Published in final edited form as:

Mov Disord. 2009 January 15; 24(1): 119–122. doi:10.1002/mds.22324.

Essential tremor might be less frequent than Parkinson's disease in North Israel Arab villages

A Glik, MD^{1,*}, M Masarwa, MD^{1,*}, A Abuful, MN², A Deeb, BN², R Strugatsky, MD¹, LA Farrer, PhD, MD³, RP Friedland, MD⁴, and R Inzelberg, MD^{1,5}

¹ Department of Neurology and The Sagol Neuroscience Center, Sheba Medical Center, Tel Hashomer, Israel

² Tel Aviv University, Ramat Aviv, Israel

³ Departments of Medicine (Genetics Program), Neurology, Genetics & Genomics, Epidemiology, and Biostatistics, Boston University Schools of Medicine and Public Health, Boston, Massachusetts, USA

⁴ Laboratory of Neurogeriatrics, Department of Neurology, Case Western Reserve University, School of Medicine, Cleveland, Ohio, USA

⁵ Rappaport Faculty of Medicine, Technion, Haifa, Israel

Abstract

Essential tremor (ET) is much more prevalent than Parkinson's disease (PD) in Western countries. We estimated ET and PD prevalence in Wadi Ara Arabic villages in Northern Israel.

In this door-to-door survey, all consenting residents aged ≥ 65 years were systematically examined by an Arabic speaking team. No pre-screening questionnaires were used. A random sample of 900 subjects [437 males, mean age (SD)=72.6 years(6.6)] of the 2,163 eligible residents were evaluated. Sixteen subjects had an action, intentional tremor. Tremor prevalence was estimated as 1.78 % (95 % CI 1.1–2.87). Nine of these had another likely cause of tremor. Only 7 were diagnosed as ET [prevalence 0.78 % (95 %CI 0.38–1.6)]. PD was diagnosed in 13 subjects. PD prevalence was 1.44 % (95%CI 0.84–2.45).

ET is unusually uncommon in this population and possibly even less frequent than PD. PD prevalence in Wadi Ara is similar to that reported in Western countries.

Keywords

Epidemiology; prevalence studies; tremor; Parkinson's disease; Arabic

Address for correspondence: Inzelberg Rivka, MD, Department of Neurology, The Sagol Neuroscience Center, Sheba Medical Center, Tel Hashomer, 52621, Israel, Tel: +972-3-5304718 or +972-3-5304753, Fax: +972-3-5304718, inzelber@post.tau.ac.il, Cc to: rivka.inzelberg@gmail.com.

*The first two authors have equally contributed to the study

Author roles:

Glik A, MD. Performed statistical analysis and wrote the manuscript.

Masarwa M, MD. Examined the patients and participated in writing the manuscript.

Abuful A, MN. Examined the patients.

Deeb A, BN. Examined the patients.

Strugatsky R, MD Examined the patients.

Farrer LA, MD PhD. Designed the study and participated in writing the manuscript.

Friedland RP, MD. Designed the study, supervised data collection and participated in writing the manuscript.

Inzelberg R, MD. Designed the study, supervised data collection and analysis, examined the patients and wrote the manuscript.

Introduction

Both essential tremor (ET) and Parkinson's disease (PD) are among the most frequent movement disorders.^{1, 2} The incidence of both diseases increases with age.^{3–6} ET affects between 12 and 23% of the elderly population versus 0.70–1.5% affected by PD in the same age group.^{7–11} Differences in population and methodology may account for variation in prevalence estimates across studies.^{10–15} Door-to-door surveys are the most appropriate way for accurately assessing the prevalence of movement disorders. The detection rate of previously undiagnosed cases can be higher.¹⁶ Our previous observations in Wadi Ara villages in Northern Israel in a small sample of the population, suggested that ET is unusually rare.¹⁷ The paucity of this tremor raises the question whether other movement disorders are also uncommon. We thus conducted a door-to-door study of a larger population sample and estimated the prevalence of both ET and PD.

Methods

Wadi Ara or the Ara Valley is a rural area in Northern Israel whose inhabitants are Arabic Israeli citizens. The population aged ≥ 65 years included 2163 residents on prevalence day (1/1/2003, Israel Central Statistics Bureau). The present work is part of a large scale epidemiological study carried out in Wadi Ara, where residents aged ≥ 65 years are systematically consecutively approached, reply to questionnaires concerning cardiovascular risk factors, activities of daily living (ADL), life style, cognitive function and undergo full neurological examination.^{17,18}

We consecutively approached village houses and examined 900 residents aged ≥ 65 years at prevalence day. Elderly citizens in this area reside with their children. A fluently Arabic speaking team [nurse (AA) and neurologist (MM)] examined one or two subjects in each house. The team interviewed all subjects about medical, family history and medications. The nurse conducted cognitive evaluation, the neurologist performed full neurological examination. All information was reviewed by several neurologists (MM, RS, RI) in bi-monthly consensus conferences. The study was approved by the Institutional Ethical Committee, Israel Ministry of Health, Institutional Regulatory Boards of Case and Boston Universities. All participants signed a written consent form. Examinations were free of charge and without asking about the health insurance status of the subject.

Diagnostic criteria for ET

ET diagnosis was based on criteria established and validated by Louis et al.^{19, 20} Examination included a standardized tremor examination,^{19, 20} neurological examination and the motor part of the Unified Parkinson's Disease Rating Scale (UPDRS).²¹ Tremor score was calculated as the sum of scores (0–3 each item) in 6 tests: postural tremor and 5 tests with each hand (pouring water, spoon drinking, drinking water, finger-to-nose and drawing).²³

Diagnosis of definite ET required moderate oscillatory postural tremor usually present during examination, a moderate and clearly oscillatory kinetic tremor in at least one arm during 4/5 actions and tremor that by history interfered with ≥ 1 ADL. Diagnosis of probable ET required moderate, clearly oscillatory kinetic tremor usually present during examination and during 4/5 actions. Possible ET required moderate clearly oscillatory kinetic tremor during action. Exclusion criteria included cerebellar signs, parkinsonism, dystonia, peripheral neuropathy, possible drug related tremor, hyperthyroidism, chronic alcoholism or anxiety.

Diagnostic Criteria for Parkinson's disease

We used Gelb's criteria for PD diagnosis.²² Group A features: resting tremor, bradykinesia, rigidity, asymmetric onset. Group B features: prominent postural instability, freezing or hallucinations ≤ 3 years after onset, dementia preceding motor symptoms or in the first year, supranuclear gaze palsy, severe symptomatic dysautonomia unrelated to medication, documentation of a condition plausibly connected to the symptoms. Possible PD was diagnosed if ≥ 2 Group A were present; at least 1 being tremor or bradykinesia, had either no Group B features, or in cases with symptom duration ≤ 3 years none of the Group B features is present and with substantial sustained documented response to levodopa, dopamine agonist or the patient did not have an adequate trial of levodopa or dopamine agonist. Probable PD was diagnosed when ≥ 3 Group A features and none of the Group B features were present (symptoms ≥ 3 years) and with substantial sustained documented response to levodopa or dopamine agonist. Since definite PD requires autopsy confirmation, we had no definite PD cases.

Results

951 subjects that were approached, 918 accepted to participate in the study (refusal rate 3.5%). Exclusion causes (n=18): recent head trauma (n=2), recent ischemic stroke (n=3), end-stage renal failure (n=2), metastatic carcinoma (n=2), systemic disease (n=7), severe depression (n=2). The cohort consisted of 900 subjects [437 males, mean age(SD) 72.6(6.6) years]. The mean age(SD) of men was 72.7(7) and women 72.4(6.2) years. The target population aged ≥ 65 years counts 2163 residents. The proportion of subjects aged ≥ 75 years was similar in the target population [n=709 (33%)] and our cohort [n=313, (35%); ($\chi^2=1.054$, d.f. 1, $p>0.1$)]. The gender distribution of the target population included 52% men versus 49% men in the examined population ($\chi^2=2.9$, d.f.=1, $p=0.09$).

A postural, kinetic and clearly oscillatory tremor of moderate amplitude was observed in 16 subjects [8 males, mean age(SD) 74.4(6.3) years, range 66–85]. Tremor prevalence was 1.78% (95% CI 1.1–2.87). Of these, 9 had another possible tremor cause: aminophylline treatment (n=8) and severe renal failure (n=1) [5 males, mean age(SD) 74.9(6) years, range 66–83, tremor score 2–20]. One patient had head tremor (83 years, male). None reported a family history of tremor. In all, tremor severity was enough to raise the differential diagnosis of ET. We could not exclude ET with superimposed drug-induced tremor since these two types of tremor were similar. Only 7 subjects [3 males, mean age(SD) 73.9(7.3) years, range 67–85, tremor score 4–25]. had a tremor compatible with the possible ET without any additional cause. If all cases with additional causes of tremor would be excluded, the prevalence of ET would be 0.78% (95% CI 0.38–1.6).

Table 1 shows the age-stratified distribution of tremor cases. Prevalence was higher (not significantly) in older age strata ($\chi^2=1.905$, d.f.=2, $p>0.1$ all tremor cases; $\chi^2=1.052$, d.f.=2, $p>0.1$ possible ET).

PD was diagnosed in 13 subjects [6 males, age(SD) 72.3(4.9) years, range 65–81 years; Hoehn and Yahr stage II (n=3), III (n=5), IV–V (n=5), UPDRS scores range 10–89]. PD prevalence was estimated as 1.44% (95% CI 0.84–2.45). One additional patient was diagnosed as drug-induced parkinsonism. Two subjects were diagnosed as possible and 11 as probable PD. Three subjects were newly diagnosed by our team. Table 1 shows the age-stratified distribution of PD cases. Prevalence was higher in the 70–79 years stratus. Only 2 subjects were older than 80 years.

Discussion

We found that ET prevalence is similar to that of PD in Wadi Ara villages. This is an unusual observation since ET is the most common adult movement disorder¹⁹ with a crude prevalence varying between 1.3%²³ and 12.5%¹⁰ above the age of 70 years in some populations. Other studies found a prevalence of 3.5%,²⁴ 3.9% (≥ 65 years),²⁵ 4.8% (≥ 65 years),²⁶ and 7%.¹⁵ If all our tremor cases are considered as possible ET, the prevalence would be 1.78% compared to PD prevalence of 1.44%. When all cases with an additional possible cause of tremor are excluded ET prevalence is low (0.78%), which is about half of PD prevalence. While the herein estimated prevalence of PD is similar to that observed in Western population,¹ 19 that of ET, is considerably lower.²⁷ The rarity of ET in this door-to-door survey is compatible with our previous in-patient hospital record survey and field observations in a smaller population sample.¹⁷ 28 The aim of the present study was to verify whether other movement disorders are rare in this population. Our study showed that PD is not less common than in Western populations and that ET is exceptionally uncommon.

Differences of ET prevalence in published studies may stem from methodological variations.⁶ 19 29 Case finding strategy is an important methodological element.¹⁹ 30 Most published studies have been carried out in two phases¹² 31 32 using an initial screening step. The strength of our study is in the fact that all individuals were examined with no prior selective steps such as questionnaires, thus providing a more accurate estimate of prevalence. The rate of refusal was low, consecutive houses were approached, thus minimizing selection bias. We relied on findings at neurological examination and not patient complaints in order to prevent reporting bias. We did not find any tremor patient with a positive family history, a finding that could partly contribute to the low prevalence of ET.

In the present study two (15%) of the PD cases were newly diagnosed by our team. Previous epidemiological studies have shown a considerable number of de novo cases detected,³³ 34 a finding that highlights the importance of door-to-door screening in PD prevalence surveys. Studies based on known PD subjects tend to underestimate the real frequency of PD.³⁵

Our ET prevalence estimate is very low. The observation that the PD prevalence in Wadi Ara is comparable to that in other populations and the fact that we examined every subject in consecutive houses decrease the likelihood that the low ET prevalence is an artifact of selection or reporting bias, health insurance status or variable access to medical care. Factors that might “protect” the Wadi Ara inhabitants from ET remain to be elucidated.

Acknowledgments

Supported in part by the NIH (R01 AG017173, R01 AG09029, R01 HG/AG02213) the Joseph and Florence Mandel Research Fund, the Nickman Family, GOJO Corp. and the Fullerton Foundation and the Institute for the Study of Aging. The authors have no conflicts of interest.

References

1. Shahed J, Jankovic J. Exploring the relationship between essential tremor and Parkinson's disease. *Parkinsonism Relat Disord.* 2007; 13:67–76. [PubMed: 16887374]
2. Jankovic J. Essential tremor: clinical characteristics. *Neurology.* 2000; 54:S21–25. [PubMed: 10854348]
3. Moghal S, Rajput AH, D'Arcy C, Rajput R. Prevalence of movement disorders in elderly community residents. *Neuroepidemiology.* 1994; 13:175–178. [PubMed: 8090259]
4. Louis ED, Marder K, Cote L, et al. Prevalence of a history of shaking in persons 65 years of age and older: diagnostic and functional correlates. *Mov Disord.* 1996; 11:63–69. [PubMed: 8771069]

5. Findley LJ. Epidemiology and genetics of essential tremor. *Neurology*. 2000; 54:S8–S13. [PubMed: 10854346]
6. de Rijk MC, Tzourio C, Breteler MM, et al. Prevalence of parkinsonism and Parkinson's disease in Europe: the EUROPARKINSON Collaborative Study. European Community Concerted Action on the Epidemiology of Parkinson's disease. *J Neurol Neurosurg Psychiatry*. 1997; 62:10–15. [PubMed: 9010393]
7. Trenkwalder C, Schwarz J, Gebhard J, et al. Starnberg trial on epidemiology of Parkinsonism and hypertension in the elderly. Prevalence of Parkinson's disease and related disorders assessed by a door-to-door survey of inhabitants older than 65 years. *Arch Neurol*. 1995; 52:1017–1022. [PubMed: 7575219]
8. de Pedro-Cuesta J. Parkinson's disease occurrence in Europe. *Acta Neurol Scand*. 1991; 84:357–365. [PubMed: 1837650]
9. Morgante L, Rocca WA, Di Rosa AE, et al. Prevalence of Parkinson's disease and other types of parkinsonism: a door-to-door survey in three Sicilian municipalities. The Sicilian Neuro-Epidemiologic Study (SNES) Group. *Neurology*. 1992; 42:1901–1907. [PubMed: 1407570]
10. Rautakorpi I, Takala J, Marttila RJ, Sievers K, Rinne UK. Essential tremor in a Finnish population. *Acta Neurol Scand*. 1982; 66:58–67. [PubMed: 7113680]
11. Elble RJ. Tremor in ostensibly normal elderly people. *Mov Disord*. 1998; 13:457–464. [PubMed: 9613737]
12. Benito-Leon J, Bermejo-Pareja F, Rodriguez J, Molina JA, Gabriel R, Morales JM. Prevalence of PD and other types of parkinsonism in three elderly populations of central Spain. *Mov Disord*. 2003; 18:267–274. [PubMed: 12621629]
13. Rajput AH, Offord KP, Beard CM, Kurland LT. Essential tremor in Rochester, Minnesota: a 45-year study. *J Neurol Neurosurg Psychiatry*. 1984; 47:466–470. [PubMed: 6736976]
14. Brin MF, Koller W. Epidemiology and genetics of essential tremor. *Mov Disord*. 1998; 13 (Suppl 3):55–63. [PubMed: 9827596]
15. Dogu O, Sevim S, Camdeviren H, et al. Prevalence of essential tremor: door-to-door neurologic exams in Mersin Province, Turkey. *Neurology*. 2003; 61:1804–1806. [PubMed: 14694055]
16. Claveria LE, Duarte J, Sevillano MD, et al. Prevalence of Parkinson's disease in Cantalejo, Spain: a door-to-door survey. *Mov Disord*. 2002; 17:242–249. [PubMed: 11921108]
17. Inzelberg R, Mazarib A, Masarwa M, Abuful A, Strugatsky R, Friedland RF. Essential tremor prevalence is low in Arabic villages in Israel: door-to-door neurological examinations. *J Neurol*. 2006; 253:1557–1560. [PubMed: 17006631]
18. Inzelberg R, Schechtman E, Abuful A, et al. Education effects on cognitive function in a healthy aged Arab population. *Int Psychogeriatr*. 2007; 19:593–603. [PubMed: 17052375]
19. Louis ED, Ottman R, Hauser WA. How common is the most common adult movement disorder? Estimates of the prevalence of essential tremor throughout the world. *Mov Disord*. 1998; 13:5–10. [PubMed: 9452318]
20. Louis ED, Ford B, Frucht S, Barnes LF, M XT, Ottman R. Risk of tremor and impairment from tremor in relatives of patients with essential tremor: a community-based family study. *Ann Neurol*. 2001; 49:761–769. [PubMed: 11409428]
21. Fahn, SERL. Unified Parkinson's disease rating scale. In: Fahn, SMCD.; Calne, D.; Goldstein, M., editors. Recent development in Parkinson's disease. 1. Macmillan; 1987. p. 153-164.
22. Gelb DJ, Oliver E, Gilman S. Diagnostic criteria for Parkinson disease. *Arch Neurol*. 1999; 56:33–39. [PubMed: 9923759]
23. Haerer AF, Anderson DW, Schoenberg BS. Prevalence of essential tremor. Results from the Copiah County study. *Arch Neurol*. 1982; 39:750–751. [PubMed: 7138316]
24. Salemi G, Savettieri G, Rocca WA, et al. Prevalence of essential tremor: a door-to-door survey in Terrasini, Sicily. Sicilian Neuro-Epidemiologic Study Group. *Neurology*. 1994; 44:61–64. [PubMed: 8290093]
25. Louis ED, Marder K, Cote L, et al. Differences in the prevalence of essential tremor among elderly African Americans, whites, and Hispanics in northern Manhattan, NY. *Arch Neurol*. 1995; 52:1201–1205. [PubMed: 7492295]

26. Benito-Leon J, Bermejo-Pareja F, Morales JM, Vega S, Molina JA. Prevalence of essential tremor in three elderly populations of central Spain. *Mov Disord.* 2003; 18:389–394. [PubMed: 12671944]
27. Koller, W.; Busenbark, K. Essential tremor. In: Watts, R.; Koller, W., editors. *Movement disorders: neurologic principles and practice*. 1. Mc Graw Hill; 1997. p. 365-385.
28. Nisipeanu P, Inzelberg R, Strugatsky R, Carasso R. Essential tremor in Jewish and Arabic population in Israel. *Mov Disord.* 2000; 15(Suppl 3):100. Abstract.
29. Louis ED, Ford B, Lee H, Andrews H, Cameron G. Diagnostic criteria for essential tremor: a population perspective. *Arch Neurol.* 1998; 55:823–828. [PubMed: 9626774]
30. Meneghini F, Rocca WA, Anderson DW, et al. Validating screening instruments for neuroepidemiologic surveys: experience in Sicily. Sicilian Neuro-Epidemiologic Study (SNES) Group. *J Clin Epidemiol.* 1992; 45:319–331. [PubMed: 1314889]
31. Louis ED, Ford B, Lee H, Andrews H. Does a screening questionnaire for essential tremor agree with the physician's examination? *Neurology.* 1998; 50:1351–1357. [PubMed: 9595986]
32. Benito-Leon J, Bermejo-Pareja F, Louis ED. Incidence of essential tremor in three elderly populations of central Spain. *Neurology.* 2005; 64:1721–1725. [PubMed: 15911798]
33. Kis B, Schrag A, Ben-Shlomo Y, et al. Novel three-stage ascertainment method: prevalence of PD and parkinsonism in South Tyrol, Italy. *Neurology.* 2002; 58:1820–1825. [PubMed: 12084883]
34. de Rijk MC, Breteler MM, Graveland GA, et al. Prevalence of Parkinson's disease in the elderly: the Rotterdam Study. *Neurology.* 1995; 45:2143–2146. [PubMed: 8848182]
35. Schoenberg BS, Anderson DW, Haerer AF. Prevalence of Parkinson's disease in the biracial population of Copiah County, Mississippi. *Neurology.* 1985; 35:841–845. [PubMed: 4000484]

Table 1

Stratification by age and gender. Subjects with tremor and PD
Prevalence of essential tremor (ET) and Parkinson's disease (PD) stratified by age and gender. Numbers concerning ET are depicted in two rows in each cell. The upper row indicates all subjects with a postural and action tremor and the lower row indicates possible ET diagnosed by stricter criteria.

Age group [years]	Subjects [N]	Tremor [N]	Possible ET [N]	Tremor [P* (95%CI)]	Possible ET [P* (95%CI)]	PD [N]	PD [P* (95%CI)]
65-69	349	4		1.14 (0.45-2.91)		4	1.14 (0.45-2.91)
		2		0.57 (0.16-2.06)			
Males	172 (49%)	3		1.74 (0.59-5)		1	0.58 (0.1-3.22)
		1		0.58 (0.1-3.22)			
Females	177 (51%)			0.56 (0.1-3.12)		3	1.69 (0.58-4.86)
		1		0.56 (0.1-3.12)			
70-79	415	8		1.9 (0.98-3.76)		8	1.93 (0.98-3.76)
		3		0.72 (0.24-2.1)			
Males	197 (47.4%)	2		1 (0.28-3.63)		5	2.54 (1.09-5.81)
		1		0.50 (0.09-2.82)			
Females	218 (52.5%)	6		2.75 (1.27-5.87)		3	1.38 (0.47-3.97)
		2		0.92 (0.25-3.29)			
≥ 80	136	4		2.94 (1.15-7.32)		1	0.74 (0.13-4.06)
		2		1.47 (0.4-5.2)			
Males	68 (50%)	3		4.41 (1.51-12.18)		0	0 (0-0.54)
		1		1.47 (0.26-7.87)			
Females	68 (50%)	1		1.47 (0.26-7.87)		1	1.47 (0.26-7.87)
		1		1.47 (0.26-7.87)			
Total	900	16		1.78 (1.1-2.87)		13	1.44 (0.84-2.45)
		7		0.78 (0.38-1.6)			
Males	437 (49%)	8		1.83 (0.93-3.57)		6	1.37 (0.63-2.96)
		3		0.69 (0.24-2.0)			
Females	463 (51%)	8		1.73 (0.88-3.37)		7	1.51 (0.73-3.08)
		4		0.86 (0.33-2.19)			

* P=Prevalence/100