EXTRA Dementia and Geriatric Cognitive Disorders

Dement Geriatr Cogn Disord Extra 2017;7:109–121
DOI: 10.1159/000468923
Published online: April 7, 2017

Original Research Article

Associations between Pain and Quality of Life in Severe Dementia: A Norwegian Cross-Sectional Study

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Keywords
Age 80 years and over · Dementia · Mediation analysis · Nursing home · Pain · Quality of life

Abstract
Background/Aims: Many variables influence the quality of life in older adults with dementia. We aim to quantify how the relationship between pain and quality of life in nursing home residents with severe dementia can be explained by neuropsychiatric symptoms, depressive symptoms, and activities of daily living. ***Methods:*** This article presents cross-sectional baseline data from a cluster randomised controlled trial. ***Results:*** The total and direct effects of pain on quality of life were statistically significant. Both neuropsychiatric and depressive symptoms partially mediated the relationship between pain and quality of life. Activities of daily living acted as a mediator only when modelled together with depressive symptoms. ***Conclusion:*** Pain, neuropsychiatric symptoms, and depressive symptoms appear to be important factors that influence the quality of life for nursing home residents with severe dementia. Therefore, multidimensional interventions may be beneficial for maintaining or improving quality of life in this population.

Introduction

In 2010, an estimated 35.6 million people worldwide were affected by dementia, and this number is expected to almost double every 20 years as the population ages [1]. Studies based on the Norwegian nursing homes (NHs) have shown that the proportion of residents affected by dementia was as high as 80% [2, 3]. Dementia has severe consequences for those affected

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DOI: 10.1159/000468923

as well as for their families and carers. In addition, dementia is an expensive health care issue, especially in the last years of a person's life [4]. Considering that dementia has no cure, it is imperative to maintain or enhance the quality of life (QoL) for persons with dementia. However, determining what constitutes QoL from the perspective of a person with dementia is challenging, especially in the later stages of this disease [5, 6]. According to Lawton [7], in persons with dementia, QoL includes the ability to perform activities of daily living (ADL), engaging in social behaviour, balanced positive emotions, and an absence of negative emotions. However, there is no clear understanding of how insights into concepts such as QoL change as dementia progresses [8]. Thus, formal assessments of QoL indicators are necessary to emphasise that QoL is as relevant to people with dementia as it is to the general population [9]. Previous studies have shown that many variables are associated with QoL in NH residents with dementia [10–12], which contributes to the complexity of dementia care. Studies of the relationship between QoL and neuropsychiatric symptoms (NPS) have shown that an increasing occurrence of NPS, especially depression and anxiety, is associated with reduced QoL [10–14]. In addition to NPS, several studies have investigated the association between QoL and impaired ADL in this population, but with inconsistent findings. Some found a statistically significant association between QoL and ADL [10–12], whereas a systematic review concluded that there is no convincing evidence for an association between QoL and activity limitation [13].

Pain is a common problem among older adults, and it is estimated that ≥50% of NH residents with dementia experience pain on a regular basis [15–18]. Despite over a decade of research into this subject, pain is still assessed and treated inadequately in this population [17, 19]. This is a pressing ethical and professional concern because uncontrolled pain has a major impact on the individual, as well as affecting the management of health care and costs, and thus it has a great societal impact [20]. In general, pain impacts emotional, social, and physical functioning [21], and there is evidence of a significant association between pain and QoL in middle-aged cohorts. However, less is known about the relationship between pain and QoL in older adults [22]. In older adults with dementia, pain is associated with a higher occurrence of NPS, such as agitation, aggression, and depression [23–28], and it also affects ADL and care activities [29, 30]. However, it is important to note that the evidence for these associations is not strong [31]. The relatively small number of studies of the association between pain and QoL in NH residents with dementia found that pain affected QoL to varying degrees [12, 32–35]. However, we do not know how pain exerts its effect on QoL in this population. Furthermore, as reviewed above, both pain and QoL are in themselves associated with NPS (including depressive symptoms) and ADL in NH residents with dementia. Yet, the focus of previous research has primarily been on the impact of selected variables and not on possible mediation patterns.

In the present study, our objective was to explore whether the relationship between pain and QoL in NH residents with severe dementia is mediated by NPS, depressive symptoms, and/or ADL. Thus, we investigated the mediating effect of NPS, depressive symptoms, and ADL on the relationship between pain and QoL among older adults with severe dementia.

Subjects and Methods

Study Design

This study used cross-sectional data obtained from a single-blinded, parallel, cluster randomised controlled trial conducted in Norwegian NHs between March 2015 and June 2016 (ClinicalTrials.gov: NCT02945865).

Participant Involvement

No patients were able to take part in formulating the research question, designing, or conducting the research. Registered nurses (RNs) from NHs not participating in the study provided feedback on the tolerance and acceptance of the data collection procedure and informed the choice of which measurement tools to use by providing their experience and preferences. The RNs also provided valuable feedback on the feasibility of the study's inclusion/exclusion criteria.

Sample

A total of 112 inpatients from 16 NHs were included. Eligible residents were identified in a 2-step process:

- *Step 1.* RNs in the NHs included residents according to the following criteria: (1) aged 65 years or older; (2) diagnosis of dementia in the medical records; and (3) lacking the capacity for self-reporting or being non-verbal, which is a clinical feature of advanced dementia [36].
- *Step 2. The* first author further assessed the residents recruited from step 1 in terms of whether they fulfilled 1 or more of the following criteria: clinically significant (1) pain, (2) agitation, or (3) NPS at the study's baseline. Clinically significant pain was defined as a score ≥5 on the Doloplus-2 pain scale [37]. A score ≥39 on the Cohen-Mansfield Agitation Inventory (CMAI) [38, 39] indicated significant agitation, and NPS were defined as a score ≥4 on a single item (frequency × severity) of the Neuropsychiatric Inventory, Nursing Home Version (NPI-NH) [3]. The CMAI was only used in the eligibility assessment, not in further analysis for this paper.

The RNs identified 121 eligible patients in step 1; none of the residents were excluded in step 2. Of the 121 eligible residents identified in steps 1 and 2, 9 residents were excluded (1 resident died, 2 residents were withdrawn by RNs, and 1 NH with 6 residents withdrew their participation). Residents with a short-term stay admission (<4 weeks) were not eligible for participation. The RNs performed the recruiting procedure so no information was available about those who declined to participate.

Data Collection

An RN at the NH collected the demographic data, medical diagnoses, and details on the prescribed medications from the residents' medical records using standardised forms. Trained RNs collected the data on pain, depressive symptoms, ADL, and QoL using validated assessment tools. The investigator (first author) administered the NPI-NH in standardised interviews with the RNs to collect data about NPS, and the investigator was on site and available for questions when the RNs collected the data.

Measures

Pain. Doloplus-2 is a pain assessment tool based on observations of behaviour in older adults with cognitive impairment [37, 40]. The scale comprises 10 items grouped into 3 dimensions: somatic, psychomotor, and psychosocial reactions to pain. Each item in the 3 dimensions is scored from 0 to 3, where 0 indicates that the behaviour considered is "as usual" or "absent," whereas 3 is the highest score for the behaviour. The total score ranges from 0 to 30, where a score ≥5 indicates pain [37]. The Norwegian version of Doloplus-2 has been tested in Norwegian NH populations [32, 40, 41]. Cronbach's α for our study was 0.78. A cut-off value of ≥5 was used in the analyses.

Neuropsychiatric Symptoms. The NPI-NH was used to assess the occurrence, frequency, and severity of behavioural and NPS. Using scripted questions, the caregivers answered whether the resident exhibited a specific behaviour or not. If "present," the caregiver was

asked to rate the frequency (1 = rarely, i.e., less than once per week; 2 = sometimes, i.e., about once per week; 3 = often, i.e., several times per week but less than every day; or 4 = very often, i.e., once or more per day/essentially present continuously) and severity (1 = mild; 2 = moderate; and 3 = serious). For each of the behavioural domains, a total domain score was calculated by multiplying the frequency and severity (F × S). The total NPI-NH score, ranging from 0 to 120, was calculated by summing up all of the first 10 domain scores. If neurovegetative symptoms are not of particular importance, the tool's developer recommends excluding the domain scores "Sleep and night-time behaviour disorders" and "Appetite and eating changes" from the total NPI-NH score [42]. The Norwegian version of the NPI-NH is valid and reliable [43]. Cronbach's α for this study was 0.50 with 10 items. The NPI-NH has been suggested for both clinical and research use by the Norwegian National Advisory Unit on Ageing and Health, and it is a frequently used tool for assessing NPS in Norwegian NHs. Due to the low internal consistency in our study, confirmatory factor analysis of the NPI-NH was conducted to determine whether our data had the same structure as the 3- or 4-factor solutions proposed by Selbæk and Engedal [44]. Our data did not have an acceptable fit, or any other factor solution. Thus, we treated the NPI-NH scale as unidimensional, and the total score was used in the analyses.

Depressive Symptoms. The Cornell Scale for Depression in Dementia is used to assess signs and symptoms of depression in older adults with moderate-to-severe dementia [45]. Each patient's primary care provider at the NH (an RN or nurse assistant) was interviewed by an RN based on the 19 items of the scale, where each was scored as: 0 = absent; 1 = mild or intermittent; 2 = severe; or "a" = unable to evaluate. The item scores were added together to obtain a total score, where a score of ≤6 indicated the absence of depressive symptoms. A score of 7–11 indicated a possible mild depressive episode, and a score ≥12 suggested a moderate-to-major depressive episode [46]. The Norwegian version is valid and reliable [47]. In our study, Cronbach's α was 0.85.

Activities of Daily Living. The Physical Self-Maintenance Scale comprises 2 scales: Performance ADL (PADL) and Instrumental ADL [48]. We used the 6 PADL items toileting, feeding, dressing, grooming, physical ambulation, and bathing. There were 6 possible options with associated scores (from 0 = not applicable and 1 = total independence to 5 = total dependency) for each item to describe the person's level of functioning. Higher scores indicated lower levels of functioning. In the current study, the single item scores were added together to obtain a summed score, and we used a cut-off score ≥18 (a score ≥3 on the single items) to indicate moderate-to-high dependency. The Norwegian version of the scale has been used in large NH studies in Norway [3, 47, 49]. Cronbach's α for this study was 0.77.

Quality of Life. The Quality of Life in Late-Stage Dementia (QUALID) scale has 11 items [50]. A proxy who observed a resident's behaviour during the previous week assessed the frequency of each item on a 5-point scale, which ranged from "never/seldom" to "most of the day." The total score ranged from 11 to 55, where lower scores denoted higher QoL [50]. There is no established cut-off for indicating high/low QoL on this scale. The QUALID scale has been translated into Norwegian and shown to be both valid and reliable [51]. In the present study, the internal consistency was α = 0.81. A continuous score was used in the analyses.

Ethics

Given the severity of cognitive impairment in the participating residents, written consent was obtained from the residents' next of kin before the residents were included in the study. If the RNs considered that study participation might be a burden for the resident, the resident was withdrawn from the study. The Regional Ethics Committee approved the procedure of this study (Ref. No. 2014/1431; REC South East, Norway).

Table 1. Bivariate correlation between the study variables

	Pain	NPS	Depressive symptoms	ADL
Pain				
NPS	**0.36*** **			
Depressive symptoms	**0.37** **	**0.43*** **		
ADL	**0.29***	0.17	0.05	
QoL	**0.52*** **	**0.60*** **	**0.57*** **	**0.33*** **

Bold type signifies significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. NPS, neuropsychiatric symptoms; ADL, activities of daily living; QoL, quality of life.

Data Analyses

We used baseline data from a cluster randomised trial for the analysis presented in this study. Therefore, we tested whether the groups were balanced at baseline using the Mann-Whitney U test for continuous variables and the χ^2 test for categorical variables. There were no statistically significant differences between the clusters, so the data were further treated as 1 sample.

Spearman's rank test was used to test for correlations between the independent and the mediator variables. The mediation analyses were performed as described by Hayes [52], using the PROCESS macro. PROCESS is based on ordinary least-squares regression [52], and it was used to estimate: (1) the total effect of pain on QoL (c); (2) the direct effect of pain on QoL (c'); and (3) the specific indirect effects through mediator NPS (model 1) or depressive symptoms (model 2) only, and mediator ADL only ($a_i b_i$). Unstandardised coefficients are presented in the figures and tables [53]. Age and sex were included as covariates in the model. Confidence intervals for the indirect effects were constructed using a bias-corrected bootstrap method [53] with 10,000 bootstrap samples. This study was exploratory, so multiple testing adjustments were not performed.

All of the statistical analyses were conducted using SPSS Statistics (version 22; IBM Corp., Armonk, NY, USA).

Multiple Mediation Models

Mediation analysis helps to explain the mechanisms that underlie an observed relationship between independent and dependent variables [53]. Hayes presented 2 types of multiple mediator models: the serial and the parallel model. In the serial model, one of the mediators causes/affects the other mediator. By contrast, in the parallel model, the mediators are not causally related to one another.

We tested 2 mediation models to explore the relationship between pain and QoL. Two different models were tested, because we hypothesised that NPS and depressive symptoms may affect the association between pain and QoL in different ways, and explain different amounts of the variance in QoL. Because NPS are composed of varying syndromes, we hypothesised that this variable would operate in a different way compared to a more delineated syndrome like depression. In model 1, we tested whether the relationship between pain and QoL was mediated by NPS and ADL, and in model 2 we tested depressive symptoms and ADL as mediators.

Preliminary Analyses

The bivariate correlation analysis showed statistically significant correlations between pain and NPS, depressive symptoms, ADL, and QoL (Table 1). "Depressive symptoms" is one

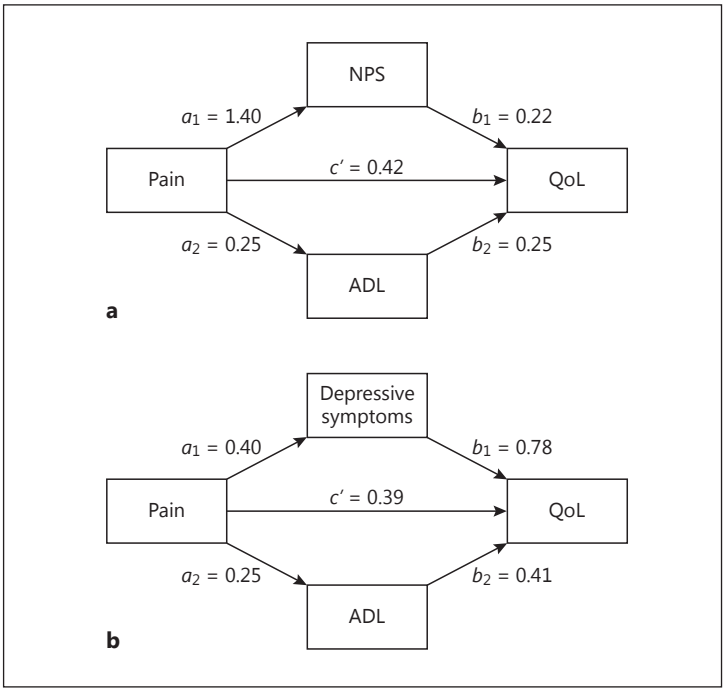

Fig. 1. Parallel multiple mediator models. **a** Model 1: pain (X), QoL (Y), NPS (M_1), and ADL (M_2). **b** Model 2: model 1: pain (X), QoL (Y), depressive symptoms (M_1), and ADL (M_2). ADL, activities of daily living; NPS, neuropsychiatric symptoms; QoL, quality of life.

of the items that comprises NPS, so we were not surprised to find a moderate correlation between NPS and depressive symptoms (Spearman's ρ = 0.43). Based on previous research [54, 55], we hypothesised a serial multiple mediator model where NPS affected ADL in model 1, and depressive symptoms affected ADL in model 2. However, we found no statistically significant correlations between our proposed mediators: NPS and ADL, or depressive symptoms and ADL (Table 1). Consequently, our data did not satisfy the assumptions of a serial model, which is why we rejected our hypothesised serial models in favour of parallel models (Fig. 1).

Results

Sample Characteristics

Among the 112 residents included in this study, 69% were women. The median age was 84 years (range, 68–99). Over one-third of the sample (39%) had a degenerative type of dementia (Alzheimer, frontotemporal, or Lewy body) and 36.6% were categorised as "unspecified." The median length of stay in the NH was 26 months (range, 1–178). The prevalence of pain was 67.9%. The median total pain score was 8. The median total score for ADL was 20, and 65% of the sample were moderately to highly dependent in ADL. For NPS, the median total score was 22. The median total score on the Cornell Scale for Depression in Dementia was 6, and 42% of the sample had a possible mild or moderate-to-severe depressive episode. For QoL, the median total score was 24. More details on the sample's characteristics are shown in Table 2.

Mediation Analysis

Model 1 tested the specific indirect effects of NPS (M_1) and ADL (M_2) on the association between pain (X) and QoL (Y). Model 2 tested the specific indirect effects through depressive

DOI: 10.1159/000468923

Table 2. Sample characteristics

Variable	*n* (%)	Median (min, max)
Age, years		84 (68, 99)
Duration of stay in nursing home, months[a]		26 (1, 178)
Sex		
Female	78 (69.6)	
Male	34 (30.4)	
Type of dementia		
Degenerative	44 (39.3)	
Vascular	16 (14.3)	
Mixed	10 (8.9)	
Secondary	1 (0.9)	
Unspecified	41 (36.6)	
Pain		
Not present (Doloplus-2 score ≤5)	36 (32.1)	
Present (Doloplus-2 score ≥5)	76 (67.9)	
Pain score		8 (0, 22)
Depressive symptoms		
Absence of depressive episode (Cornell score ≤6)	65 (58.0)	
Possible mild depressive episode (Cornell score 7–11)	26 (23.2)	
Depressive symptoms score		6 (0, 33)
ADL		
Independent to low dependency (PSMS score ≤17)	39 (34.8)	
Moderate-to-high dependency (PSMS score ≥18)	73 (65.2)	
ADL score		20 (10, 28)
NPS score		22 (0, 74)
QoL score		24 (11, 48)

PSMS, Physical Self-Maintenance Scale; ADL, activities of daily living; NPS, neuropsychiatric symptoms; QoL, quality of life. [a] Missing data on 5 participants at baseline. Variable not included in the mediation analysis.

symptoms (M_1) and ADL (M_2). Age and sex were not statistically significant covariates in these models.

As shown in Table 3, both model 1 and model 2 explained 28% of the variance in QoL. The total (c) and direct effects (c') of pain on QoL were statistically significant in both models. The total effect indicates that an increased pain score was associated with an increased QoL score (c = 0.80) after adjusting for all the mediators. Higher QUALID scores represented lower QoL. The direct effect indicates that pain was independently associated with QoL (model 1: c' = 0.42; model 2: c' = 0.39) and not completely mediated through NPS, depressive symptoms, and ADL.

The results obtained from models 1 and 2 indicate that pain was associated with an increased NPS burden, ADL dependency, and the number of depressive symptoms. Our mediation analysis showed how much the scores for the proposed mediators increased when pain increased by 1 unit (a_i: X → M_1 and X → M_2). For each unit change in pain, NPS increased by 1.40 and ADL by 0.25 units. Pain was significantly associated with more depressive symptoms (a_1 = 0.40) and ADL (a_2 = 0.25) scores in model 2.

Furthermore, we estimated how much QoL changed when our proposed mediators increased by 1 unit (b_i: M_1 → Y and M_2 → Y). Model 1 showed that having a higher NPS score was significantly associated with higher QoL scores (b_1 = 0.22), indicating that an increase in NPS reduced QoL. There was no statistically significant association between ADL and QoL in model 1. In model 2, both depressive symptoms (b_1 = 0.78) and ADL (b_2 = 0.41) were associated with a higher QoL score, which demonstrated their negative impact on QoL.

DOI: 10.1159/000468923

Table 3. Results of the mediation analysis: total, direct, and indirect effects

	c (SE)	c' (SE)	a_i (SE)	b_i (SE)	a_ib_i [95% CI]	Proportion mediated	R^2
Model 1							
Total effect	**0.80 (0.12)*****						0.28
Indirect effect via NPS			**1.40 (0.27)*****	**0.22 (0.04)*****	**0.31 [0.18, 0.50]**	39.1%	0.20
Indirect effect via ADL			**0.25 (0.08)*****	0.25 (0.13)	0.06 [–0.00, 0.17]		
Direct effect		**0.42 (0.12)*****				53.0%	
Model 2							
Total effect	**0.80 (0.12)*****						0.28
Indirect effect via depressive symptoms			**0.40 (0.09)*****	**0.78 (0.10)*****	**0.31 [0.16, 0.48]**	38.6%	0.15
Indirect effect via ADL			**0.25 (0.08)*****	**0.41 (0.13)****	**0.10 [0.04, 0.21]**	12.9%	0.09
Direct effect		**0.39 (0.11)*****				48.5%	

Bold type signifies significance: ** $p < 0.01$; *** $p < 0.001$. NPS, neuropsychiatric symptoms; ADL, activities of daily living.

Finally, we estimated the specific indirect effect of pain on QoL through our mediators (a_ib_i: X → M_1 → Y and X → M_2 → Y). In model 1, ADL was not a mediator in the relationship between pain and QoL. NPS partially mediated in the link between pain and QoL ($a_1b_1 = 0.31$). About 40% of the total effect of pain on QoL was mediated through NPS. In model 2, both depressive symptoms ($a_1b_1 = 0.31$) and ADL ($a_2b_2 = 0.10$) partially mediated the relationship between pain and QoL. Almost 13% of the total effect of pain on QoL was attributed to ADL. A larger effect was observed for depressive symptoms, which accounted for 38.6% of the total effect of pain on QoL.

Discussion

In this study, we aimed to obtain insight into the underlying mechanisms in the relationship between pain and QoL in NH residents with severe dementia by testing 2 multiple mediator models. This is the first study to investigate the possible mediation effect of depressive symptoms, NPS, and ADL on the association between pain and QoL in this patient population. As expected, our results showed that both NPS and depressive symptoms partially mediated the relationship between pain and QoL. Surprisingly, the role of ADL in the mechanism underlying pain and QoL differed in the 2 models. In the first model, ADL was not a mediator, whereas ADL mediated the relationship between pain and QoL in the second model. These findings suggest that NPS and depressive symptoms are the main mechanisms by which pain exerts its effect on QoL, which highlights the importance of assessment and intervention regarding pain and behavioural and psychiatric symptoms in order to maintain or increase QoL in this patient population. Given the suggestion that NPS and depressive symptoms influenced the association between pain and QoL in different ways, we found that the proportions mediated by NPS and depressive symptoms were approximately the same. However, regarding explained variance, NPS explained more of the variance in QoL than did symptoms of depression.

Another important finding of this study is that pain was associated with increased NPS burden, ADL impairment, and symptoms of depression. This supports the findings of previous studies [23–30] and reinforces our understanding of the impact of pain on well-being in cognitively impaired older adults. Furthermore, both mediation models confirmed that pain

might reduce QoL in institutionalised older adults with severe dementia, which is in accordance with previous research [33–35, 56]. These findings highlight the importance of adequate pain assessment and management in this population, which may benefit NPS, depressive symptoms, ADL, and QoL. In a systematic review, Pieper et al. [57] concluded that the available evidence suggests that pain interventions are effective in reducing both pain and behavioural symptoms in people with dementia.

As expected, our study showed that both NPS and depressive symptoms were associated with reduced QoL in NH residents with dementia, which is consistent with previous studies [10–13], especially when proxy rated [14]. This indicates that preventing and reducing both NPS and symptoms of depression may increase the QoL in this population.

Interestingly, we found that ADL was only significantly associated with QoL when modelled together with depressive symptoms, indicating a possible interaction between those 2 factors. Cipher and Clifford [54] refer to research on QoL where functional capacity is suggested to be the ultimate manifestation of QoL. However, our data do not support this hypothesis. An association between ADL and QoL has been reported in previous studies [10–12]. Thus, we hypothesised that previous studies found a significant association whereas we did not because ADL is more important for certain domains of QoL rather than for overall QoL, such as the "well-being" subscale of the QUALID scale, as considered previously [10], or the QUALID "comfort" subscale [11].

Our findings indicate that older adults with severe dementia may suffer from several co-occurring debilitating symptoms. Our results indicate that a large proportion of our sample was burdened by pain, with moderate-to-high dependency in ADL and a probable or definite depressive episode. Every resident screened for inclusion (step 2 in the recruitment procedure) had clinically significant pain, NPS, or agitation. These factors may present as similar behaviours and interact in different ways. Behaviours such as aggression, agitation, and strained body expressions are frequently interpreted as a symptom of dementia and not recognised as a possible symptom of pain [57], and pain is the last factor to be assessed as the cause of residents' behaviour [58]. We note that behaviour may be the only means of communication for people affected by severe dementia; however, it is challenging to assess whether this behaviour is an indicator of pain, or a manifestation of other conditions such as depression [59]. Therefore, behavioural changes in long-term care residents with cognitive impairment might have multifactorial causes and manifestations.

Strengths and Limitations

One strength of this study is that we only included NH residents with severe dementia. Our sample is more homogeneous than samples comprising people with varying degrees of dementia – which may affect the generalisability of our results. However, the relatively small sample size may also affect the generalisability of our findings.

The data analysed were cross-sectional, and thus we were unable to comment on causal relationships. Nevertheless, we still consider that our results may provide important insights into this complex process by identifying associations between variables and providing evidence concerning the mechanism of pain and QoL in NH residents with severe dementia.

The effects estimated in this study may be considered small, even though most of the pathways estimated by the mediation analysis were statistically significant. However, statistical significance does not necessarily imply clinical relevance or relevance to patients.

Furthermore, our data were based on proxy assessment, because self-reporting by residents was not possible due to their degree of cognitive impairment. However, the proxies were trained and they knew the residents very well, and we have no reason to consider that the results are not reliable given the constraints of the data collection method. In addition, no other assessment method is currently recognised as a "better" approach than that used in this study.

DOI: 10.1159/000468923

Due to their high workload, the NHs were not able to include every resident who satisfied the inclusion criteria. However, there is no reason to consider that the selected participants were different from those who were not selected.

Many tools have been developed for pain assessment in people with dementia; however, there is limited evidence for the validity of these tools [60]. The Norwegian version of Doloplus-2 needs further validation in populations that cannot self-report pain [32]. Questions about the scale's sensitivity and specificity have been raised [61]. Furthermore, there is a lack of information about how the cut-off score was determined, and it has not been empirically validated [41, 61]. However, based on the Norwegian and international literature [32, 60, 61], we considered Doloplus-2 to be the most appropriate of the tools available in Norwegian.

Furthermore, the high correlation between QoL and pain, symptoms of depression, and NPS might indicate conceptual overlapping, which has consequences for both research and clinical practice. Overlapping behavioural manifestations observed in, for instance, depression, pain, and dementia make it challenging for health care professionals to differentiate between these concepts in clinical practice [62]. In research, conceptual overlap may make the relative importance of each concept unclear [63]. In this study, measurement overlap may have led to an overestimation of the strengths of the associations between the variables included in our mediation models.

In this study, we do not have data that would allow us to discuss in detail in what way the identified mediation patterns may be similar or vary with the degree of cognitive functioning or with the setting (e.g., NH vs. community). However, we recognise it as an interesting field for further research. Moreover, it would be useful to conduct a longitudinal study to examine whether adequate pain management over time is associated with improvements in QoL and ADL, as well as with reduced occurrence of NPS and depressive symptoms. Considering that NPS comprises several symptoms that often cluster together and overlap with each other, we suggest examining how single items that compose NPS might affect the relationship between pain and QoL in dementia, which is an exciting area for further research.

Practical Implications

From a clinical point of view, the findings of this study extend previous assumptions and empirical research by providing insight into the mechanisms that underlie the relationship between pain and QoL. Our selected study variables are the most prevalent, and they are highly relevant in NH residents with severe dementia. We showed that pain is strongly correlated with QoL and only partially mediated by symptoms of depression, NPS, and ADL. A better understanding of the effects of pain, NPS, depressive symptoms, and ADL on QoL may help elucidate some of the complexities of dementia care faced by health care professionals every day. Moreover, it can provide a foundation for the design of more effective interventions that have the potential to change care delivery and resource use.

Conclusion

The main finding of this study is that both NPS and depressive symptoms partially mediated the relationship between pain and QoL, which suggests that NPS and depressive symptoms are the main mechanisms by which pain exerts its effect on QoL in NH residents with severe dementia. ADL was a mediator only when combined with depressive symptoms and not when combined with NPS. Pain, depressive symptoms, and NPS appear to be important factors that influence QoL; therefore, multidimensional interventions may be beneficial for QoL in NH residents with severe dementia.

DOI: 10.1159/000468923

Acknowledgement

We thank Prof. em. Knut Engedal for his valuable comments during the design of the study and in the preparation of the manuscript. The authors like to thank all the residents, their next of kin, and the staff of the participating nursing homes for their willingness and enthusiasm that made this study possible. We thank the Oslo and Akershus University College of Applied Sciences for funding this study and publication in this journal.

Statement of Ethics

The Regional Ethics Committee approved the procedure of this study (Ref. No. 2014/1431; REC South East, Norway).

Disclosure Statement

No conflicts of interest are to be declared.

Funding Sources

The Oslo and Akershus University College of Applied Sciences funded the first author's doctoral studies. The second author is supported by a Canadian Institutes of Health Research New Investigator Award.

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