone, and discharge codes were recorded for all reported hospitalizations and all hospitalizations occurring within ARIC communities.

At ARIC visit 2 (v2) in 1990–1992, all participants underwent a 3-instrument cognitive assessment in addition to the entire cardiovascular assessment [7]. The 3-instrument cognitive testing was repeated in a subset of the ARIC cohort who underwent magnetic resonance imaging (MRI) in 1994–1995; in the entire ARIC cohort at visit 4 (1996–1999) [8,9]; in a subset at the ARIC-MRI examination in 2004–2006 (Jackson and Forsyth County sites only); and again in the full cohort at the latest visit (visit 5). ARIC participants had *APOE* genotyping performed using the TaqMan assay (Applied Biosystems, Foster City, CA) once that assay became available. All surviving ARIC participants were invited to an in-person assessment at ARIC-NCS visit 5 between June, 2011, and August, 2013. If they were unable or unwilling to undergo an in-person assessment in clinic, they were offered an in-person assessment in their home or long-term care facility. If they were unwilling or unable to participate in any in-person assessment, a telephonic cognitive assessment was offered. If they were unable or unwilling to unable to undergo a telephonic cognitive assessment, and if cognitive impairment was suspected based on hospital

discharge codes or annual telephone interviews, a family member was invited to participate in an interview about the participant's cognitive and functional status. Fig. 1 shows the flow of participants in ARIC.

Institutional review boards of each ARIC center have approved the ARIC study protocol over its 28-year existence. Participants provided written informed consent for their participation at each study visit. Consent was obtained from a designated proxy along with the participant's assent in participants with a known diagnosis of dementia, impaired mental status (determined in the examination), or where our trained staff deemed that the participant had diminished capacity to provide informed consent.

2.2. Instruments

Participants who were evaluated in person at ARIC-NCS underwent a sequential evaluation. The following cognitive, behavioral, and functional assessments were completed for all participants at ARIC-NCS.

2.2.1. Core in-person assessments

1. The centers for epidemiological studies-depression scale [10] was administered. A score of >8 was considered as suggestive of depression.
2. The three ARIC cognitive instruments that have been administered beginning with ARIC visit 2 were the delayed word recall task, digit symbol substitution from the Wechsler Adult Intelligence Scale -Revised (WAIS-R), and a letter fluency task [7]. Normative data [7,11] and longitudinal data [12,13] have been presented.
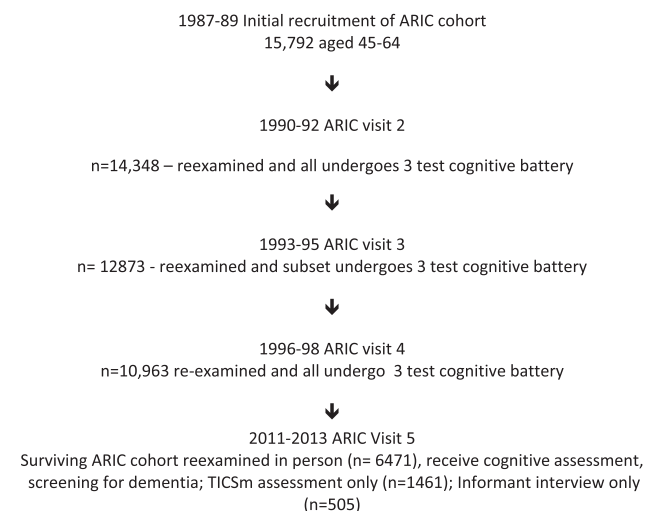

1987-89 Initial recruitment of ARIC cohort
15,792 aged 45-64

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1990-92 ARIC visit 2

n=14,348 – reexamined and all undergoes 3 test cognitive battery

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1993-95 ARIC visit 3
n= 12873 - reexamined and subset undergoes 3 test cognitive battery

↓

1996-98 ARIC visit 4
n=10,963 re-examined and all undergo 3 test cognitive battery

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2011-2013 ARIC Visit 5
Surviving ARIC cohort reexamined in person (n= 6471), receive cognitive assessment, screening for dementia; TICSm assessment only (n=1461); Informant interview only (n=505)

Fig. 1. Timeline for participants in the ARIC-NCS. Abbreviations: ARIC-NCS, Atherosclerosis Risk in Communities Neurocognitive study.