Article

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Individual risk factors for possible undetected dementia amongst community-dwelling older people in New Zealand

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Abstract

There is general acknowledgement of the importance of early diagnosis of dementia, yet there are still high rates of undetected dementia internationally. The aim of this cross-sectional study was to determine the sociodemographic characteristics associated with possible undetected dementia in a large sample of community-dwelling older New Zealanders. The sample consisted of older people (age $\geq$ 65) who had received the homecare version of the international Residential Home Care Assessment version 9.1 over a two-year period and who were screened positive for possible dementia on the international Residential Assessment's Cognitive Performance Scale. People with possible alternative explanations for impaired cognitive performance such as depression and other neurological conditions were excluded from analysis. The 5202 eligible individuals were categorized into two groups: (1) those with a recorded

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diagnosis of dementia (64%) and (2) those without a recorded diagnosis of dementia (i.e. possible undetected dementia group) (36%). Logistic regression was used to evaluate the association between individual characteristics and possible undetected dementia. Significant risk factors for being in the possible undetected dementia group included Asian ethnicity, living alone, not having participated in long-standing social activities recently, major life stressors, and limited accessibility of their house. The knowledge gained from this study could enable targeting of services and resources for the groups at risk of undetected dementia to have a more equitable access to early diagnosis.

Keywords
detection, undetected, diagnosis, dementia and Alzheimer's disease

Introduction

One of the major challenges in the management of dementia is early and precise diagnosis. The benefits of early and precise diagnosis are manifold. First, the initial diagnostic workup may identify potentially reversible causes of cognitive impairment. Second, early diagnosis can help the individual and their care partners to access information and support to help them to understand, plan, and respond positively to changes. Third, when a diagnosis of dementia is confirmed, evidence-based pharmacological and non-pharmacological interventions can be implemented early to delay the progression of cognitive decline and maximize functioning and well-being. Early diagnosis can be beneficial for the person with dementia and their care partner's quality of life (Logsdon, McCurry, & Teri, 2007). Despite the potential benefits of early diagnosis and treatment, it was estimated that the percentage of undiagnosed dementia in primary health care settings ranges from 20 to 50% in developed countries, and it increases to 90% in developing countries (Alzheimer's Disease International, 2011; Jitapunkul, Chansirikanjana, & Thamarpirat, 2009; Walker, Lord, & Farragher, 2017).

Previous studies have evaluated the clinical and sociodemographic characteristics of people with undiagnosed dementia (Cherubini et al., 2012; Connolly, Gaehl, Martin, Morris, & Purandare, 2011; Shores et al., 2004; Steenland et al., 2008). Savva and Arthur (2015) found that people with undiagnosed dementia were more likely to suffer from mild dementia rather than the more advanced stages of the disease; while married woman, those with higher education and those younger than 90 years old were more likely to have an adequate dementia diagnosis. In addition, Wilkins et al. (2007) found that older age and living alone were associated with undiagnosed dementia.

An Italian study of residents of aged residential care facilities found that one possible explanation for undiagnosed dementia was a lack of systematic assessment of cognitive functioning (Cherubini et al., 2012). A meta-analysis concluded that general practitioners (GPs) have difficulties differentiating between mild cognitive impairment (MCI) and mild dementia, and recording these diagnoses in patients' medical record (Koch, Iliffe, & Project, 2010). A UK study reported that possible undiagnosed dementia was more likely among practices run by one GP compared to multiple GPs and practices in more affluent areas (Connolly et al., 2011).

New Zealand is the first country in the world to implement a mandated comprehensive assessment for all older people who are being assessed for publically funded community services or aged residential care. The international Residential Assessment Instrument (interRAI) is a comprehensive geriatric assessment developed by a network of health researchers in over 30 countries (The interRAI Organization, 2017). interRAI aims to provide a clinical assessment of medical, rehabilitation, and support needs and abilities. This information can support care planning, resource allocation, quality measurement, and outcome evaluation (Mathias, Hirdes, & Pittman, 2010). Embedded in the interRAI assessment is a routinely collected outcome scale called the Cognitive Performance Scale (CPS), as well as recording whether the person has a diagnosis of Alzheimer's disease or dementia. This study used the New Zealand interRAI database and was aimed to compare the sociodemographic factors associated with people with possible undetected dementia and those with diagnosed dementia by linking their CPS scores with a recorded diagnosis of Alzheimer's disease or dementia.

Materials and methodology

Setting

The study sample consisted of older people (age $\geq$ 65) who had received an interRAI Home Care Assessment version 9.1 (interRAI-HC 9.1) anywhere in New Zealand between 1 July 2014 and 30 June 2016. The New Zealand interRAI group at the Ministry of Health provided access to de-identified data from people who gave consent to have their records used for research purposes at the time of their interRAI assessment. A previous study using the New Zealand interRAI database has found 93.1% of people provided consent for research (Schluter et al., 2016).

The interRAI data were collected by trained interRAI assessors using a face-to-face assessment. The interRAI assessor may use multiple sources of information, e.g. referral note, person interview, observation, discussion with family, carers, or health professionals to gain accurate information. A national competency framework provides quality assurance for interRAI assessment. The interRAI assessors must be clinically registered and signed off as competent involving attending a three-day interRAI training programme, completing 10 assessments and care plans, passing an evaluation, and achieving an acceptable quality review outcome. The individual items of the interRAI Home Care version have been shown to have good inter-rater reliability (Hirdes et al., 2008).

Cognitive status recorded on interRAI

(i) CPS. The CPS score is determined by an algorithm using items concerning daily decision-making ability, short-term memory, procedural memory, ability to make self-understood, ability to feed oneself, and whether the individual was in a coma. These items are combined into a hierarchical ranking scale providing scores from 0 to 6 (0 = intact, 1 = borderline intact, 2 = mild impairment, 3 = moderate impairment, 4 = moderately severe impairment, 5 = severe impairment, and 6 = very severe impairment) (Morris et al., 1994).

The CPS has good specificity for identifying people with cognitive impairment/dementia in long-term care and acute hospital settings (Bula & Wietlisbach, 2009; Hartmaier et al., 1995;

Paquay et al., 2007; Smart, Herrmann, & Lanctot, 2011; Travers, Byrne, Pachana, Klein, & Gray, 2013; Wellens et al., 2013) and moderate to strong correlations with the mini-mental state examination (MMSE) (Bula & Wietlisbach, 2009; Chan, Lai, & Chi, 2014; Gruber-Baldini, Zimmerman, Mortimore, & Magaziner, 2000; Hartmaier et al., 1995; Jones, Perlman, Hirdes, & Scott, 2010; Landi et al., 2000; Morris et al., 2016; Snowden et al., 1999; Travers et al., 2013; Wellens et al., 2013). Table 1 summarizes the mean MMSE scores against CPS scores reported in some of these studies.

The recommended CPS cut-off score for the presence of cognitive impairment is ≥ 2. A cut-off score of ≥ 3 was used in the present study to increase certainty about the presence of clinically significant cognitive impairment. As shown in Table 1 a CPS score of ≥ 3 suggests a moderate degree of cognitive impairment on the MMSE.

(ii) The Activities of Daily Living (ADL) Hierarchy Scale: It is used to measure an individual's degree of dependence in ADLs. It measures four performance areas: personal hygiene, locomotion, toilet use, and eating. The range of activities included in the scale extends from activities that tend to decay first and those activities that are kept the longest, such as keeping personal hygiene and eating, respectively. These items are assessed as a range into a hierarchical ranking scale providing scores from 0 to 6 (0 = independent, 1 = independent but with some set-up help, 2 = supervision but no direct hands-on support, 3 = limited assistance, 4 = extensive assistance, 5 = maximal assistance, and 6 = total dependence; Morris, Berg, Fries, Steel, & Howard, 2013). Moreover, the ADL Hierarchy Scale has been widely used in other international studies to compare home care and long-term settings (Carpenter, Hastie, Morris, Fries, & Ankri, 2006; Onder et al., 2012).

(iii) Dementia diagnosis: The interRAI items on recorded diagnosis of Alzheimer's disease and other dementia were used. They have been found to have high reliability with medical records (Hirdes et al., 2008). There are four categories in the interRAI Alzheimer's disease and dementia diagnosis: 0 = Not present; 1 = Primary diagnosis for current stay; 2 = Diagnosis present, receiving active treatment; 3 = Diagnosis present, monitored but no active treatment. For this study we combined category 1, 2, and 3 to a single category representing that Alzheimer's disease/dementia diagnosis was present.

Participant's selection

Figure 1 shows the flow chart of participant selection process. Where there was more than one assessment for an individual in the study period only the first assessment was included in the analysis. Individuals were excluded from the analysis if they had relevant co-morbidities recorded in the interRAI that may have impacted on cognitive performance and if they were in long-term care.

Measurements

A range of characteristics of the individual were collated from the interRAI assessment:

- Sociodemographic factors: gender, age, ethnicity (European, Maori, Pacific people, Asian, and other), marital status (married/in a de facto relationship or not), living arrangement (living alone or not).

Table 1. Studies characteristics and mean MMSE scores against CPS scores.

Study	Bula and Wietlisbach (2009)	Gruber-Baldini et al. (2000)	Hartmaier et al. (1995)	Jones et al. (2010)	Paquay et al. (2007)	Wellens et al. (2013)
Country	Switzerland	US	US	Canada	Belgium	Belgium
Setting	General internal medicine service of an academic medical centre	Nursing homes	Nursing homes	Adult inpatient mental health and addictions hospital	Nursing homes	Geriatric wards (university hospitals)
Participants	n=401	n=1939	n=200	n=215	n=198	n= 97
Mean age	82.4	81.6	80.5	67.2	83.6	85
CPS	Mean MMSE scores (±SD)					
0 – Intact	26.6 (2.7)	24.0[a]	24.2 (3.5)	28.6 (2.1)	21.3[a]	23 (5)
1 – Borderline intact	23.9 (4.3)	19.8[a]	23.4 (4.8)	27.3 (2.4)	18.7[a]	21 (6)
2 – Mild impairment	21.5 (4.2)	15.2[a]	17.1 (5.1)	23.8 (5.1)	19.6[a]	15 (7)
3 – Moderate impairment	19.1 (4.3)	13.5[a]	12.7 (5.3)	20.3 (7.9)	14[a]	14 (6)
4 – Moderate-severe impairment	n.a.	8.5[a]	5.8 (5.9)	16.6 (7.3)	19[a]	14 (8)
5 – Severe impairment	16.3 (5.5)	9.4[a]	3.4 (3.9)	15.7 (6.9)	9.3[a]	6 (6)
6 – Very severe impairment	6.0 (0.0)	5.9[a]	1.6 (3.5)	n.a.	2.9[a]	6 (8)

CPS: Cognitive Performance Scale; MMSE: mini-mental state examination; n.a.: not available; SD: standard deviation.

[a]The value of standard deviation is not available or extractable from the published figure.

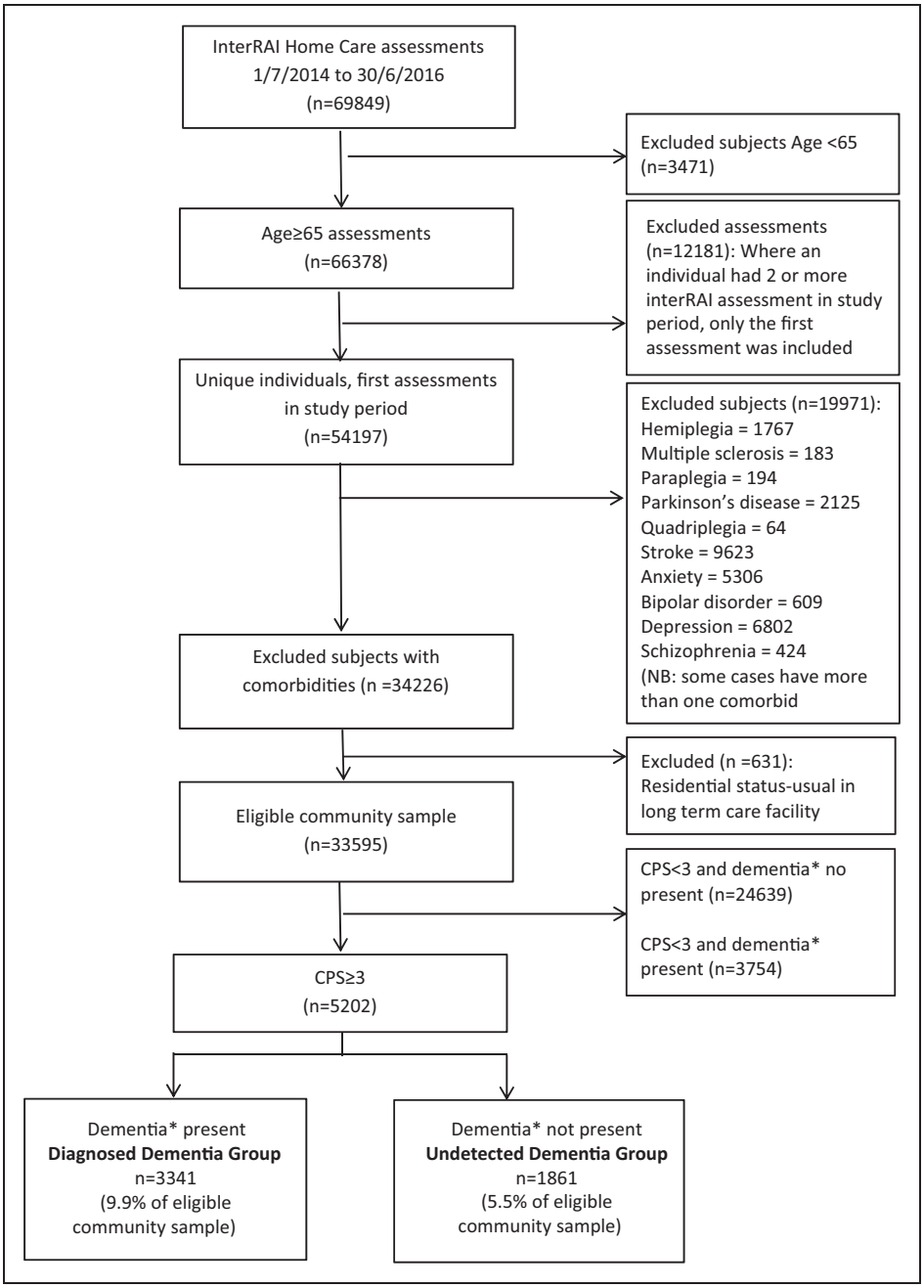

Figure 1. Flow chart of study subjects selection and grouping. *Dementia= Alzheimer's disease diagnosis or dementia other than Alzheimer's disease. CPS: Cognitive Performance Scale; interRAI: International Residential Assessment Instrument.

Other psychosocial variables:

- Participation in social activities of long-standing interest in the last 30 days This was originally coded as 0 = never, 1 = more than 30 days ago, 2 = 8–30 days ago, 3 = 4–7 days ago, 4 = In last three days; it was recoded as 'Yes' (original codes: 0,1) or 'No' (original codes: 2, 3, 4) (yes or no).
- Major life stressors (e.g. episode of severe personal illness, death or severe illness of close family member/friend, loss of home, major loss of income/assets, victim of a crime such as robbery, loss of driving license/car) in the last 90 days (yes or no).
- Limited access to home or rooms in home (e.g. difficulty entering or leaving home, unable to climb stairs, difficulty manoeuvring within rooms, no railings although needed) (yes or no).

Statistical analysis

The PASW statistics version 21 (SPSS, Chicago, IL) was used for data analysis. Bivariate analysis with chi-square test (for categorical variables) and Student's t-test (for continuous variables) were performed to evaluate the differences in individual characteristics between the diagnosed dementia group and possible undetected dementia group to identify significant variables.

A multiple logistic regression model was used to evaluate the association between sociodemographic characteristics with possible undetected dementia (binary outcome: possible undetected dementia versus diagnosed dementia). Only variables that showed a statistically significance ($p < 0.05$) between groups in the univariate analysis and that were not significantly correlated with each other (tetrachoric correlation analysis) were included in the model. For variables that were significantly strongly correlated ($r \geq 0.70$) only the variable with the smaller p-value in the univariate analysis was included in the model. All variables, except ethnicity, are dichotomous variables. For the purpose of performing a tetrachoric correlation analysis with other variables, ethnicity was dichotomous as 'European versus Non-European' and 'European versus Asian'. There was a small number of missing data for the variables included in the analyses and they were excluded from the final analysis.

Results

Bivariate analyses

Table 2 summarizes the sociodemographic characteristics across the two groups (diagnosed dementia, possible undetected dementia). The mean age for the possible undetected dementia group was significantly higher than the diagnosed dementia group (83.6 years, SD ± 7.7 versus 82.6 years, SD ± 7.0; $p = 0.000$). The mean CPS score in the diagnosed dementia group was significantly higher than the possible undetected dementia group (3.7, SD ± 1.0 versus 3.4, SD ± 0.8; $p = 0.000$). In regards to the ADL Hierarchy Scale the possible undetected dementia group had a significantly higher mean score compared to the diagnosed dementia group (2.2, SD ± 1.7 versus 1.8, SD ± 1.5; $p = 0.000$). Compared with the diagnosed dementia group, subjects in the possible undetected dementia group were less likely to be married or in a de facto relationship (37.6% versus 54.5%, $p = 0.000$) and more likely to be living alone (42.8% versus 26.4%, $p = 0.000$).

Table 2. Individual characteristics in the diagnosed dementia group and possible undetected dementia group.

Variables	Diagnosed dementia N = 3341 n (%)	Possible undetected dementia N = 1861 n (%)
Age*	82.6 (SD±7.0)	83.6 (SD±7.7)
CPS score*	3.7 (SD±1.0)	3.4 (SD±0.8)
ADL Hierarchy Scale*	1.8 (SD±1.5)	2.2 (SD±1.7)
Gender		
Male	1445 (43.3)	787 (42.3)
Female	1896 (56.7)	1074 (57.7)
Ethnicity[a],*		
European	2730 (81.7)	1568 (84.3)
Maori	282 (8.4)	122 (6.6)
Pacific people	205 (6.1)	87 (4.7)
Asian	90 (2.7)	72 (3.9)
Others	33 (1.0)	11 (0.6)
Marital status[b],*		
Married or de facto	1818 (54.5)	699 (37.6)
Not married or de facto	1520 (45.5)	1162 (62.4)
Living alone*		
Yes	882 (26.4)	796 (42.8)
No	2459 (73.6)	1065 (57.2)
Participated in social activities of long-standing interest in the last 30 days[c],*		
Yes	1528 (52.6)	678 (42.6)
No	1376 (47.4)	912 (57.4)
Experienced major life stressors in the last 90 days[4],*		
Yes	1175 (35.2)	966 (52.1)
No	2164 (64.8)	887 (47.9)
Limited access to home or rooms in home*		
Yes	197 (5.9)	160 (8.6)
No	3144 (98.4)	1701 (91.4)

ADL: Activities of Daily Living; CPS: Cognitive Performance Scale; SD: standard deviation; DDG: Dementia Diagnosed Group; UDG: Undetected Dementia Group

Mean and SD are shown for continuous variables. Proportions as percentages are shown for categorical variables. P values for group differences were calculated with Student's t-test for continuous variables and chi-square test for categorical variables.

[a]Missing data in the DDG and UDG = 1.

[b]Missing data in the DDG = 3.

[c]Missing data in the DDG = 473; UDG = 271.

[d]Missing data in the DDG = 2; UDG = 3.

*p value=<0.05.

Logistic regression

The variable marital status was not included in the model because it was highly correlated with the living alone variable (correlation coefficient = 0.86, p = 0.000). The results of the logistic regression with diagnosis status as the outcome variable are summarized in Table 3.

Table 3. Multiple logistic regression analysis predicting the probability of possible undetected dementia by sociodemographic variables.

Variable	Multiple logistic regression model OR (CI 95%)	P value
Age	1.01 (1.00–1.02)	0.000
Ethnicity		
European (ref)	1	0.012
Maori	0.99 (0.77–1.27)	
Pacific people	1.04 (0.78–1.38)	
Asian	1.91 (1.33–2.74)	
Others	0.78 (0.35–1.69)	
Living alone prior to admission		
Yes (versus no)	2.01(1.75–2.30)	0.000
Participation in social activities in the last 30 days		
No (versus yes)	1.37(1.20–1.56)	0.000
Major life stressors in the last 90 days		
Yes (versus no)	1.88(1.65–2.14)	0.000
Limited access to home or rooms in home		
Yes (versus no)	1.44 (1.13–1.84)	0.003

CI: confidence interval; OR: odds ratio.

Compared with the diagnosed dementia group, subjects in the possible undetected dementia group were significantly (i) less likely to have participated in social activities of long-standing interest in the last 30 days (42.6% versus 52.6%, $p = 0.000$), (ii) more likely to have experienced major life stressors in the last 90 days (52.1% versus 35.2% $p = 0.000$), and (iii) more likely to report limited access to home or rooms in home (8.6% versus 5.9%, $p = 0.000$). Ethnicity had a significant effect on the diagnosis of dementia ($p = 0.012$); Asian people has a greater risk of being in the possible undetected dementia group (OR = 1.91, CI = 1.33–2.74). Other factors that were significantly associated with possible undetected dementia are living alone (OR = 2.01, CI = 1.75–2.30), not participated in social activities of long-standing interest in the last 30 days (OR = 1.37, CI = 1.21–1.56), major life stressors in the last 90 days (OR = 1.88, CI = 1.65–2.14), and limited access to home or rooms in home (OR = 1.44, CI = 1.13–1.84). Although it was statistically significant, age was very weakly associated with undetected dementia with an OR of 1.01 (CI = 1.00–1.02).

Discussion

This study was aimed to identify the characteristics of individuals with possible undetected dementia who were assessed for home support services or residential care by using the routinely collected interRAI data in New Zealand. We found a lack of diagnosis was more common among those who were living alone, Asian, had limited social engagement, had experienced significant recent life events, had limited access to their home or parts of their home, and to a small degree among those who were older. Although statistically significant, the differences in the mean CPS and ADL Hierarchy Scale scores in the possible undetected dementia group and diagnosed dementia group are probably not clinically significant. The mean CPS score was 3.4 and 3.7 in the possible undetected dementia group and

diagnosed dementia group, respectively, representing moderate to moderately severe cognitive impairment. The mean ADL Hierarchy Scale score was 1.8 and 2.2 in the possible undetected dementia group and diagnosed dementia group, respectively (ADL Hierarchy Scale scores: 1 = independent but with some setup help; 2 = supervision but no direct hands-on support).

A number of previous international studies have found that cohabiting increases the likelihood that a dementia will be diagnosed (Alzheimer's Disease International, 2015; Bartfay, Bartfay, & Gorey, 2013; Wilkins et al., 2005, 2007). It is plausible that the higher rates of diagnosis for the individuals living with a partner reflect the likelihood that the partners are more likely to perceive changes in cognitive performance and encourage medical attention (Gibson & Richardson, 2017; Jitapunkul et al., 2009; Lehmann, Black, Shore, Kasper, & Rabins, 2010). In addition, it has been shown that primary care physicians were less likely to detect dementia in people living alone, perhaps because of the lack of collateral information (Lehmann et al., 2010).

There has been an increasing attention to the needs of people living alone with dementia in the literature. Previous studies have found people living alone with dementia may have difficulty accessing health and home care services (Lehmann et al., 2010). They were also less likely to receive diagnostic investigations such as neuroimaging and lumbar puncture or to be prescribed cholinesterase inhibitors and memantine (Cermakova et al., 2017). When clinicians working with older people living alone with dementia, de Witt and Ploeg (2016) emphasized the importance of building trusting person-centred relationships to support them to share decision-making, access services, and continue to live in their homes. It is important that community care clinicians are actively engaged in the early detection of dementia in people living alone and establishing support (Evans, Price, & Meyer, 2016).

The present study found Asian people were more likely to be in the possible undetected dementia group. Cultural factors and stigmatization can play a role in the under-diagnosis of dementia; and in certain cultures Alzheimer's disease and dementia are considered as part of the normal cognitive ageing process (Koehn, Garcia, Spence, Jarvis, & Drummond, 2012; Lian et al., 2017; Morhardt, Pereyra, & Iris, 2010). Older people of ethnic minorities may have more difficulties with accessing health services, health education, and following up their treatment (Morhardt et al., 2010). Language and communication barriers can be a barrier for some older Asian people in accessing services for memory problems (Giebel et al., 2015; Hinton, Franz, & Friend, 2004). Asian people are the third largest minority group (about 11%) in New Zealand (Minister of Statistics, 2013). However, national and regional efforts to achieve health care equity have tended to focus on Maori and Pacific people (Sheridan et al., 2011). A previous New Zealand report suggested that the lower rates of access to mental health services by Asian people are probably due to a lack of their inclusion in public health policy programmes (Metha, 2012). Koehn et al. (2012) investigated how older Chinese-Canadian negotiated the pathway from the point of initial symptom recognition by family or friends to formal dementia diagnosis seeking. They highlighted the importance of accessing information about dementia symptoms and psychosocial resources in their own language and community (Koehn et al., 2012).

We also found cognitively impaired older people who have not participated in social activities of interest in recent time or who had experienced recent significant life events were less likely to be diagnosed with dementia. People who have reduced their level of social participation may be less likely to have their cognitive impairment noticed by their peers and social network. There is limited literature suggesting that in some situations stressful life

events can be associated with increased cognitive decline (Peavy et al., 2012; Sundstrom, Ronnlund, Adolfsson, & Nilsson, 2014; Tschanz et al., 2013). The relevant question in the interRAI asks whether they have had a major stressor in the last 90 days such as an episode of severe personal illness, death or illness of a close family member friend, loss of home, major loss of income/assets, victim of crime such as robbery, loss of driver's license/car. A possible explanation is that older people who have undetected dementia do not have the necessary psychosocial support put in place as for people with a confirmed diagnosis of dementia, and they are therefore more susceptible to experience a life event as stressful.

In our study those who reported limited access to home or rooms in home (e.g. difficulty entering or leaving home, unable to climb stairs, difficulty manoeuvring within rooms, no railings although needed) had an increased risk of being in the possible undetected dementia group. The literature on this topic mainly reports on the relationship between home environment and people who already have a dementia diagnosis (Marquardt, Bueter, & Motzek, 2014). It is possible that lack of access is acting as a proxy for socioeconomic status – being aware of access issues but being unable to rectify them. Previous research suggests that low-income older people are more vulnerable to a lack of diagnosis for dementia (Wilkins et al., 2007). Financial barriers may be a barrier to seeking health professional advice. It is also possible that in some cases cognitively impaired older people are less likely to seek medical care and have their dementia diagnosed because they have physical difficulty leaving or entering the house.

In the present study age was only weakly associated with undetected dementia; an OR of 1.01 is unlikely to be of any clinical significance. The international literature on age and undetected dementia is mixed. For example, Wilkins et al. (2007) reported that the likelihood of not getting an appropriate dementia diagnosis increased with age. However, a meta-analysis on the prevalence and determinants of undetected dementia in the community found no association between older subjects and undetected dementia (Lang et al., 2017).

Strengths and limitations

There are some limitations that must be acknowledged. First, due to the cross-sectional nature of this study, the temporality of the phenomena cannot be taken into account for analysis. Second, interRAI assessment is designed to assess older people who require a comprehensive geriatric assessment to access home support or aged residential care; therefore, the results of this study cannot be generalized to the overall older population in New Zealand. Third, the dementia diagnosis was not independently verified by the research team. However, interRAI assessors used multiple sources of information to ascertain the presence of a diagnosis of dementia and previous research has found this interRAI item to be very consistent with medical records (Foebel et al., 2013). We also used a higher CPS cut-off score (≥ 3 instead of ≥ 2) to be certain about the presence of clinically significant cognitive impairment. Although CPS scores had a moderate to strong correlation to MMSE scores, CPS has not been validated specifically for dementia diagnosis. There could have been misclassification of dementia cases in the possible undetected dementia group. It is also possible that some of the cases classified as having possible undetected dementia might have cognitive impairment due to other reasons not necessarily dementia. We have attempted to address this issue by excluding subjects with cognitive impairment due to other potential secondary causes (e.g. depression, hypothyroidism, etc.). Unfortunately, cognitive decline (e.g. as measured by the change of CPS scores) is not assessed as part of

interRAI. We have therefore cautiously used the term 'possible undetected dementia' in this study. However, it is important to note that the rates of dementia in our sample are similar to the rates reported by studies in the general population (Rizzi, Rosset, & Roriz-Cruz, 2014). Fourth, we decided to exclude people with an existing neurological condition (e.g. stroke, Parkinson's disease) recorded on their interRAI assessment; some of them were likely to be under the care of a neurologist, geriatrician, general physician, or GP for their neurological condition. Other clinician and health services related factors could result in undiagnosed dementia. However, those in the undetected dementia group might be more likely being with undiagnosed stroke and Parkinson's disease as well. This possible unbalanced distribution could potentially result in non-differential misclassification. Future studies are needed to explore the specific individual risk factors associated with undetected dementia in these subgroups. Lastly, the level of education can play an important role in having an adequate diagnosis of dementia (Savva & Arthur, 2015); however, the interRAI does not routinely record this information and we were not able to determine the role of education in our study.

Conclusions

To our knowledge this is the first study in New Zealand to examine the sociodemographic risk factors associated with possible undetected dementia. Our study emphasizes the importance of conducting clinical assessments at a community level to understand the complex interactions of clinical and sociodemographic characteristics. Our results could help to identify the individual characteristics that play a role in the under-diagnosis of dementia in the local context and guide interventions to promote early diagnosis in vulnerable groups. In particular, community awareness and de-stigmatization campaign, psychoeducation, and cultural friendly dementia services have the potential to improve the journey of dementia diagnosis and post-diagnosis in older Asians; and GPs and community services providing care for older people living alone can be more vigilant in screening for cognitive impairment.

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