Abstract

Objectives

To describe the treatment of hypertension in people with dementia and collate evidence on adverse health events whilst on treatment.

Design

A multi-centre prospective observational cohort study.

Setting and Participants

People with documented diagnoses of hypertension and dementia were recruited through memory clinics and general practice from eight sites in the UK.

Methods

The cohort was recruited between July 2013 and October 2014. Participants underwent face-to-face, standardised assessment of blood pressure (BP), activities of daily living, cognitive function, and medication use. Follow up was by monthly telephone interview for 6 months to collate data on adverse health events.

Results

181 participants were recruited and 177 followed-up. 126 (70%) were female, mean age was 82 (SD6.3) years, median Mini Mental State Examination score 23 (IQR18-26) and mean BP 141/78 (SD22/12) mmHg. Antihypertensive drugs were prescribed in 157 (87%). Participants were prescribed a median of 1 (IQR1-2) antihypertensive medication. ACE-inhibitors and/or Angiotensin Receptor Blockers were the most frequently prescribed antihypertensives in 63% of participants. Target BP was achieved in 58% (95% CI49% - 64%). Increasing number of antihypertensives was not associated with lower systolic or diastolic BP, or with a higher proportion of patients attaining target BP. Participants had 214 falls, three had a fracture, three developed symptomatic heart failure, four had cerebrovascular events and eight died.

Conclusions and Implications

In this population of people with mild dementia, participants were treated with standard antihypertensive medications in a similar proportion to the general population, with a similar proportion achieving target BP. The rate of adverse health events was higher than in randomised controlled trials of antihypertensives and raises reservations about the

assumptions underpinning antihypertensive treatment in people with dementia. These findings may help inform clinical decision making.

Introduction

International policies and guidelines stress the importance of the detection and treatment of hypertension, which is the most important cardiovascular risk factor with the greatest impact on mortality[1-3]. High blood pressure is common amongst older adults. A reported 56.1% of community dwelling older people and 43.7% of care home residents have hypertension[4]. Prevalence increases with age[5] and approximately 80% of those aged over 80 are hypertensive[6]. Multiple large scale randomised controlled trials, such as the Hypertension in the Very Elderly Trial (HYVET), have demonstrated health benefits from medications that lower blood pressure[5,7] and increasingly guidelines are advocating lower and lower target blood pressures even amongst the oldest old[8-10].

Current guidance on hypertension advises that co-pathology should be taken into account when treatment decisions are made[1]. People with dementia were not included in the large scale Randomised Controlled Trials (RCTs) of antihypertensives. At present, there are no condition-specific recommendations for treating hypertension in people with dementia and the benefits of treatment are assumed to apply. Observational evidence, however, has suggested the benefits of blood pressure lowering may be attenuated by co-existing cognitive impairment. A cohort study of 1587 people over 75 years found higher systolic blood pressure to be associated with reduced mortality in people with cognitive and functional impairment[11]. The PARTAGE group found an association between increased mortality and a systolic BP below 130mmHg in care home residents taking two or more antihypertensives[12]. The Leiden 85+ study found an association between cognitive decline and low blood pressure in patients taking antihypertensives[13]; a finding replicated by Mossello and colleagues[14].

It is clear from the above that generic guidelines for management of hypertension may require some interpretation in patients with dementia. What is not clear is how the uncertainty surrounding treatment in this group influences practitioner decisions. It is possible, for instance, that those concerned about potential side effects of antihypertensives might advise against treatment or use less stringent target blood pressures[15], while others might advocate tight blood pressure control[16].

There are limited data available on how people with cognitive impairment are affected by antihypertensive-associated adverse health events[17]. Medication side effects are commonly overlooked in dependent people with cognitive impairment[18], raising the possibility of greater harm from adverse health events associated with antihypertensive therapy in people with dementia.

The aim of the Hypertension in Dementia (HinD) study, described in this paper, was to describe current practice regarding treatment of hypertension in people with dementia. Specific objectives were to (i) describe the proportion people with dementia and hypertension that are prescribed antihypertensives, (ii) to identify what class of antihypertensives are prescribed, (iii) to identify the proportion achieving target blood pressure, and (iv) to describe how often they report adverse health events during 6 months follow-up. By doing so the study aimed to provide more evidence for clinicians and patients to use in informed decision-making.

Methods

Study design

The HinD study was an observational cohort study.

Cohort

The cohort involved a multi-centre prospective community-based cohort in the UK. Between July 2013 and October 2014, 181 individuals with recorded diagnoses of hypertension and dementia were recruited via GP practices and memory clinics from 8 sites. All participants had an informant and where they lacked capacity to consent consultee advice was sought regarding participation in the study. After informed consent or consultee advice was obtained, participants and informants underwent a face-to-face standardised assessment involving assessment of blood pressure, activities of daily living (ADLs), cognitive function, and medication use. Participants were followed up with monthly telephone interviews for 6 months to collect information on adverse health events. *(Ethical approval was obtained from NRES Committee East Midlands - Nottingham 1 REC ref. 13/EM/0099 and Scotland A REC ref. 14/SS/0035)*

Selection criteria

Individuals with documented diagnoses of hypertension and dementia were potentially eligible for this study. In those recruited through general practice, practice databases were searched for individuals coded as having these two conditions on the practice database. In those recruited through memory services, clinics used recorded medical histories of hypertension and dementia to identify potential participants. Hypertension and dementia diagnoses were not re-evaluated during screening for this study and prescription of antihypertensive medication was not used to identify people with hypertension.

Blood pressure

Researchers measured blood pressure using a validated automatic BP machine (OMRON M6 HEM-7211-E) with an appropriate cuff size after 10 minutes of rest when seated. The blood pressure one minute after standing was then measured. Postural hypotension was defined as a drop of more than 20mmHg in systolic blood pressure or of 10mmHg in diastolic blood pressure.

Cognitive assessment and dependency for ADLs

Cognitive function was assessed using the Mini-Mental State Examination (MMSE)[19]. Dependency for activities of daily living was evaluated using the modified Barthel Index[20].

Comorbidity

Participants and informants were asked about their medical diagnoses at baseline interview and these were confirmed by reference to medical records.

Medical events

Participants and informants were contacted every week for four weeks and then monthly for a further 5 months. A structured telephone interview with the participant and/or informant was used to collect data on falls, falls with fractures, new cardio- or cerebrovascular events (self-reported myocardial infarction, stroke, TIA, heart failure), or death.

Planned statistical analysis

Descriptive statistics were used to describe the study population and its antihypertensive treatment and adverse health events in detail. The rate of reported adverse health events over the duration of the study was transformed into the rate per 1000patientyears and 95% confidence interval estimates were calculated. Differences between GP and memory clinic recruits, between those achieving and those not achieving target BP, and between those taking and not taking antihypertensive agents were explored using: the t-test for continuous and normally distributed variables; the Mann-Whitney U test for continuous and non-normally distributed or ordinal variables and the Chi-Squared test for categorical variables. Association between number of antihypertensives and blood pressure and achievement of target blood pressure was tested using regression analysis.

Results

Study population

1585 eligible individuals with diagnoses of hypertension and dementia were invited to participate in the study via mail sent to clinic lists from GP practices and memory clinics from 8 sites within the UK. 181 individuals were recruited: 86 from GP practices, 95 from memory clinics. Of these 181 individuals, one withdrew before baseline assessment could be completed and a further three withdrew before follow-up commenced, leaving 177 to enter follow up (Figure 1).

People recruited via GP were more likely to have fallen (30% vs 16% p=0.021), took fewer antihypertensives (median 1 (IQR1-2) vs 2 (IQR 1-2) p=0.008), had more medical diagnoses (median 5.5 (IQR 4-8) vs 4 (3-5) p<0.001), and were more dependent for basic ADLs (Barthel median 19 (IQR 14.75-20) Vs 20 (IQR 17-20) p=0.028) compared to those recruited via memory clinics.

Figure 1 Participant flow diagram

At baseline 126 (70%) were female, mean age was 82 years (SD 6.3), and median MMSE score was 23 (IQR 18-26). Alzheimer's dementia was the most common dementia diagnosis in 101 (56%), followed by vascular dementia 36 (20%), mixed dementia 23 (13%) and others 20 (11%). There were a median of 5 (IQR 3-7) medical diagnoses per participant. Diabetes mellitus was the most common problem (35 (19%)) while previous stroke and myocardial infarction were also frequently reported (28 (16%), 23 (13%) respectively). The baseline variables of the HIND population are summarised in table 1.

Table 1. HIND population baseline variables

Blood pressure and treatment

High blood pressure was treated in 157 (87% (95% CI 82% - 92%)); 23 (13%) were taking no agents, 79 (44%) were taking one, 50 (28%) were taking two, 20 (11%) were taking three, 6 (3%) were taking four and 2 (1%) were taking five agents. ACEi/ARBs were the most frequently prescribed antihypertensive (63%), followed by calcium channel blockers (37%), beta-blockers (34%) and diuretics (23%). An average blood pressure of 141/78 (SD 22/12) was recorded. Increasing number of antihypertensives was not associated with lower blood

pressure (systolic blood pressure R^2=0.008 P=0.248, diastolic blood pressure R^2=0 P=0.907) see Table 2.

Target blood pressure (as defined by NICE 2011 guidance[1]) was achieved in 58% (95% CI 49% - 64%) of those on treatment. Increasing numbers of antihypertensives were not associated with a higher proportion of participants having a blood pressure at or below their specified target (p= 0.952) (table 2).

Table 2 The number of antihypertensive agents prescribed and mean blood pressure and proportion achieving target blood pressure.

Postural blood pressure

Postural blood pressures were measured in 174 individuals at baseline and were omitted in 6 where participants were unable to stand. 19 (11%) participants had a drop in blood pressure sufficient to meet the criteria for orthostatic hypotension. Orthostatic hypotension was more prevalent in those not prescribed antihypertensives (6 (26%) Vs 13 (8.6%) P=0.009).

Follow up

177 participants entered follow up of whom 155 were taking at least one antihypertensive. Of those on treatment during 6 months follow up, 71 participants (46%) reported at least one fall and 30 (19%) two or more. In total 214 falls were sustained; a rate of 2760 falls per 1000 patient-years. Three participants (2%) sustained a fracture (41 per 1000 patient-years) as a result of falling, three (2%) experienced five episodes of heart failure (65 (95% CI 58-71) per 1000 patient-years), four (3%) experienced six strokes / TIAs (77 (95% CI 70-84) per 1000 patient-years) and eight (5%) participants died (103 (95%CI 95-111) per 1000 patient-years).

Discussion

In this study of people with mild dementia and a diagnosis of hypertension, high blood pressure was treated in the majority of participants and standard antihypertensive medication was used. Target blood pressure was achieved in just over half of participants irrespective of the number of antihypertensives prescribed. The majority of those not prescribed antihypertensives had blood pressure readings within the target range. Presumably these individuals had become normotensive having previously been

hypertensive or had been erroneously coded. The study population largely had mild dementia, but experienced multiple adverse health events during the six month follow up period with falls being the most common.

The study recruited participants from a variety of settings and geographical locations so its findings are likely to be applicable across the whole of the UK. The most important limitation affecting the study was that the recruitment strategy selected a study population with mild dementia, limiting generalisability of the findings to this group.

A systematic review of historical observational studies of the treatment of hypertension in people with dementia [18] found that 73% were on at least one antihypertensive. In the current study treatment rates were higher at 87% (95% CI 82% - 92%), which is in keeping with the findings of a survey of the general population (Health Survey for England 2011) where the reported treatment rate was also 87%[21]. The higher treatment rate, than that identified by the review, may be an effect of the timing of the study, or because the HinD population were mildly cognitively impaired and hence similar to the general population. The proportion achieving target blood pressure (58%) was similar to that reported in both the review (55%)[18] and Health Survey (52%)[21]. The average blood pressure was similar to that achieved in randomised controlled trials such as HYVET (140/72 (HYVET) vs 141/78 (HinD))[10].The Health Survey found that ACEi/ARBs were the most frequently prescribed class[22] – the same as in the HinD study. However, the systematic review identified diuretic antihypertensives as the most frequently prescribed class (64%), while calcium channel blockers (43%), ACEi/ARBs (42%) and β-blockers (42%) were less commonly prescribed perhaps reflecting historic prescribing trends[18].

The HinD population experienced multiple adverse health events including 214 falls, of which 3 resulted in fractures, and one in twenty dying during the 6 month follow-up period. The incidence of falls (2760 falls per 1000 patient-years) was similar to that reported by Allan and colleagues in another UK cohort study of people with mild to moderate dementia due to Alzheimer's disease (2486 per 1000 patient-years) and vascular disease (3135 per 1000 patient years)[23]. The rate of falls was higher than has been reported in non-cognitively impaired older people (1023 per 1000 patient-years)[23] and in community dwelling older women (1003 per 1000 patient-years)[24]. The fracture rate (41 per 1000 patient-years) was higher than that reported in those aged 80-85 in the Rotterdam Study (20 per 1000 patient-years men, 30 per 1000 patient years for women). This is in keeping with other groups' findings that falls and fractures are more common in people with cognitive impairment[25-27].

The rates of events such as heart failure (65 (95% CI 58-71) per 1000 patient-years), stroke (77 (95% CI 70-84) per 1000 patient-years) and death (103 (95%CI 95-111) per 1000

patient-years) were higher than those reported in trials such as HYVET (heart failure 5.3 per 1000 patient-years, stroke 12.4 per 1000 patient-years, death 47.2 per 1000 patient-years [10]). This may reflect the higher conventional vascular risk within the HinD population where the prevalence of comorbidities such as diabetes and ischaemic heart disease was higher[10] at baseline. Previous observational data have raised the possibility that the effect of blood pressure lowering may be attenuated in the presence of co-existing cognitive impairment. The Milan Geriatrics 75+ cohort study found that in participants with Mini-Mental State Examination scores indicating cognitive impairment and ADL dependence, a higher systolic blood pressure was associated with reduced mortality[11]. The data from HIND therefore aligns with data from generic longitudinal observational cohort studies which suggest that populations recruited by RCTs, such as HYVET, were not fully representative of the patterns of comorbidity and adverse outcomes seen in the real world. In HIND, as in the Milan-65+ and PARTAGE studies, both were more common.

Conclusion and implications

Participants in this study had their blood pressure treated with standard antihypertensive medications. Their blood pressure was treated in a similar proportion to the general population and a similar proportion achieved target blood pressure. This suggests that clinicians currently do not regard this group as being sufficiently different from patients without dementia to recommend specific treatment approaches. The higher rate of adverse health events experienced by this population compared to the findings of the large scale randomised controlled trials may just reflect the relative robustness of a randomised controlled trial population. However, it does raise the possibility that treatment of hypertension in people with dementia may be associated with greater harm. Clinicians must understand the caveats attached to treatment in this patient group – it is not clear that they currently do so, or if they do, that this understanding changes practice.

These discussions are, at present, stymied by the limitations of observational data and in particular by the largely mildly impaired nature of participants. A randomised controlled trial examining the risk to benefit ratio of antihypertensives in people with dementia is one possible way forward but could, in practice, be very difficult to conduct. In the absence of an RCT, further observational data are required so that those writing guidelines can give appropriate consideration to the safest approach to treatment in this vulnerable group of patients.

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Figure Legend

Figure 1 Participant flow diagram