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The Knowledge of Caregivers About Care for People Living With Dementia and Its Associations in Nursing Homes and Home Care—A Quantitative Study

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ABSTRACT

Aim: This study is intended to generate insight into the knowledge possessed by formal caregivers in the Netherlands about care for people living with dementia. More specifically, it explores the association between the knowledge and characteristics of caregivers in nursing homes and home care. The formal caregivers included in this study served a variety of functions, primarily as nursing staff.

Design: A quantitative retrospective cohort study.

Methods: We analysed two datasets based on two Dementia Knowledge Monitors (DKMs): one for the nursing-home setting (DKM-NH; $n = 5807$) and one for the home-care setting (DKM-HC; $n = 532$). Total scores and subscale scores ranged from 0 to 100. Analyses were conducted at both the total level and the subscale level.

Results: On average, nursing-home caregivers scored 68.3 out of 100, as compared to 62.9 for home caregivers. Scores for nursing-home caregivers were associated with age, function, educational training, region and experience (working in a specialised dementia department, private experience and years of working in a nursing home). Scores for home caregivers were associated with function, age and the number of PwD for whom they had provided care.

Conclusion: Knowledge of dementia care leaves room for improvement for formal caregivers in all functions, in both nursing-home and home-care settings. Professional function, experience with dementia and previous extra training have a significant impact on a caregiver's level of knowledge concerning dementia care.

Public Contribution: Offering educational programmes to caregivers could increase dementia-care knowledge. Additionally, caregiver experience in caring for PwD could potentially be optimised through short internships, shadowing and staff retention. Future research should explore valid, effective and attractive educational programmes for the various functional groups, in addition to identifying strategies for accelerating the process of acquiring experience in care for people with dementia.

1 | Introduction

Dementia care is complex, given the need to focus on multiple aspects of emotional, physical, cognitive and behavioural well-being. In recent decades, the focus of healthcare for people living with dementia (PwD) has shifted from a medical model to a quality-of-life model, in which the highest priority is the well-being of the individual (World Health Organization 2013).

Personalised healthcare is thus essential, as the unique constellation of needs and problems varies for each older person (Kitwood 1998; Mohr et al. 2021). Personalised care is also required in order to prevent and manage challenging behaviour, which is of key importance in long-term care (James et al. 2020). In spite of comorbidity and cognitive decline, it is important to retain independence for as long as possible (Kaczynski et al. 2019; Subramaniam 2019; Kada et al. 2009). Involvement in, development of and implementation of innovations in care technology is key to promoting independence (Astell et al. 2019; Moyle 2019; Puaschitz et al. 2021). Over time, the progressive deterioration caused by dementia leads to changes in the needs of PwD, requiring carers to identify evolving needs and to provide the appropriate care at the right time. Furthermore, partnering with family members and volunteers is essential in dementia care, for example, to collaboratively develop a tailored activity plan and to support family members in moral issues concerning their participation in care (Hovenga et al. 2024; Kelley et al. 2019; Malmedal et al. 2020).

To meet the highly complex demands of care for PwD, the competencies of formal caregivers are extremely important, and building the knowledge and skills of staff to deliver evidence-based, culturally appropriate and human rights-oriented health and social care (Cahill 2020) is crucial. A variety of skills is needed in dementia care, including 'hard' skills, such as supporting activities of daily living (ADL), as well as—and equally important—'soft' skills, such as communication. Nurses themselves voice the need for knowledge as a prerequisite to offering high-quality care (Piirainen et al. 2021). Higher levels of caregiver knowledge are associated with a more positive attitude towards PwD (Evripidou et al. 2019; Cooper 2021; Hsiao et al. 2015) and a higher confidence level among caregivers (Evripidou et al. 2019). High levels of knowledge among caregivers are positively associated with how they treat people (Hsiao et al. 2015).

Therefore, the aim of this retrospective quantitative study is to generate insights into the knowledge that formal caregivers possess about caring for PwD in both nursing home and home-care settings in the Netherlands. The study also examines the association between the characteristics of caregivers and their knowledge of dementia care.

1.1 | Background

Three reviews assessed the knowledge of nurses about dementia care. In a systematic review on the knowledge possessed by nurses concerning dementia care, based on 19 studies, Evripidou et al. (2019) conclude that 'nurses lack knowledge, communication skills, management strategies and confidence in the provision of dementia care', which raises concerns about the quality of care for people with dementia (PwD). Of the 19 studies included in their review, however, only four concerned long-term care. This may have had a negative influence on the results, as more dementia care knowledge and expertise may be expected of long-term caregivers compared to what is expected of hospital staff. However, Zhao, Jones, et al. (2022) found in an integrative review based on 38 studies, focusing on healthcare professionals in general, that dementia knowledge ranged from low to moderate levels and that attitudes towards dementia care were generally negative. This led to stigma towards PwD, and family carers experienced stress due to insufficient support, expecting more assistance from community nurses. Yaghmour (2022) reported in their integrative review, which focused on nurses and was based on 72 studies, that most nurses possessed the basic knowledge of dementia. However, there were deficiencies in nurses' understanding of the disease spectrum from onset to end of life, a lack of knowledge about the specific safe use of certain pain management therapies and a lack of understanding of the disease process.

Noteworthy is the norm used to define a satisfactory level of dementia knowledge. Evripidou points out that of the 16 included quantitative studies, only two instruments were used more than once, with most questionnaires specifically designed for the purpose of each study. Spijker et al. (2022) examined which knowledge tests are available for nurses and care workers and traced eight instruments: KIDE, DKAT1, DKAT2, DKAS, ADKS, UJA Alzheimer's Care Scale, KASA and KDC-SAT, of which the DKAS had the best psychometric qualities. Still, the competencies required by nurses in dementia care and in which settings are still a matter of debate (Koskinen et al. 2015); at the national levels, nurses' competencies are often presented only at a general level and thus do not specifically address care for older people.

The nature of care in nursing-home settings differs from that in home-care settings, and the focus of dementia knowledge required in each setting also varies. For example, in home care, it is important to recognise and respond to signs of cognitive deterioration in the client or overburdening on the part of family members. In a nursing home, caregivers must be alert to and counter signs of social isolation on the part of residents. To build the required competencies, caregivers need at least sufficient actual knowledge regarding the care of PwD (SBB 2019). Both nursing-home and home-care settings are characterised by the variety of functions employed by nursing staff, which may encompass certified nurse assistants, as well as nursing aides and registered nurses. At present, little is known about the knowledge that caregivers in the Netherlands possess about dementia care, nor in nursing-home setting or home-care setting.

2 | Methods

2.1 | Design

A quantitative retrospective cohort study.

2.2 | Setting

In the Netherlands, nursing homes provide care to people with an official indication for constant supervision or care. In Dutch nursing homes, teams consist of client-support workers, nursing aides (EQF Level 2) (European Commission 2008), certified nursing assistants (CNAs) (similar to a licensed practical nurse in the American healthcare system, EQF Level 3), registered nurses (EQF Level 4–6), allied health professionals (EQF Level 6–7) and activity supervisors. Nursing-home facilities are often divided into somatic departments (for residents with primarily

TABLE 1A | Overview of subscales in DKM-nursing home/NH and DKM-home care/HC.

Subscale	DKM-NH_2017	Number of items	Subscale	DKM-HC_2018	Number of items
ss1	What is dementia? (Dementia from a physical perspective and multimorbidity)	8	ss1	What is dementia? (Dementia from a physical perspective and multimorbidity)	9
ss2	The person with dementia (Dementia from a personhood perspective)	6	ss2	The person with dementia (Dementia from a personhood perspective)	9
ss3	Communication (Skills in (non) verbal communication)	7	ss3	Communication (Skills in (non) verbal communication)	5
ss4	Approach (How to react in from psychosocial perspective)	9	ss4	Approach (How to react in from psychosocial perspective)	8
ss5	Person-centred care (To provide care based on individual's history and personality)	5	ss5	During nursing (To be alert on (physical) complications)	7
ss6	Challenging behaviour (How to react on and prevent challenging behaviour)	6	ss6	Family and informal caregiver (Care for family members affected by the impact of dementia)	8
ss7	Laws and regulations (Knowledge of Dutch regulations related to dementia)	5	ss7	Physical environment (Design of the house)	4
ss8	Family and informal caregivers (Care for family members affected by the impact of dementia)	6	ss8	Laws and regulations (Knowledge of Dutch regulations related to dementia)	6
ss9	Physical environment (Design of the unit and living room)	6			

physical impairments) and psychogeriatric departments (for residents with mainly cognitive impairments). Although people living with some degree of dementia can be found in both somatic and psychogeriatric departments, the dementia is generally more advanced in psychogeriatric departments.

In Dutch home care, teams consist mainly of CNAs (EQF Level 3) and registered nurses (EQF Level 4–6).

2.3 | Dementia Knowledge Monitor

The Dementia Knowledge Monitor (DKM) is a questionnaire containing multiple choice questions, developed as a formative testing method, with the intention of identifying areas of dementia-care knowledge in which improvements by respondents might be possible (Clark 2012). The objective of the DKM is to make caregivers more aware of their own knowledge of dementia care and to help them, through reflection, to progress from being unconsciously (in)competent in dementia care to being consciously (in)competent (Curtiss and Warren 1973). Therefore, the respondents receive feedback immediately after filling out their answers: the correct answers and advice on how to acquire more information about the topic. The care organisation receives a summary of the state of knowledge on an organisational level.

The DKM assesses the knowledge required to provide high-quality, person-centred daily dementia care to PwD. Therefore, the DKM investigates aspects of dementia care, such as communication, well-being and responses to challenging behaviour, in addition to aspects like epidemiology and risk factors (see Tables 1a and 1b; Ideon 2020a). It focuses on the knowledge of CNAs, as they are the largest professional group providing long-term dementia care in the Netherlands.

The DKM was developed through a consensus study using the Delphi method, conducted by an expert panel, mainly consisting of nurse practitioners. This panel determined the minimal knowledge that CNAs should possess about dementia care as a prerequisite for providing high-quality, person-centred dementia care in long-term care settings. The expert panel decided which topics and questions should be included, assessing the concept questions for relevance, content accuracy and clarity of language. To align with the language used by practice-educated CNAs, the questions were preferably formulated as 'mini cases'

TABLE 1B | Examples of question types and response categories.

DKM-NH, 2017 Subscale 4: Approach Item 31	Mr Severijn is displaying apathetic behaviour. He is not taking any initiatives, is not participating in activities and shows little emotion. What is the best course of action?[a] a. Find out what the reason is for his apathetic behaviour. b. Actively involve him in the daily routine and encourage him to express his emotions. c. Accept that he is displaying apathetic behaviour. Most appropriate answer is b.
DKM-HC, 2018 Subscale 3: Communication Item 21	People with dementia, like everyone else, have a need for stimuli. However, the processing of these stimuli does not always go well. What do you do? Choose the most appropriate answer.[a] a. Provide as few stimuli as possible because people with dementia become confused by stimuli. b. Be flexible in the number of stimuli offered and adapt to the residents. c. Offer as many stimuli as possible so that people are well activated. Most appropriate answer is b.

[a]The instruction for completing the questionnaire DKM is: 'Provide the most appropriate answer'.

of one or two sentences to reflect as closely as possible the situations they face in daily practice (see Table 1b). There were three Delphi rounds, and items were included if at least 80% of the panel members agreed on their relevance, content and formulation (Ideon 2020b, 2020c).

The DKM is updated every 3 years, using the same Delphi method to capture current scientific and best-practice knowledge. No norms were set because establishing cut-off scores is arbitrary (Ideon 2020b, 2020c); however, the DKM demonstrates content validity, as it is based on the consensus of an expert panel regarding the 'minimal knowledge CNAs should have'. Fewer correct answers relate to more topics where improvements could be made by respondents, which may be perceived as suboptimal.

There are two versions of the DKM: one for the nursing-home setting (DKM-NH) and one for the home-care setting (DKM-HC). Each version has been developed to capture the nature of care required in its particular care setting. For example, while the DKM-NH focuses more on involving family in daily care and contains a section on 'Family and informal caregivers', the DKM-HC focuses more on the early detection of overburdening on the part of informal caregivers. Each DKM was developed by experts from the relevant setting, comprising 8–11 experts.

In this quantitative retrospective cohort study, for the nursing-home setting, we used data from the DKM-NH_2017, which consists of 58 items divided into nine subscales. For the home-care setting we used data from the DKM-HC_2018, which consists of 56 items divided into eight subscales (Table 1a). The DKMs are multidimensional monitors, meaning that the subscales are not interrelated. All items have two or three nominal response options; item scores are 0 or 1, respectively indicating wrong and correct answer. The DKMs yield a total score and subscale scores, with a range of 0–100, with higher scores indicating higher levels of knowledge. The subscale score is calculated as the mean of the item scores in that subscale, multiplied by 100, thus allowing proper comparisons at the subscale level. The total score is calculated as the mean of all item scores multiplied by 100; total score is not calculated as the mean of the subscales as each item was perceived as just as important as the other and otherwise subscales with less items would gain relatively too much weight.

2.4 | Data Gathering

Data were examined of care staff members of care organisations in the long-term care who had assessed the knowledge of dementia care using the DKM-NH_2017 or the DKM-HC_2018 ($n = 30$). Care organisations voluntarily reached out to Ideon, expressing their interest in assessing all care staff, not just the CNAs; and they believed that entire staff should meet the same level of dementia-care knowledge as the CNAs.

The DKM was distributed to care organisations by Ideon, which thus gathered all data. The researcher (S.J.E.B.) extracted the data from the Ideon servers on 4 April 2021. We included all participants in the datasets up to that date. Nursing-home participants completed the DKM between January 2018 and April 2021, and home-care participants between November 2018 and May 2020. The researcher prepared the DKM-NH and DKM-HC datasets separately for analyses. This study includes data only from participants who completed the DKM.

Both datasets included the participant characteristics gender, age, private experience with dementia, professional function and years of experience. Professional function included client-support workers (e.g., welfare workers, receptionists, cooking personnel, cleaners), nursing aides, CNAs, nurses, allied health professionals and activity supervisors. The DKM-NH dataset included four additional characteristics: previous training on dementia, region, type of department and years of employment. The DKM-HC dataset also included previous experience in a nursing home and the number of PwD cared for on a weekly basis.

2.5 | Data Analysis

Descriptive statistics were determined using frequencies, mean, standard deviation (SD), median, range values and testing for normality (using IBM SPSS Statistics). Participant characteristics were tested for correlation with DKM scores in a univariate analysis. Because the scores were not normally distributed, a Mann–Whitney *U*-test was conducted for characteristics with two subgroups, and a Kruskal–Wallis *H*-test was conducted for characteristics with more than two subgroups, including

pairwise comparisons between each subgroup when a characteristic showed a significant correlation (defined as $p < 0.05$). Significance values were adjusted with Bonferroni correction to correct for multiple testing.

2.6 | Ethical Considerations

The datasets used were anonymous. By completing the DKM, participants implicitly consented to the use of their DKM scores for scientific purposes, as this was addressed in the privacy statement that was accessible during completion of the DKM. At the end of the DKM, Ideon asked participants to voluntarily answer questions on personal characteristics for scientific purposes. Participants who provided this information thus explicitly consented to the use of data regarding their characteristics.

3 | Results

3.1 | Nursing Home

The DKM-NH dataset consisted of 5807 unique participants from 30 care organisations. Participant characteristics are presented in Table 2. The majority of participants were female (93.5%) and had worked for their care organisations for 0–10 years (58.6%). Approximately half of the participants were between 46 and 60 years of age (46.4%), had received no previous training regarding dementia (51.9%), had no private experience with dementia (52.2%) and had worked as a CNA (52.6%).

The mean DKM-NH total score was 68.3 (SD 11.4) (Table 3). Participants scored highest on the subscale ss3 (Communication) (76.6) and lowest on the subscale ss9 (Physical environment) (63.4). The scores were not normally distributed, with a tendency towards higher scores.

3.1.1 | Participant Characteristics Associated With Level of Knowledge

In the total DKM-NH scores, seven of the nine participant characteristics were significantly related (see Table 4). Three characteristics—region, previous training on dementia and function—were also significantly related to all nine subscale scores. Participants from the Northern region scored significantly higher on the total score (71.7) and on all subscales (see Table S5) than did participants from the other regions (e.g., total score range 65.6–69.7). Moreover, participants who had received previous training on dementia scored significantly higher on the total score (recent: 70.5, longer than 2 years ago: 71.2) and on all subscales than did participants who had not received previous dementia training (e.g., total score 66.6). We found no significant difference between having received training more than 2 years ago or less than 2 years ago (Table S4). The scores of CNAs (e.g., total score 70.3) were significantly higher than those of client-support workers and nursing aides (e.g., total score 62.1 and 60.1 respectively) but lower on total score and eight subscales, as compared to nurses and allied health professionals (e.g., total

TABLE 2 | Participant characteristics; nursing home/NH ($n = 5807$, employed by 30 organisations) and home care/HC ($n = 532$, employed by six organisations).

Characteristic	DHM-NH, *n* (%)	DKM-HC, *n* (%)
Gender	$n = 3011$	$n = 316$
Female	2816 (93.5%)	310 (98.1%)
Male	195 (6.5%)	6 (1.9%)
Age	$n = 3328$	$n = 325$
0–30	636 (19.1%)	49 (15.1%)
31–45	787 (23.6%)	95 (29.2%)
46–60	1544 (46.4%)	164 (50.5%)
60+	361 (10.8%)	17 (5.2%)
Function	$n = 4834$	$n = 527$
Client-support workers	1171 (24.2%)	30 (5.7%)
Nursing aides	353 (7.3%)	2 (0.4%)
CNA	2549 (52.6%)	379 (71.9%)
Registered nurse	513 (10.6%)	109 (20.7%)
Allied health professional	146 (3.0%)	—
Activity supervisor	111 (2.3%)	7 (1.3%)
Specialty department	$n = 2029$	
Psychogeriatric department	1115 (55.0%)	
Somatic department	646 (31.8%)	
Other departments	268 (13.2%)	
Years of employment at current organisation	$n = 476$	
0–10	279 (58.6%)	
11–20	117 (24.6%)	
20+	80 (16.8%)	
Years of experience	In NH ($n = 2752$)	In HC ($n = 255$)
Shorter than 2 years	695 (25.3%)	53 (20.8%)
Between 2 and 5 years	504 (18.3%)	63 (24.7%)
Between 6 and 10 years	417 (15.2%)	77 (30.2%)
Between 11 and 15 years	323 (11.7%)	21 (8.2%)
Longer than 15 years	813 (29.5%)	41 (16.1%)
Experience in other setting		$n = 267$

(Continues)

TABLE 2 | (Continued)

Characteristic	DHM-NH, *n* (%)	DKM-HC, *n* (%)
Yes, in a psychogeriatric day care		22 (8.2%)
Yes, in a nursing home		61 (22.9%)
Yes, in a care home		145 (54.3%)
No		39 (14.6%)
Private experience with dementia	*n* = 3007	*n* = 317
No	1571 (52.2%)	164 (51.7%)
Yes	1436 (47.8%)	153 (48.3%)
Number of PwD		*n* = 307
0		23 (7.5%)
1–2		82 (26.7%)
3–5		89 (29.0%)
6 or more		113 (36.8%)
Training on dementia	*n* = 3005	
Yes, less than 2 years ago	819 (27.3%)	
Yes, 2 years ago or more	626 (20.8%)	
No	1560 (51.9%)	
Region in Netherlands	*n* = 5677	
North	1393 (24.5%)	
East	1493 (26.3%)	
South	1103 (19.4%)	
West	1688 (29.7%)	

score 75.2 and 80.3) (see Table S2). The scores of CNAs were similar to those of activity supervisors (e.g., total score 70.4).

Age was significantly related to the mean total score and eight subscale scores, albeit with no identifiable trend. Participants between 31 and 45 years of age scored highest on the total score and six of the subscales (see Table S1). The mean total score and six subscales were significantly related to years of experience in a nursing home: participants with more years of experience scored significantly higher (see Table S3).

Participants working in a somatic department scored significantly lower on average than did those working in a psychogeriatric ward on the total score (68.8 vs. 71.3), as well as on five subscales (Table 4). On average, participants with private experience in dementia care scored significantly higher on the total score and on two subscales—ss1 (What is dementia?) and ss2

TABLE 3 | DKM-nursing home/NH: total and subscale scores (*n* = 5807).

	Total	ss1	ss2	ss3	ss4	ss5	ss6	ss7	ss8	ss9
Mean (SD)	68.3 (11.4)	68.4 (17.7)	63.7 (21.2)	76.6 (17.9)	65.6 (19.2)	67.3 (20.7)	68.0 (20.2)	65.3 (20.6)	75.7 (18.8)	63.4 (21.7)
Minimum	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Median (interquartile range)	68.7 (62.1–75.9)	75.0 (62.5–75.0)	66.7 (50.0–83.3)	85.7 (71.4–85.7)	66.7 (55.6–77.8)	60.0 (60.0–80.0)	66.7 (50.0–83.3)	60.0 (60.0–80.0)	83.3 (66.7–83.3)	66.7 (50.0–83.3)
Normality (*p*)	0.067 (<0.001)	0.169 (<0.001)	0.168 (<0.001)	0.205 (<0.001)	0.138 (<0.001)	0.198 (<0.001)	0.163 (<0.001)	0.222 (<0.001)	0.217 (<0.001)	0.161 (<0.001)

TABLE 4 | DKM-nursing home/NH: correlations between participants' characteristics and total and subscale scores ($n = 5807$).

Characteristics (number)	Total score	ss1	ss2	ss3	ss4	ss5	ss6	ss7	ss8	ss9
Gender										
Female (2816)	68.6	68.8	63.8	76.5	65.7	67.6	68.2	65.8	76.4	63.9
Male (195)	68.3	67.6	64.6	74.2	65.8	68.0	66.8	67.0	78.8	61.6
p	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.640	1.000
Age										
0–30 (636)	67.1	68.8	64.0	75.1	64.9	67.2	64.0	64.0	75.8	58.5
31–45 (787)	69.4	70.0	65.3	75.9	67.1	68.5	69.1	67.9	77.9	62.1
46–60 (1544)	69.0	68.6	64.2	77.4	65.9	67.6	69.1	65.2	76.2	65.7
60+ (361)	65.4	64.0	58.0	74.7	61.7	63.1	66.4	63.5	72.3	64.8
p	<0.010	<0.010	<0.010	0.090	0.001	<0.010	<0.010	<0.010	<0.010	<0.010
Function										
Client-support workers (1171)	62.1	61.7	57.4	71.7	58.4	61.5	62.4	56.7	70.1	58.7
Nursing aide (353)	60.1	61.7	54.5	69.2	56.3	60.2	59.3	57.8	67.8	53.7
CNA (2539)	70.3	70.3	65.2	78.7	68.3	69.1	69.5	69.1	76.6	65.2
Registered nurse (513)	75.2	75.9	70.7	81.0	71.5	74.8	74.5	75.6	83.1	70.1
Allied health professional (147)	80.3	82.7	78.9	83.1	75.3	76.6	83.5	80.6	88.5	74.2
Activity supervisor (111)	70.4	66.8	65.0	79.8	69.5	71.9	71.8	60.9	79.7	66.8
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Specialty department										
Psychogeriatric department (1115)	71.3	71.0	67.8	79.7	67.6	70.9	70.2	71.1	77.5	66.5
Somatic department (646)	68.8	70.0	63.0	75.6	66.3	66.6	68.7	66.2	77.6	63.8
p	<0.001	0.229	<0.001	<0.001	0.147	<0.001	0.121	<0.001	0.876	0.006
Years of employment										
0–10 (279)	65.3	64.3	62.8	74.0	62.1	66.3	64.8	60.0	74.4	58.5
11–20 (117)	68.0	65.0	66.4	73.8	62.9	69.7	68.5	66.3	78.8	63.0
20+ (80)	67.7	67.5	66.3	74.8	63.3	68.5	66.3	63.8	76.0	62.9
p	0.730	1.000	1.000	1.000	1.000	1.000	1.000	0.340	1.000	0.880
Years of experience in nursing home										
<2 years (695)	65.9	66.8	61.9	74.7	63.1	64.1	64.9	61.2	75.5	59.9
2–5 years (504)	68.3	68.3	64.9	77.0	64.5	68.5	67.7	65.9	75.7	62.8
6–10 years (417)	69.2	69.2	63.8	76.5	66.0	68.6	69.0	67.7	76.2	65.4
11–15 years (323)	70.5	70.7	65.5	76.7	67.8	68.7	70.1	69.2	78.4	67.5
>15 years (813)	70.6	70.3	65.5	77.7	68.3	69.4	70.7	69.0	78.2	66.3

(Continues)

TABLE 4 | (Continued)

Characteristics (number)	Total score	ss1	ss2	ss3	ss4	ss5	ss6	ss7	ss8	ss9
p	<0.010	<0.010	0.060	0.880	<0.010	<0.010	<0.010	<0.010	0.190	<0.010
Private experience with dementia										
No (1571)	67.9	67.6	62.7	75.7	64.9	67.1	67.2	65.8	76.5	63.1
Yes (1436)	69.4	70.0	65.3	77.3	66.6	68.4	69.3	66.1	76.7	64.5
p	<0.010	<0.010	0.020	0.420	0.260	0.730	0.040	1.000	1.000	0.940
Training on dementia										
Yes, <2 years ago (819)	70.5	71.5	67.2	77.9	66.4	70.5	70.2	69.0	77.6	64.7
Yes, ≥2 years (626)	71.2	70.6	66.7	78.5	68.1	70.7	71.1	69.8	78.3	67.2
No (1560)	66.6	66.7	61.1	74.9	64.5	65.1	66.1	62.7	75.3	62.0
p	<0.001	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.001	<0.010	<0.010
Region in Netherlands										
North (1393)	71.7	71.6	67.2	80.2	70.2	69.8	71.7	68.1	78.0	67.2
East (1493)	69.7	69.0	64.8	77.5	66.5	69.4	70.2	66.6	76.8	66.1
South (1103)	66.3	66.6	63.1	75.4	62.7	66.4	65.3	62.6	74.0	60.6
West (1688)	65.6	66.4	60.3	73.4	63.0	64.2	64.8	63.7	73.8	59.6
p	<0.001	<0.010	<0.010	<0.001	<0.001	<0.010	<0.001	<0.010	<0.010	<0.001

Note: Significant *p*-values are underlined.
Abbreviation: CNA = certified nursing assistant.

(The person with dementia)—than did participants with no private experience (Table 4). We found no significant differences on the mean total score or subscale scores for the characteristics gender and years of employment.

3.2 | Home Care

The DKM-HC dataset consisted of 532 unique participants from six organisations. Participant characteristics are presented in Table 2. The majority of the participants were female (98.1%) and worked as CNAs (71.9%). Approximately half of the participants were between 46 and 59 years of age (50.3%), had private experience with dementia (48.3%) and had experience in a care home (54.3%). More than one-third (36.8%) of the participants cared for six or more PwD on a weekly basis.

The mean total score was 62.9 (SD = 9.4) (see Table 5). Mean scores on the eight subscales varied from 42.3 (ss8—Laws and regulations) to 79.6 (ss7—Physical environment).

3.2.1 | Participant Characteristics Associated With Level of Knowledge

Significant differences in the mean total score of the DKM-HC were found for three participant characteristics: function, age and number of PwD cared for per week (see Table 6). Function was related to the total score and to six of the eight subscales: the scores of CNAs were significantly higher than, for example, those of client-support workers (total score 62.5 vs. 49.8), but they were lower than those of nurses (total score of 62.5 vs. 67.5) (see Table S7). There were no significant differences in the scores of CNAs and those of nursing aides or activity supervisors.

Participants who cared for a greater number of PwD each week scored significantly higher on the mean total score and on one subscale (ss2—The person with dementia), as compared to participants who cared for fewer patients (see Table 6 and Table S8). We also found significant differences in terms of participant age, with older participants tending to have higher total scores. Participants in the age group 0–30 years scored approximately 4 points lower than did those in the age groups 31–45 and 46–59 years. The scores on the subscales reflected a similar trend, although only one subscale (ss8—Laws and regulations) showed a significant association (see Table S6).

We found no significant differences between mean scores for the subgroups gender, experience in a nursing home, private experience or years of experience in home care (see Table 6).

3.3 | Comparisons Between DKM-NH and DKM-HC

In both datasets, the majority of the participants were female (93.5%–98.1%); about half (46.4%–50.5%) were 46–59 years of age, and around half (47.8%–48.3%) had private experience

TABLE 5 | DKM-home car/HC: total and subscale scores ($n = 532$).

	Total	ss1	ss2	ss3	ss4	ss5	ss6	ss7	ss8
Mean (SD)	63.0 (9.4)	61.9 (15.5)	55.5 (18.7)	64.1 (20.5)	67.2 (17.8)	69.8 (16.5)	68.3 (14.9)	79.6 (21.1)	42.3 (20.8)
Minimum	28.6	22.2	11.1	0.0	12.5	14.3	0.0	0.0	0.0
Maximum	87.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Median (interquartile range)	62.5 (57.2–69.6)	66.7 (55.6–77.8)	55.6 (44.4–66.7)	60.0 (45.0–80.0)	75.0 (50.0–75.0)	71.4 (57.1–85.7)	75.0 (62.5–75.0)	75.0 (75.0–100.0)	33.3 (33.3–50.0)
Kolmogorov–Smirnov statistic (p)	0.058 (< 0.001)	0.154 (< 0.001)	0.136 (< 0.001)	0.191 (< 0.001)	0.174 (< 0.001)	0.186 (< 0.001)	0.217 (< 0.001)	0.257 (< 0.001)	0.173 (< 0.001)

with dementia. Both datasets revealed wide variations in participant scores. The average score for nursing-home participants was 68.3 (SD 11.4) and, for home-care participants, it was 62.3 (SD 9.4).

The DKM-NH and DKM-HC have five subscales in common, although the content of the items varies, as the content is customised to the setting. The average scores of nursing-home participants were higher than those of home-care participants on four mutual subscales: 'What is dementia?' (ss1/ss1), 'The person with dementia' (ss2/ss2), 'Communication' (ss3/ss3) and 'Family and informal caregivers' (ss8/ss6). In contrast, home-care participants scored higher on the subscale 'Physical environment' (ss9/ss7).

Age and function were significantly associated with the total scores and some of the subscale scores in both datasets. Gender had no significant association with the scores in both datasets. No other characteristic had a similar association with the scores in both datasets.

4 | Discussion

The objective of this study was to provide insight into the knowledge possessed by caregivers in the Netherlands regarding dementia care for PwD and, more specifically, into the relationship between the knowledge and characteristics of caregivers. The average score of CNAs in nursing homes on the DKM-NH was 68.3 (out of 100) and, for CNAs in home care, it was 62.9 (out of 100); indicating suboptimal knowledge and plenty of room for improvement, since the DKM is developed on the basic level of knowledge a CNA should have. Scores for nursing-home caregivers were associated with age, function, educational training, region and experience with dementia. Scores for home caregivers were associated with function, age and the number of PwD for whom they had provided care.

4.1 | Dementia Knowledge of Caregivers

The average score of nursing-home caregivers on the DKM-NH was 68.3 (out of 100) and, for home caregivers, it was 62.9 (out of 100). The DKMs reflect the knowledge that CNAs must have in order to provide individual, person-centred daily dementia care with a focus on communication, well-being and preventing and responding to challenging behaviour. Ideally, therefore, caregiver scores on the DKMs should be high. The relatively low scores in our study—70.3 for CNAs working in nursing homes and 62.5 for CNAs working in home care—suggest that improvements in knowledge of dementia care are needed in both settings. Earlier studies have also reported low to moderate levels of dementia-care knowledge among caregivers (see e.g., Evripidou et al. 2019; Zhao, Moyle, et al. 2022).

As mentioned previously, nursing-home caregivers also scored higher than home caregivers on several of the mutual subscales. This difference might be due to slight differences between the DKM-NH and the DKM-HC. Although both versions have the same structure, were developed by expert panels and focus on CNAs, the content of their items and subscales

TABLE 6 | DKM-home care/HC: correlations between participants' characteristics and total and subscale scores ($n = 532$).

Characteristics (number)	Total score	ss1	ss2	ss3	ss4	ss5	ss6	ss7	ss8
Gender									
Female (310)	63.7	62.9	56.3	63.3	68.9	69.8	69.2	80.5	43.5
Male (6)	62.8	63.0	53.7	66.7	66.7	69.1	60.4	83.3	50.0
p	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Age									
0–30 (49)	59.6	58.7	52.2	58.8	62.3	67.1	70.2	73.5	37.1
31–45 (95)	64.4	63.6	54.9	59.8	71.8	72.3	70.1	80.5	45.8
46–59 (164)	64.0	64.2	57.4	66.0	68.6	68.9	67.7	82.6	42.8
≥ 60 (17)	65.1	55.6	57.5	71.8	69.1	70.6	67.7	85.3	56.9
p	0.035	0.315	1.000	0.182	0.140	0.938	1.000	0.469	0.042
Function									
Client-support workers (30)	49.8	56.3	40.0	54.0	46.3	54.3	57.1	70.8	27.2
Nursing aides (2)	59.8	61.1	27.8	80.0	68.8	57.1	68.8	100.0	41.7
CNA (379)	62.5	60.7	54.7	64.9	67.1	70.6	67.6	79.5	40.9
Registered nurse (109)	67.9	67.4	62.1	64.2	73.1	72.0	73.9	82.8	51.1
Activity supervisor (7)	60.5	63.5	58.7	57.1	64.3	61.2	66.1	71.4	40.5
p	< 0.007	< 0.007	< 0.007	0.546	< 0.007	< 0.007	< 0.007	0.091	< 0.007
Years of experience in home care									
< 2 years (53)	64.1	62.7	55.8	63.0	68.9	71.4	70.3	83.0	43.7
2–5 years (63)	64.2	64.0	57.9	66.4	67.9	68.3	70.0	79.8	44.7
6–10 years (77)	64.1	62.3	58.4	63.1	70.8	71.6	67.5	77.6	44.4
11–15 years (21)	65.9	64.0	51.9	68.6	76.8	69.4	72.6	85.7	46.8
> 15 years (41)	63.9	63.1	52.9	62.9	69.8	71.1	68.9	84.8	45.1
p	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Private experience									
No (164)	63.3	61.5	55.0	64.8	69.9	70.0	68.1	79.9	42.9
Yes (153)	64.0	64.5	57.5	61.7	67.5	69.3	69.9	81.4	44.6
p	1.000	0.399	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Experience in other setting									
Yes, in a psychogeriatric day care (22)	66.0	66.2	62.1	66.4	71.6	70.1	67.6	84.1	44.7
Yes, in a nursing home (61)	64.5	63.8	57.4	65.3	70.5	67.7	70.5	81.2	45.1
Yes, in a care home (145)	62.6	61.5	53.9	61.4	67.9	70.0	68.6	79.5	43.6
No (39)	62.0	65.2	54.1	61.0	65.7	67.4	68.9	75.6	40.2
p	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Number of PwD in care									
0 (23)	58.6	57.5	50.2	58.3	63.6	60.3	66.3	80.4	39.9
1–2 (82)	61.6	59.8	52.6	62.2	67.5	68.3	68.0	79.3	41.1

(Continues)

TABLE 6 | (Continued)

Characteristics (number)	Total score	ss1	ss2	ss3	ss4	ss5	ss6	ss7	ss8
3–5 (89)	63.5	64.2	55.1	63.2	69.8	69.8	69.4	77.8	42.1
6 or more (113)	66.2	65.7	61.4	65.0	70.0	72.7	69.5	83.2	47.2
p	<u>< 0.007</u>	0.161	<u>0.042</u>	1.000	1.000	0.084	1.000	1.000	1.000

Note: Significant *p*-values are underlined.
Abbreviation: CNA = certified nursing assistant.

differs according to the specific dementia-care knowledge required in each of the particular care settings. It is interesting to note that the differences we found in scores are corroborated by those reported by Attard et al. (2020), which reveal an association between the profession of nursing-home nurse and a higher level of knowledge, as compared to nurses in other settings (Attard et al. 2020).

4.2 | Associations With Participant Characteristics

Three characteristics of participants stood out in their association with a higher level of dementia knowledge: professional function, experience and previous training. First, we found a significant association between professional function and dementia knowledge in both the nursing-home and home-care settings, with higher functions being associated with higher knowledge scores. The clinical relevance was substantial: nursing aides in the nursing-home setting scored 60.1 out of 100, as compared to allied health professionals 80.3. This finding is in line with those of several previous studies, as highlighted in Evripidou et al. (2019). The level of prior education could potentially explain the influence of the professional function, as many studies have indicated that previous education predicts dementia knowledge scores (Blaser and Berset 2018; Dai et al. 2020; Evripidou et al. 2019; Nakanishi and Miyamoto 2016; Zhao, Jones, et al. 2022; Zhao, Moyle, et al. 2022).

Second, participants with more experience in dementia care demonstrated a higher level of knowledge. Participants in the nursing-home setting scored significantly higher when they had private experience with dementia and more years of experience working in the nursing-home setting and in a psychogeriatric department (as compared to working in a somatic department). Previous studies have also reported a positive relationship between experience and knowledge (Blaser and Berset 2018; Evripidou et al. 2019; Jakobsen and Sørlie 2016; Nakanishi and Miyamoto 2016; Parveen et al. 2021; Zhao, Jones, et al. 2022). More specifically, the review by Zhao, Jones, et al. (2022) and a study by Attard et al. (2020) indicate that there is an association between working in a dementia-specific unit and a higher level of knowledge. This could possibly explain why we found no associations between knowledge scores and years of experience working in the care sector in general: it is experience in dementia care that predicts the knowledge score. In the home-care setting, however, the only significant differences we found were with more experience in dementia care due to having cared for a greater number of PwD, but there was no significant difference due to private experience, number of years working in the homecare setting or previous experience in nursing-home care. We assume that, in home care, experience with dementia care is built primarily through the number of PwD one has cared for. If this is the case, even if one has worked in home care for a number of years but has had little experience caring for PwD during that time, it would be difficult to maintain the same level of dementia knowledge.

Third, nursing-home caregivers who had received training on dementia showed significantly higher scores, indicating the positive influence of training courses on knowledge. Unfortunately, we had no data retrieved on this subject for home caregivers. This finding is in line with the results of two reviews (Evripidou et al. 2019; Zhao, Jones, et al. 2022) and two studies (Dai et al. 2020; Keogh et al. 2020). We nevertheless found no significant differences in care knowledge between caregivers who had received training more than 2 years ago and those who had received such training less than 2 years ago. This result might indicate that nursing-home caregivers are able to retain the knowledge for longer than 2 years. This is in contrast with a clinical trial, in which Cristancho-Lacroix et al. (2015) demonstrate that knowledge after dementia training improved for only up to 3 months. Interestingly, we performed an additional sub-analysis, which showed that 67% of allied health professionals and only 40% of nursing aides had attended training programmes after commencing employment. This might explain at least part of the aforementioned differences in knowledge related to function, with lower professional functions being prone to receive less training.

We close with two discussion points. First, although we found significant associations with the age of participants, we could not identify any clear trend. This is in contrast to existing literature, which mentions that older caregivers have significantly higher levels of dementia knowledge (Parveen et al. 2021; Zhao, Jones, et al. 2022). Finally, we found that nursing-home participants from the Northern region of the Netherlands scored significantly higher than did those from other regions. We included this characteristic, as previous findings from an unpublished study suggested this phenomenon. This might be related to the level of urbanisation, as was examined in a study from Hsiao et al. (2015).

4.3 | Strengths and Limitations

The extensive scope of the two datasets in terms of both the number and the characteristics is a key strength of this study. Not all characteristics were included in both datasets, however, and some issues are therefore open for more research—for example, whether an association with geographical region can also be found within the home-care setting. Another 'black-box' characteristic is training, which may have varied from an hour-long clinical lesson to official external dementia courses of much longer duration. Finally, the number of participants in

subgroups varied substantially, and the consequences of this uncertainty for the computed associations are unclear. We found no indications of selection bias, either in the organisations or among the respondents; both proactive and reactive organisations participated, and the impression was that the response rate stemmed mainly from the managers' commitment and efforts.

4.4 | Implications for Future Research and Practice

With mean scores of around 65 out of 100, the participants' level of dementia-care knowledge leaves substantial room for improvement. This applies to all professional functions within the nursing-home setting and even more within the home-care setting. It is especially important for CNAs, nursing aides and client-support workers. We see two main strategies for influencing and increasing dementia-care knowledge: providing more training opportunities and enhancing experience with dementia experience.

First, in our study, only 48% of the caregivers had received some training after commencing employment, even though 75% had worked in the sector for more than 2 years, with 40% having more than 11 years of experience. As training significantly improves knowledge, care organisations could offer more training programmes, which could substantially raise the level of dementia-care knowledge (Hirt and Beer 2020; Perkins et al. 2022; Pleasant et al. 2020). This potential is reported in a study by Evripidou et al. (2019), as well as in more recent studies exploring different types of educational dementia-care programmes, including open online courses (Eccleston et al. 2019), simulation teaching strategy (Kimzey et al. 2021), YouTube (Nguyen et al. 2020) and interventions based on virtual and augmented reality (Jones et al. 2021). Additional efforts to educate caregivers should focus on nursing aides and CNAs, as they apparently receive less training than those in other professional functions. Additional training programmes are of utmost importance when considering the future, as there is a forecasted decrease in the number of carers who have received initial nursing education in dementia care. We recommend more research on the validity and effectiveness of a variety of teaching strategies to increase dementia-care knowledge. Collaboration between care organisations, educational institutes and universities is needed in order to ensure the inclusion of the most recent evidence, for example, training-on-the-job seems promising (Kim et al. 2023).

Second, experience with dementia care correlates with higher knowledge scores, as found in numerous studies.

Therefore, it is important to deliberately enhance caregivers' experience; however, the literature is scarce, and the dementia programmes aimed at enhancing nursing staff's experience seem to be in the early stages. Yet, various opportunities do seem to be available, including internal traineeships on specific psychogeriatric wards, external traineeships in specialised care centres, shadowing experts and job rotations. The retention of experienced caregivers is obviously also highly important in this situation. The knowledge and competencies of dementia caregivers are not easily supplemented. Future research should focus on various ways of gaining dementia experience and their effectiveness. Finally, as previously mentioned, the association between the level of dementia-care knowledge and regional factors should be investigated, described and explained more extensively.

5 | Conclusion

The results of this study indicate that improving the level of knowledge about dementia care is necessary for all nursing functions in both the nursing-home and the home-care setting. Training has a significant impact on the level of dementia-care knowledge, and this offers care organisations a possible route towards improving the knowledge of their formal caregivers. We also found an association between experience with dementia and better scores on the DKM. This connection could be optimised by internships, shadowing and the retention of experienced staff. Research is necessary to explore valid and attractive educational programmes for the various function groups and to identify strategies for accelerating the process of becoming experienced in caring for PwD and retaining experienced nursing staff.

Author Contributions

Sabien Johanna Everdina Bosman: conducted the study and wrote the paper. Marlijn Abbink and Marleen Lovink: responsible for methodology and assessed concepts of the paper. Anke Persoon: responsible for methodology, supervision of the study and feedback on paper.

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Conflicts of Interest

Marlijn Abbink is the owner and director of the company Ideon, which issues the Dementia Knowledge Monitors. Ideon is a learning and development company in the field of elder care, providing a range of services, including Knowledge Monitors and training courses. Anke Persoon conducted the previous consensus studies. There are no conflicts of interest for the other authors.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.