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Depressive symptoms among nursing home residents in Norway and South Korea

Master Thesis in Global Health Sciences

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Abstract

Background: The world population is ageing, and the number of older people is rapidly increasing. There will be more chronically ill older people who will need long-term care. The prevalence of depression in nursing home setting is high. Depression is one of the leading disabling disorders and noticeably unrecognized and untreated in nursing home setting. Research on risk factors that are associated with depression in this setting is scarce.

Study design: This is a cross – sectional study that used a secondary data from Norway and South – Korea.

Purpose: The purpose of this study is to investigate the prevalence and risk factors of depressive symptoms in Norwegian and South – Korean nursing homes. This is the first study that compares these two countries.

Methods: The residents were recruited from 10 Norwegian and 10 South – Korean nursing homes. The prevalence and risk factors were assessed in 588 residents, 261 from Norway and 327 from South – Korea. Data was collected using interRAI LTCF. Depressive symptoms were measured using Depression Rating Scale (DRS). Multivariate logistic regression was used to investigate the association between depressive symptoms and the risk factors.

Results: Prevalence of depressive symptoms was 38% in Norway and 48% in South – Korea. Age and gender were associated with depressive symptoms only in Norwegian sample in bivariate analysis. Pain, conflicts with other residents/staff, loneliness and aggressive behaviour were significantly associated with depressive symptoms. There was no significant difference in terms of depression between the countries when the regression model was adjusted for the risk factors.

Conclusion: The prevalence of depressive symptoms in nursing home residents is very high. Risk factors that were found to be associated with depressive symptoms in both countries were: pain, conflicts with other residents/staff, loneliness and aggressive behaviour. Even though the countries are in different geographic areas it seems that pattern or mechanism of depressive symptoms is the same. There should be more focus on the recognition of depressive symptoms and the psychosocial wellbeing of this frail population.

Keywords: Depressive symptoms, prevalence, risk factors, nursing home, long-term care

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Table of contents

List of tables

Abbreviations

ADL – Activities of daily living

ADLH – Activities of daily living (Hierarchy scale)

ABS – Aggressive behaviour scale

CPS – Cognitive performance scale

CSDD – Cornell Scale for Depression in Dementia

DRS – Depression rating scale

InterRAI LTCF – Resident Assessment instrument for Long-Term Care Facilities

LTCF – Long-Term Care Facilities

LTCI – Long-Term Care Insurance

MND – Median

NH – Nursing home

NHI – National Health Insurance

OR – Odds ratio

SD – Standard deviation

1 Introduction

The world's population is ageing, and the proportion of elderly is rapidly increasing. It is estimated that the number of elderlies who are 60 years or older, will be two-fold by 2050 (Data from Population Prospects: the 2017 revision). During the 80's the prevalence of older population in Norway was 14,7 % (Data from Statistics Norway)[1], while in South - Korea it was 3,8% (Cho, Lee, Kim, Lee, & Sohn, 2011). However, the growth of older population in South - Korea will increase with a faster pace. By 2040, the number of older people will increase by ten-fold in 60 years' time span (Cho et al., 2011). Both Norway and South - Korea are developed countries that have had rapid economic growth during the last couple of decades. An ageing population will more likely have more chronically ill people that can affect their quality of life, functional ability and mental health. Therefore, more older people will require long-term care services.

In Norway most of the older persons live at home, while some receive long-term care at home or in long-term care facilities (LTCF), i.e. nursing homes. About 5.5% of older persons aged 65 and older, received long-term care in LTCF while 12.4% received long-term care at home, in 2008 (Colombo & et al.). Most of Norwegian nursing homes (NH) are public. That is, owned by municipalities. The system is funded by national taxes but older people who receive long-term care at home or LTCF may require paying co-payments. Co-payment correspond to 75% of the basic amount in the National Insurance Scheme[2]. In other words, the co – payment would depend on their income (pension). However, South - Korea is an insurance-based society, where access to health care is provided by the mandatory National Health Insurance (NHI) and mandatory Long-Term Care Insurance (LTCI) (H. Kim, Jung, & Kwon, 2015). Since the society in South Korea is based on norms of collectivism and Confucianism, it was common that the family took care of older family members. There has been a change in this pattern during past few decades, where the percentage of older persons whose family takes care of them, is decreasing. Despite the rapid increase in older population, South Korea has a short history of LTC services. It was introduced for the first time in 2008 (H. Kim, Jung, & Kwon, 2015). Another issue is that LTCH (Long-Term Care Hospitals) where are treated older persons with higher medical care needs, are funded by NHI, while LTCF are funded by LTCI. Because of the lack of cooperation between those two institutions and partly the eligibility criteria for LTCI,

[1] http://www.ssb.no/318601/percentage-of-the-population-aged-65-or-over.selected-countries-sy-107
[2] https://www.regjeringen.no/no/tema/helse-og-omsorg/helse--og-omsorgstjenester-i-kommunene/innsikt/egenbetaling-i-og-utenfor-institusjon/id434597/

older people are misplaced (Jeon & Kwon, 2017; H. Kim, Jung, & Kwon, 2015). That is, older people who have lower medical care needs and were supposed to reside at LTCF are placed in the LTCH and vice versa. Therefore, these differences in who funds the LTCF and the eligibility criteria can affect the representation of older persons in nursing homes in those two countries.

According to WHO, depression is one of the leading causes of disability and one of the major contributors to the overall global burden of disease. Even though there are effective treatments, a considerably low proportion of those who are affected receive the treatment. Some of the barriers to effective treatment are lack of resources, lack of trained health-care providers, social stigma and inaccurate assessment. The risk factors that are associated with depression may have different etiological pathway as nursing home represents a quite different setting than the community.

2 Literature Review

2.1 Prevalence of depressive symptoms in LTCF

Depression is defined as prolonged and continuous sad feeling and loss of interest. It is characterized by loss of energy and appetite, persistent feeling of worthlessness and guilt, troubles with sleeping and concentration (Tiong, Yap, Huat Koh, Phoon Fong, & Luo, 2013). It is not uncommon for people with depression to have thoughts of death and even attempt to commit suicide. According to symptoms, depression can vary from mild to severe. In addition, American Psychiatric Association pointed out that it is important to differentiate feeling of grief from depression, as these two terms are distinct even though the symptoms might be equally intense or overlap [3]. In addition, the American Psychiatric Association mentioned that depression is characterized by persistent loss of interest and feelings of self-loathing, in grief painful feelings come in waves and are mixed with positive feelings as well.

Because of the rigorous diagnostic criteria for MDD (Major Depression Disorder), a considerable proportion of the elderly do not meet the criteria, even though they have significant depressive symptoms (Park et al., 2012). Another explanation could be that nursing home (NH) residents either suffer from dementia and depression at the same time or because the symptoms of dementia and depression overlap (Barca, Selbaek, Laks, & Engedal, 2009), the depression is often being underdiagnosed or undertreated (Watson, Garrett, Sloane, Gruber-Baldini, & Zimmerman, 2003).

In past decades, there was a lot of interest to investigate prevalence and risk factors of late-life depression. However, despite the increased interest the amount of research in this area is still scarce. In addition, there is a high amount of variety among the studies that were already conducted. Partly because studies used different methodologies and depression might vary across geographical area and cultural backgrounds (Beekman, Copeland, & Prince, 1999).

A Dutch study, the "Amsterdam Groningen Elderly Depression (AGED)", investigated prevalence and risk factors of depression among nursing home residents and found that prevalence of major depression was 8.1%, minor depression 14,1% and depressive symptoms 24% (sub-clinical depression that does not meet diagnostic criteria according to DSM-IV) (Jongenelis et al., 2004). In United States the prevalence of depression among nursing home

[3] https://www.psychiatry.org/patients-families/depression/what-is-depression

residents seem to be high as well. One study reported prevalence of depression as high as 26.6% (Gruber-Baldini et al., 2005) while another study reported prevalence of major depression 4.8%, minor depression 8.2% and possible major and minor depression 17% and 25.8% respectively (Teresi, Abrams, Holmes, Ramirez, & Eimicke, 2001). Approximately 27% of elderly living in LTCF in England and Wales were depressed (McDougall, Matthews, Kvaal, Dewey, & Brayne, 2007). In Norway, the trend seems to follow other western countries. The studies reported the prevalence of depression rates of 5.7% to approximately 28%, including those with minor depression (Barca et al., 2009; Iden, Engedal, Hjorleifsson, & Ruths, 2014). Research also showed that newly admitted residents have higher risk of depression during the first year after admission, but the prevalence seemed to decline possibly because the residents already adjusted to a new environment and built new relationships (Hoover et al., 2010; Kowalska, Rymaszewska, & Szczepanska-Gieracha, 2013; Watson et al., 2003).

Studies conducted in Asian countries such as Indonesia, Hong Kong, Taiwan and Singapore, reported higher prevalence of depression than western countries, ranging from 21% to 81% (Chow et al., 2004; Hsu, Badger, Reed, & Jones, 2013; L. C. Lin, Wang, Chen, Wu, & Portwood, 2005; P. C. Lin, Wang, & Huang, 2007; Tiong et al., 2013). In South - Korea, reported depressive symptoms rates were higher than major depression among older people in the community setting (Cho et al., 2010). Another study compared prevalence rates of Japanese and South - Korean institutionalized old persons. Both Japanese and South - Korean had high prevalence of depressive symptoms, 66.7% and 41.7% respectively, that is GDS score of six and more (Geriatric Depression Scale) (O. Kim et al., 2009). Even though the rates of depression tend to be higher among residents in LTCFs, one South - Korean study reported prevalence of 39% among community dwelling elderly compared to 24% of nursing home residents (Chung, 2008). Authors explained that this might be related to the income of the elderly. That is, nursing home could provide safer environment for low-income elderly. The fact that prevalence rates are higher among Asian older people compared to European or American, could be due to cultural factors such as filial piety. In Confucianism, it is considered as an important virtue and a duty of children to respect, obey and take care of their parents and older members of the family[4]. Asian older people have higher expectations for familial duties compared to western cultures, which can make the feeling of abandonment even stronger (P. C. Lin et al., 2007). Admission criteria for nursing home vary among the countries that may contribute to different prevalence rates. Another reason for varied prevalence rates is due to

[4] https://www.dictionary.com/browse/filial-piety

difficulty in diagnosing depression among cognitively impaired and dement residents that make up the majority of nursing home resident (Volicer, Frijters, & van Der Steen, 2011).

2.2 Recognition and treatment of depressive symptoms in Nursing Homes

One of the challenges in the nursing home setting is availability of the health care services as this frail population that have either physical or cognitive impairment can't reach their primary care physician in order to access health services. Therefore, their wellbeing is dependent on the skills of the nursing homes staff and the physicians that visits nursing homes. Usually a physician frequently visits nursing home residents; however this doesn't guarantee a good recognition and treatment of depression as general physicians do not have required psychiatric training (Ayalon, Fialová, Areán, & Onder, 2010; Volicer et al., 2011). Nevertheless, even if they receive the necessary training, depression still could be unreported. Nursing homes rarely provide services of psychologist. At least, psychiatric screening is not mandatory in Norway when it comes to newly admitted residents (Iden et al., 2014).

Most commonly, depression is treated by medications but there are other non-pharmaceutical options such as psychotherapy, music therapy, reminiscence therapy, pet therapy and physical training programs (Brownie & Horstmanshof, 2011; Iden et al., 2014). Despite the fact that there is an effective treatment available, depression seems to be under recognized and undertreated. Poor recognition and lack of treatment efficacy can even worsen the overall estimates of late-life depression and quality of life in this setting (Jongenelis et al., 2004). One American study of depression in assisted living reported that only 18% of depressed residents were receiving anti-depressant medications (Watson et al., 2003). Anti-depressant medication can be prescribed for treatment other than depression such as neuropsychiatric symptoms, insomnia and pain (Iden et al., 2014; Watson et al., 2003). In some cases, the residents were treated for depression with antipsychotics and antianxiety medications instead of antidepressants. Which further can increase the risk of falls, fractures and death (Volicer, Frijters et al. 2011).

A study conducted in Norway found that anti-depressants were prescribed to 44% of nursing home residents among which only half were using this medication for treatment of depression. (Iden et al., 2014). This study as well reported poorly recognized depression in terms of

application of diagnostic screening tools such as Geriatric Depression Scale (GDS) and Cornell Scale for Depression in Dementia (CSDD), that was documented for only 3 residents.

As nursing homes consist of large number of residents suffering from cognitive decline and dementia, this brings up another challenge for health personnel, as diagnostics of depression is very difficult among these residents. They are often not eligible for individual interviews and subsequently excluded from studies that use individual structured clinical interviews for diagnosis (Jackson, Seth, DiClemente, & Lin, 2015; Volicer et al., 2011). Since structured clinical interviews are time consuming and not suitable for residents with cognitive impairment and dementia, we might need to reconsider other diagnostic options that are based more on the observations of the symptoms.

2.3 Risk factors associated with depressive symptoms in Nursing Home setting

Studies showed that there is an association between depression and physical function among nursing home residents (Jongenelis et al., 2004; Kvael, Bergland, & Telenius, 2017). Difficulty or restrictions in performing activities of daily living (ADL) such as bathing, eating, dressing and mobility, could be described as physical disability. One depends on others in performing these activities. However, this association between depression and physical disability can go in both directions. That is, depression being a risk factor for physical disability and physical disability being a risk factor for depression (Lenze et al., 2001). The prevalence of depression symptoms is higher in institutional setting and among younger age-group with more severe functional disability when compared to those in community setting (McDougall et al., 2007). Some of the factors that can affect the quality of life are depression, physical disability, social engagement and life satisfaction. Residents with depression are often less engaged in social activities (Achterberg et al., 2003). Low social engagement can be present also among newly admitted residents, as it takes time for them to establish new social relationships with others and adapt to a new environment. Low social engagement leads to depressive symptoms similarly as depressive symptoms can lead to low social engagement. In addition, there is an association between social engagement and ADL performance, as residents with low mobility or poor ADL will more likely have low social engagement (Schroll, Jonsson, Mor, Berg, & Sherwood, 1997). After transferring from community to a nursing homes setting, many old persons experience tremendous change and have difficulties to adapt to the new environment. Loss of social contacts and inability to take care of themselves can lead to loneliness that is one of known risk factors of depression (O. Kim et al., 2009).

2.4 Rationale for this study

There are no studies that compared Norway and South Korea in terms of depressive symptoms among nursing home residents and its risk factors. The level of social engagement might differ between these two countries, among residents with poor ADL or cognitively impaired. In addition, cultural differences may contribute to differences in prevalence of depressive symptoms and the way they are expressed.

Improving the quality of life of older people in an institutional setting such as nursing home could be achieved by addressing these issues and finding proper interventions. There is increased need for research in this area, internationally. So far, there is no consensus when it comes to depression in a nursing home setting. There are several different clinical tools for diagnosis of depression among elderly that are available. However, the choice depends on several factors, such as if we want to include cognitively impaired and residents with dementia, and do we want to only investigate residents that fulfil rigorous diagnostic criteria or not. In this study, it was important to include both cognitively impaired and residents with dementia. Main focus was on the residents that have the symptoms but might not meet the diagnostic criteria. This population is the most vulnerable and improving their recognition can improve the quality of life of these residents. Learning more about the risk factors of depressive symptoms in institutional setting can help health professionals to implement simple interventions that can serve as prevention of depression.

2.4.1 Aim

The overall aim of this study is to examine risk factors and its association with depressive symptoms in Norway and South Korea.

2.4.2 Objectives

- to estimate the prevalence of depressive symptoms in both countries
- to investigate the association between depressive symptoms and risk factors
- compare the risk factors of depressive symptoms in Norway and South Korea

2.4.3 Research hypothesis

The main research hypothesis is that the predictors of depressive symptoms would be different between Norway and South Korea.

Specific research hypothesis:

- We hypothesize that prevalence of depressive symptoms will be higher in South Korea
- We hypothesize that poor health, cognitive and physical impairment will contribute to higher levels of depressive symptoms
- We hypothesize that loneliness and engagement in social activities will be significantly associated with depressive symptoms.

3 Methods

The choice of variables and how this study was structured was based on the conceptual framework that is based on the previously reviewed literature (Figure 2). The variables were categorized in three groups: demographic characteristics, those related to health condition and functional status, and social relationships and residents' engagement in the activities.

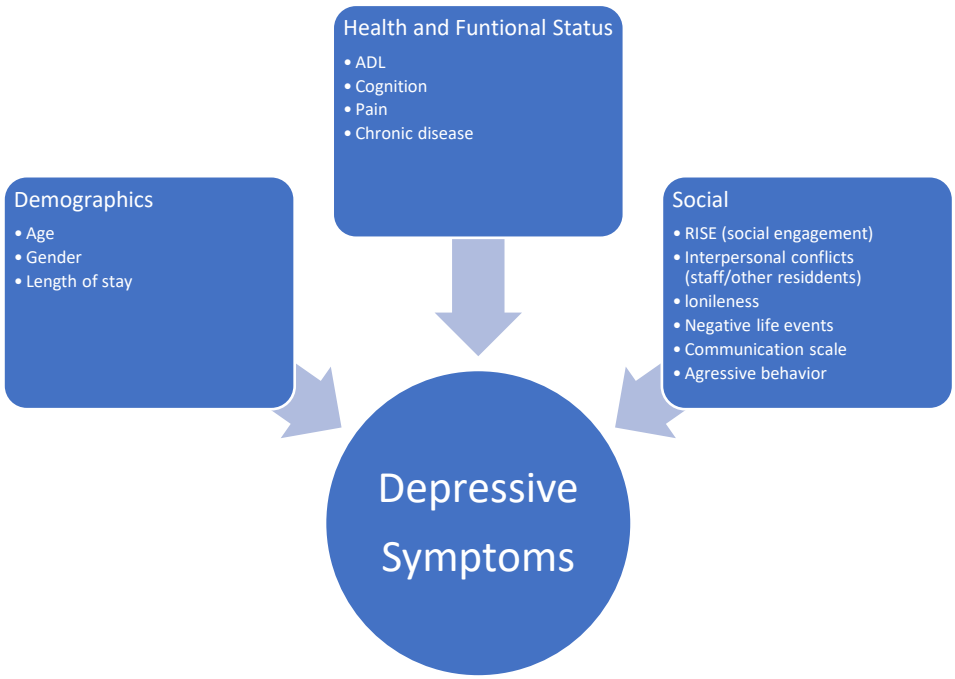

Figure 1 Conceptual framework of this study

3.1 Study Design

A cross-sectional study design was used to investigate the relationship between depression symptoms, ADL (activities of daily living) and social engagement.

3.2 Setting and recruitment

For the purposes of this thesis a secondary data was used. Data were collected in South Korean and Norwegian nursing homes. In Norway, after obtaining an approval of the Director of Health and Social Affairs, the nursing home managers were gathered and received an invitation to participate in the study. Nursing homes that accepted the invitation were eligible to be included in the study. Similarly, in South Korea the recruitment was done on voluntary basis. That is only nursing homes that accepted to participate were included.

3.3 Data collection

The Norwegian data set was collected during September - October 2014. The residents (n=261) were recruited from 10 nursing homes in Trondheim municipality. The data was collected by using Norwegian version of the interRAI LTCF. The registered nurses were given the information and training on completion of the interRAI LTCF. The South Korean data set was collected during July 2011 - September 2012 (n=327) as a part of a South Korean study. The residents were randomly selected from 10 nursing homes. Nursing homes were in 3 metropolitan areas in South Korea (Seoul, Incheon and Gyeonggi). In South Korea the data was collected by using South Korean version of the interRAI LTCF. Research team trained staff nurses who assessed older residents whom they take care of. In both countries, residents gave their consent to participate in the original study conducted in these two countries. In this study, for the convenience an English version of InterRAI LTCF will be presented.

The sample size for this study was not specifically calculated, as secondary data was used.

3.4 Participants

In the Norwegian study, residents who lived at the facility 1 month or more were included. South Korean study included residents aged 65 or older and who have lived at the facility 1 month or more.

3.5 Assessment tool InterRAI LTCF

InterRAI LTCF has a long history. It started with major scandals in long-term care of old people in United States. The issue got political attention and made Congress to take an action and investigate the quality of care in nursing homes (Carpenter & Hirdes, 2013). This led to development of a standardized Minimum Data Set (MDS), that was not implemented in all nursing homes before it was revised and upgraded to MDS 2.0 in 1996 (www.interrai.org). The MDS 2.0 consists of more than 350 items with which health professionals can obtain residents' demographic information, physical, cognitive and psychological functioning, clinical diagnosis, health conditions and treatments (Hoover et al., 2010). InterRAI LTCF evolved from MDS 2.0, comprising of 257 items (Blekken, 2016). It's a comprehensive and validated instrument that can be used by both clinicians and researchers. It can be used as a tool for individualized care and evaluating effects of interventions. Various scales that are part of InterRAI LTCF, used as outcome measurements are validated against "gold standards" which made this instrument suitable for longitudinal studies (www.interrai.org) in nursing home setting. It also enables comparison of results between different settings and countries.

3.5.1 Measurements

An overview over all variables that were used in this study is presented in Table 1.

Table 1 - List of the study variables

Variables		Measurements
Dependent Variable		
Depressive Symptom (DRS scale 0 - 14)		0: DRS 0-2 (Symptoms not present) 1: DRS 3-14 (Symptoms present)
Independent Variables		
Demographic	Age	0: <75, 1: 75-84, 2: 85+
	Gender	1: Male, 2: Female
	Length of stay	1: Less than 1 year, 2: 1 year or more
Health and Function	Sensory impairment	0: No impairment, 1: Either visual or hearing impairment, 2: Both visual and hearing impairment
	Activities of Daily Living	1: ADL 0-1 – No impairment, 2: ADL 2-3 – Moderate impairment, 3: ADL 4-6 – Severe impairment
	Cognitive Function	1: CPS 0-1 – No impairment, 2: CPS 2-3 – moderate impairment, 3: CPS 4-6 – Severe impairment
	Pain	0: No pain, 1: Mild, 2: Moderate, 3: Severe pain
	Chronic disease	0: No, 1: 1 diagnose, 2: 2 or more diagnoses
Social	Social engagement (RISE)	0: RISE 0-2 – Low social engagement 1: RISE 3-6 – Moderate to high social engagement
	Interpersonal conflict with other residents/staff	0: No, 1: Yes
	Loneliness	0: No, 1: Yes
	Negative life events prev. 90 days	0: No, 1: Yes
	Communication	0 – 8 (0 = No communication problems)
	Aggressive behaviour	1: 0 - No aggressive behaviour, 2: 1-4 – Mild to moderate, 3: 5-12 – Severe aggressive behaviour

3.5.2 Depressive symptoms (DRS Scale)

Depression symptoms were measured using an observational-based scale used as a clinical screen for depression. Depression Rating Scale (DRS scale), derived from the mood and behavioral items from the Minimum Dataset of the Resident Assessment Instrument (Burrows 2000). It comprises of seven items scored from 0-3; 0 – not present, 1 - Present but not exhibited in last 3 days, 2 – Exhibited on 1-2 of last 3 days and 3- Exhibited daily in last 3 days (See Table 2).

Table 2 - DRS scale items

Items	Score
Made negative statements	0-3
Persistent anger with self and others	0-3
Expressions, including nonverbal, of what appear to be unrealistic fears	0-3
Repetitive health complains	0-3
Repetitive anxious complaints – non health related	0-3
Sad, pained, worried facial expressions	0-3
Crying, tearfulness	0-3

Thereafter, each item is recoded to a three – point (0, 1, 2) scale and the items were summed. DRS scale ranges from 0 to 14 where 0 means no depressive symptoms, scores of 3 and greater indicate major or minor depression (Burrows, Morris, Simon, Hirdes, & Phillips, 2000).

As data were not normally distributed, this variable was dichotomized for the purposes of logistic regression.

3.5.3 Demographic variables

Demographic variables such as age, gender and length of stay were used in this study. Age was stratified in three groups: <75, 75-84 and 85 or older. Length of stay was divided in two groups: those who have lived in nursing home one year or less and those who lived in nursing home more than one year.

3.5.4 Health and functional status

Residents' functional status was measured by Activity of Daily Living (ADL) Hierarchy Sale using the items from the section G of the InterRAI LTCF Assessment form: hygiene, dressing, toilet use, transfer, locomotion, bed mobility and eating. ADL Hierarchy Scale ranges from 0-6, where scores from 0 to 1 indicate no functional impairment, scores 2-3 moderate impairment

and scores 4-6 as severe impairment (Achterberg, Pot, Kerkstra, & Ribbe, 2006; Morris, Fries, & Morris, 1999).

Cognitive function of the residents was measured by Cognitive Performance Scale (CPS). Items are taken from section C of the InterRAI LTCF Assessment. CPS scale ranges from 0-6; where 0 indicates no cognitive impairment, scores 2 or greater represent cognitive impairment.

Pain was measured using Pain Scale (PS), that ranges from 0 to 3; 0 meaning no pain and 3 indicating severe pain (Fries, Simon, & Morris, 2001). Items were used from section J from the InterRAI LTCF Assessment, which was about health conditions and pain symptoms.

The presence of chronical diseases was recorded in section I of the InterRAI LTCF Assessment. Seven chronic disease were used in this study: stroke, diabetes, chronic obstructive lung disease, cancer, cardiovascular disease, chronic heart failure and urinary tract infection. This variable was stratified according to number of present chronic diseases into 0 – no chronic disease, 1 – one chronic disease, 2 – two or more chronic diseases.

Social Engagement of the residents in the activities was measured using The Revised Engagement Scale (RISE) (H. Kim, Jung, Sung, et al., 2015). Items used for this scale are from section F of the InterRAI LTCF Assessment. This scale is reversed and ranges from 0 to 6, where greater scores indicate higher involvement in positive activities.

Other items related to social part such as interpersonal conflict with other residents/staff, loneliness, negative life events the previous 90 days were recorded in section F of the InterRAI LTCF Assessment. The items were based on yes or no answers.

Communication was measured using Communication Scale (COMM) that ranges from 0-8, where greater scores indicate bigger communication problems (H. Kim, Jung, Sung, et al., 2015).

Aggressive behavior was measure by the Aggressive Behavior Scale (ABS) that ranges from 0 to 12, where 0 indicates no aggressive behavior.

3.6 Data analysis

Statistical analyses were performed using SPSS (25.0). Statistical analyses included normality tests, descriptive statistic and estimating prevalence rates. Normality tests and inspection of histograms and Q-Q plots showed that DRS, ADL and RISE scores were not normally distributed among the residents in both countries. In this study, statistical analysis was performed using non-parametric tests. Univariable and Multivariable Logistic Regression was performed in order to investigate the association between depressive symptoms and risk factors in nursing home setting. In multivariable analysis model I all variables were included. Model II was restricted to only significant variables.

3.7 Reliability

Reliability analysis was conducted for each of the scales in both samples. Cronbach's alpha for the scales in Norwegian sample were as follows: DRS = 0.70, ADL = 0.93, COMM = 0.88, ABS = 0.73 and RISE = 0.81. In South – Korean sample, the Cronbach's alpha for the summated scales were slightly higher: DRS = 0.81, ABS = 0.77, ADL = 0.94, and RISE = 0.85.

4 Results

4.1 Sample statistics

A total of 588 residents, recruited from 10 Norwegian nursing homes (n = 261) and 10 South - Korean nursing homes (n = 327), were included in this study. Table 3 and Table 4 depict the demographic and medical characteristics of the Norwegian and South - Korean nursing home residents.

4.1.1 Norwegian sample

The mean age of the Norwegian residents was 84.68 (SD 8.32). Majority of the residents were over 85 years old (59.8%) with predominantly female population (66.5%). About 51.7 % of the residents resided in the nursing home longer than one year.

While performing the ADL's, 41.2% of the residents had a moderate functional impairment while 23.8% had no functional impairment. Approximately 46.3% of the residents had moderate cognitive impairment, followed by 30.6% who had no cognitive impairment and 23.1% who had severe cognitive impairment. Mean pain was 0.68 (SD 0.77). About half of the residents (50.4%) had two or more chronic diseases, followed by 49.6% with at least one chronic disease.

In Norwegian sample, more than half of the residents (63.3%) had moderate to high social engagement. One third (34.2%) of the residents had conflicts with other residents or staff, while loneliness was observed in only 10.5%. Negative life events were experienced by 8.2% of the residents. Mean communication was 2.50 (SD 2.43). Lastly, mild to moderate aggressive behavior was observed in 30.5% of the residents, while severe aggressive behavior was less frequent (8.1%).

Table 3 - Demographic and medical characteristics of the Norwegian residents **N = 261**

Characteristics		*N* / Mean	(%) / SD
Demographic			
Age	Mean/SD	84.68	8.325
	<75	31	11.9
	75-84	74	28.4
	85+	156	59.8
Gender	Male	87	33.3
	Female	173	66.5
Length of Stay	Mean (SD)	2.25	2.45
(years)	≤1 year	126	48.3
	2+ years	135	51.7
Health and Function			
Activities of Daily Living	Mean (SD)	2.84	1.75
(ADLH 0 - 6)	0 – 1	62	23.8
	2 – 3	107	41.2
	4 – 6	91	35.0
Cognitive Function	Mean (SD)	2.46	1.77
(CPS 0 - 6)	0 – 1	78	30.6
	2 – 3	118	46.3
	4 – 6	59	23.1
Pain	Mean (SD)	0.68	0.77
(PS 0 – 3)			
Chronic diseases	Mean (SD)	1.70	1.01
(0 – 8)	None or one diagnoses	129	49.6
	Two or more	131	50.4
Social			
Social Engagement	Mean (SD)	3.29	2.06
(RISE 0 – 6)	0 – 2 – Low	90	36.7
	3 – 6 – Moderate to high	155	63.3
Interpersonal conflict with other residents/staff	Yes	89	34.2
	No	171	65.8
Loneliness	Yes	27	10.5
	No	230	89.5
Negative life events	Yes	21	8.2
(in last 90 days)	No	236	91.8
Aggressive behavior	Mean (SD)	1.17	1.83
(ABS 0 – 12)	0 – No	159	61.4
	1 – 4 – Mild to moderate	79	30.5
	5 – 12 – Severe	21	8.1
Communication	Mean (SD)	2.50	2.43
(0-8)			

4.1.2 South – Korean sample

In South - Korea most of the residents were between 75-84 years old (41.3%) with majority of female population (76.8%). More than half of the residents (56.3%) resided in nursing home up to one year.

About 60% of the residents had severe impairment in performing ADL's, following 28.1% with moderate functional impairment and 12.2% with no functional impairment. Most of the South – Korean residents (46.8%) had moderate cognitive impairment, 42.7% had severe cognitive impairment and 10.4 % had no cognitive impairment. More than half of the residents had at

least one chronic disease (55.8%) while 44.2% had two or more chronic diseases. Mean pain was 0.59 (SD 0.76).

When it comes to social relationships, South – Korean residents had predominantly low social engagement (67%) and most of them did not have a conflict with other residents or staff (81%). Majority did not feel lonely (72.4%) or experienced a negative life event during last 90 days (97.1%). Approximately 60% haven't expressed aggressive behavior, followed by 29.9% who expressed mild to moderate aggressive behavior and finally 10,5% who showed severe aggressive behavior. Lastly, mean communication was 4.41 (SD 2.59).

Table 4 - Demographic and medical characteristics of the South-Korean residents **N =327**

Characteristic		*N* / Mean	(%) / SD
Demographic			
Age	Mean/SD	81.23	7.73
	<75	66	20.2
	75-84	135	41.3
	85+	126	38.5
Gender	Male	76	23.2
	Female	251	76.8
Length of Stay (years)	Mean (SD)	1.84	2.03
	≤1 year	184	56.3
	2+ years	143	43.7
Health and Function			
Activities of Daily Living (ADLH 0 - 6)	Mean (SD)	3.66	1.63
	0 – 1	40	12.2
	2 – 3	92	28.1
	4 – 6	195	59.6
Cognitive Function (CPS 0 - 6)	Mean (SD)	3.27	1.66
	0 – 1	33	10.4
	2 – 3	148	46.8
	4 – 6	135	42.7
Pain (PS 0 – 3)	Mean (SD)	0.59	0.76
Chronic diseases (0 – 8)	Mean (SD)	1.50	0.90
	None or one disease	178	55.8
	Two or more	141	44.2
Social			
Social Engagement (RISE 0 – 6)	Mean (SD)	1.78	2.06
	0 – 2 – Low	209	67.0
	3 – 6 – Moderate to high	103	33.0
Interpersonal conflict with other residents/staff	Yes	60	19.0
	No	256	81.0
Loneliness	Yes	87	27.6
	No	228	72.4
Negative life events (in last 90 days)	Yes	9	2.9
	No	306	97.1
Aggressive behavior (ABS 0 – 12)	Mean (SD)	1.32	2.242
	0 – No	187	59.6
	1 – 4 – Mild to moderate	94	29.9
	5 – 12 – Severe	33	10.5
Communication (0-8)	Mean (SD)	4.41	2.59

4.2 Prevalence of depressive symptoms

The prevalence and distribution of depressive symptoms is presented in Table 5. In the Norwegian sample, 38.1% of the residents had depressive symptoms while South-Korean sample had higher prevalence of depressive symptoms among residents (48.1%). The mean of DRS scale 2.97 (SD 2.91) in South-Korean sample was as well higher than the mean 2.22 (SD 2.33) in Norwegian sample.

Table 5 - Prevalence of depressive symptoms among nursing home residents **N = 588**

		Norway n=261		South – Korea n=327	
Depressive symptoms		*N*	%	*N*	%
DRS 0-14	Mean (SD)	2.22	2.33	2.97	2.91
	Yes (DRS 3-14)	99	38.1	151	48.1
	No (DRS 0-2)	161	61.9	163	51.9

The registered history of depression among residents who scored three or more on DRS Scale, was presented in Table 6. In both countries, the majority of residents who scored three or more on DRS Scale did not have registered history of depression. Among Norwegian residents, 18.4% received an active treatment while 6.1% were only monitored. However, in South-Korea only two residents had a diagnosis, among which only one received an active treatment.

Table 6 - History of depression among residents who scored 3 or more on DRS Scale **N = 248**

Diagnosis	Norway n (%)	South-Korea n (%)
Not present	64 (65.3)	148 (98.7)
Primary diagnosis for current stay	10 (10.2)	1 (0.7)
Diagnosis present - receiving treatment	18 (18.4)	1 (0.7)
Diagnosis present - monitoring but no active treatment	6 (6.1)	0
Total	98	150

Note: Item from Section I – Disease Diagnosis from InterRAI LTCF Assessment form

4.2.1 DRS scores

The distribution of DRS scores among individual InterRAI LTCF items was different between the countries. That is, the depressive symptoms that are more frequently seen vary between Norway and South - Korea. Norwegian residents mostly displayed “persistent anger with self or others” and “sad, pained, worried facial expressions”. Symptom less frequently observed was “made negative comments” (see Table 7). In South - Korea on other hand, almost half of the residents displayed “sad, pained, worried facial expressions” and “made negative comments”, while the least frequent depressive symptom was “crying, tearfulness” (see Table 8).

Table 7 - Distribution of DRS scores in different InterRAI LTCF items (Norway). **N = 261**

	Score 0		Score 1		Score 2		Total (Score 1 + Score 2)	
Items	*N*	%	*N*	%	*N*	%	*N*	%
Made negative comments	212	81.5	45	17.3	3	1.2	48	18.5
Persistent anger with self or others	161	61.9	82	31.5	17	6.5	99	38.0
Expressions of unrealistic fears	190	73.1	58	22.3	12	4.6	70	26.9
Repetitive health complaints	189	72.7	60	23.1	11	4.2	71	27.3
Repetitive anxious complaints/concerns	197	75.8	44	16.9	19	7.3	63	24.2
Sad, pained, worried facial expressions	170	65.4	76	29.2	14	5.4	90	34,6
Crying, tearfulness	208	80.0	44	16.9	8	3.1	52	20,0

Note: Items that comprise a DRS Scale.

Table 8 - Distribution of DRS scores in different InterRAI LTCF items (South-Korea). **N = 327**

	Score 0		Score 1		Score 2		Total (Score 1 + Score 2)	
Items	*N*	%	*N*	%	*N*	%	*N*	%
Made negative comments	182	58.0	117	37.3	15	4.8	132	42,1
Persistent anger with self or others	196	62.4	101	32.2	17	5.4	118	37.6
Expressions of unrealistic fears	229	72.9	71	22.6	14	4.5	85	27.1
Repetitive health complaints	190	60.5	91	29.0	33	10.5	124	39.5
Repetitive anxious complaints/concerns	204	65.0	87	27.7	23	7.3	110	35.0
Sad, pained, worried facial expressions	160	51.0	119	37.9	35	11.1	154	49.0
Crying, tearfulness	248	79.0	59	18.8	7	2.2	66	21.0

Note: Items that comprise a DRS Scale.

4.3 Distribution of demographic and medical characteristics according to DRS scale

Distribution of demographic and medical characteristics of Norwegian and South - Korean nursing home residents according to scores on DRS Scale is presented in Table 9 and Table 10.

4.3.1 Norwegian sample

Within depressed group the majority were 85 years old or older. However, age group 75-84 was equally distributed between depressed and non – depressed group. There were more female residents who were depressed than males. When it comes to functional (ADL) and cognitive performance (CPS) levels, and number of chronical diseases, all groups had higher proportion of residents in non – depressed group. Mean pain was 0.88 (SD 0.84) for depressed group and 0.55 (SD 0.68) for non – depressed group. Variables reflecting social relationships such as having conflicts with other residents/staff, loneliness and aggressive behavior, had higher proportion of residents in depressed group.

Table 9 - Distribution of demographic and medical characteristics according to scores on DRS Scale (Norway). **N = 261**

Variables		Depressed *n* (%)	Not depressed *n* (%)
Age	<75	8 (8.1)	22 (13.7)
	75-84	37 (37.4)	37 (23.0)
	85+	54 (54.5)	102 (63.4)
Gender	Male	27 (27.6)	59 (36.6)
	Female	71 (72.4)	102 (63.4)
Length of Stay (years)	≤1 year	46 (46.5)	80 (49.7)
	2+ years	53 (53.5)	81 (50.3)
Activities of Daily Living (ADLH 0 - 6)	0 – 1	27 (27.6)	35 (21.7)
	2 – 3	38 (38.8)	69 (42.9)
	4 – 6	33 (33.7)	57 (35.4)
Cognitive Function (CPS 0 - 6)	0 – 1	23 (23.5)	55 (35.0)
	2 – 3	54 (55.1)	64 (40.8)
	4 – 6	21 (21.4)	38 (24.2)
Pain (PS 0 – 3)	Mean (SD)	0.88 (0.84)	0.55 (0.68)
Chronic diseases (0 – 8)	One disease	44 (44.9)	84 (52.2)
	Two or more	54 (55.1)	77 (47.8)
Social Engagement (RISE 0 – 6)	0 – 2 – Low	38 (41.8)	52 (33.8)
	3 – 6 – Moderate to high	53 (58.2)	102 (66.2)
Conflict with other residents/staff	Yes	51 (51.5)	38 (23.6)
	No	48 (48.5)	123 (76.4)
Loneliness	Yes	22 (22.2)	5 (3.2)
	No	77 (77.8)	153 (96.8)
Negative life events (in last 90 days)	Yes	11 (11.1)	10 (6.3)
	No	88 (88.9)	148 (93.7)
Aggressive behavior (ABS 0 – 12)	0 – No	39 (39.4)	120 (75.0)
	1 – 4 – Mild to moderate	48 (48.5)	31 (19.4)
	5 – 12 – Severe	12 (12.1)	9 (5.6)
Communication (0-8)	Mean (SD)	2.74 (2.43)	2.35 (2.42)

4.3.2 South – Korean sample

In South – Korean sample, within depressed group, the highest proportion of residents were 75-84. When compared with non – depressed group, residents who were between 75-84 were almost evenly distributed. Like in Norwegian sample, higher proportion of South – Korean female residents were in depressed group compared to males. ADL and CPS levels were almost equally distributed between depressed and non – depressed group. In South – Korea, variables that reflected social relationship such as conflicts with other residents/staff, loneliness, negative life events and aggressive behavior, as well had higher proportion of residents in depressed group. Mean pain was 0.75 (SD 0.80) for the depressed group and 0.46 (SD 0.68) for non – depressed group.

Table 10 - Distribution of demographic and medical characteristics according to scores on DRS Scale (South-Korea). N=327

Variables		Depressed *n* (%)	Not depressed *n* (%)
Age	<75	31 (20.5)	30 (18.4)
	75-84	69 (45.7)	63 (38.7)
	85+	51 (33.8)	70 (42.9)
Gender	Male	34 (22.5)	42 (25.8)
	Female	117 (77.5)	121 (74.2)
Length of Stay (years)	≤1 year	90 (59.6)	89 (54.6)
	2+ years	61 (40.4)	74 (45.4)
Activities of Daily Living (ADLH 0 - 6)	0 – 1	20 (13.2)	20 (12.3)
	2 – 3	45 (29.8)	46 (28.2)
	4 – 6	86 (57.0)	97 (59.5)
Cognitive Function (CPS 0 - 6)	0 – 1	14 (9.3)	19 (11.7)
	2 – 3	73 (48.3)	75 (46.0)
	4 – 6	64 (42.4)	69 (42.3)
Pain (PS 0 – 3)	Mean (SD)	0.75 (0.80)	0.46 (0.68)
Chronic diseases (0 – 8)	One disease	90 (61.2)	80 (50.3)
	Two or more	57 (38.8)	79 (49.7)
Social Engagement (RISE 0 – 6)	0 – 2 – Low	104 (69.8)	104 (64.2)
	3 – 6 – Moderate to high	45 (30.2)	58 (35.8)
Conflict with other residents/staff	Yes	47 (31.1)	13 (8.0)
	No	104 (68.9)	150 (92.0)
Loneliness	Yes	58 (38.4)	29 (17.8)
	No	93 (61.6)	134 (82.2)
Negative life events (in last 90 days)	Yes	8 (5.3)	1 (0.6)
	No	143 (94.7)	162 (99.4)
Aggressive behavior (ABS 0 – 12)	0 – No	72 (47.7)	114 (70.8)
	1 – 4 – Mild to moderate	52 (34.4)	42 (26.1)
	5 – 12 – Severe	27 (17.9)	5 (3.1)
Communication (0-8)	Mean (SD)	4.41 (2.53)	4.37 (2.65)

4.4 Multivariate Logistic Regression

Results of multivariate regression analyses of the risk factors related to depression are presented in Table 11 and Table 12.

4.4.1 Norwegian sample

Table 11 depicts the relationship between depression and risk factors in Norwegian sample. The results of univariable logistic regression showed that risk factors such as gender, length of stay, ADL's, chronic diseases, social engagement, negative life events and communication were not significantly associated with depressive symptoms. On another hand age, pain, cognitive function, conflicts with other residents/staff, loneliness and aggressive behavior were significantly associated with depressive symptoms. These variables will be included in multivariable analysis model II, since that they have the strongest impact on the outcome variable (Log likelihood and McFadden's R^2).

Residents who were between 75-84 years old, in univariable logistic regression had 2.75 times the odds of being depressed than the group under 75 years old (p=0.033). The significance was present as well in model I (OR 3.86, p = 0.04) and model II (OR 3.39, p = 0.03). Gender was included in both model I and model II despite the fact it didn't show significance in univariable analysis. In multivariable analysis it is shown that females are at higher risk of having depressive symptoms (Model I: OR 2.40, p = 0.02; Model II: OR 2.19, p = 0.02).

Residents who had mild to moderate cognitive impairment had higher odds of being depressed than residents with no cognitive impairment (OR 2.01, p = 0.02). However, this significance was not present in model I (OR 1.15, p = 0.76). This variable was not included in model II since it did not show significance in multivariable analysis. The risk of depressive symptoms increases for each unit worsening on pain scale (OR 1.74, p <0.001). This association is seen as well in model I and model II (OR 1.51, p = 0.03).

The association between depressive symptoms and conflicts with other residents/staff seen in univariable analysis (OR 3.43, p <0.001) was not present in other two models (model II: OR 1.78, p = 0.08). However, when age and gender were removed from the model, the association was significant. Residents who were lonely had higher risk of being depressed than those who were not lonely, and this could be seen in both models (Model II: OR 7.58, p <0.001). Mild to moderate and severe aggressive behavior was significantly associated with depressive symptoms in all models (Model II – mild to moderate: OR 3.98, p <0.001; severe: OR 3.65, p = 0.02).

Table 11 - Multivariate Logistic Regression analysis (Norway). **N = 261**

Variables		Univariable logistic regression	*P*- Value	Multivariable logistic regression Model I	*P*- Value	Multivariable logistic regression Model II	*P* - Value
		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Demographic							
Age	<75	Reference		Reference		Reference	
	75-84	2.75 (1.08-6.96)	0.033*	3.86 (1.05-14.16)	0.042*	3.39 (1.08-10.59)	0.035*
	85+	1.45 (0.60-3.48)	0.400	1.70 (0.49-5.85)	0.400	1.91 (0.65-5.62)	0.239
Gender	Male	Reference		Reference		Reference	
	Female	1.52 (0.88-2.62)	0.133	2.40 (1.11-5.21)	0.026*	2.19 (1.11-4.32)	0.023*
Length of Stay (years)	≤1 year	Reference		Reference		-	
	2+ years	1.13 (0.68-1.87)	0.613	1.62 (0.79-3.31)	0.186		
Health and Function							
Activities of Daily Living (ADLH 0 - 6)	0 – 1	Reference		Reference		-	
	2 – 3	0.71 (0.37-1.35)	0.302	0.57 (0.23-1.38)	0.218		
	4 – 6	0.75 (0.38-1.45)	0.394	0.87 (0.32-2.40)	0.802		
Cognitive Function (CPS 0 - 6)	0 – 1	Reference		Reference		-	
	2 – 3	2.01 (1.10-3.70)	0.023*	1.15 (0.45-2.96)	0.763		
	4 – 6	1.32 (0.64-2.72)	0.449	0.34 (0.06-1.77)	0.201		
Pain (PS 0 – 3)		1.74 (1.24-2.44)	0.001**	1.67 (1.09-2.56)	0.018*	1.51 (1.03-2.22)	0.034*
Chronic diseases (0 – 8)	One disease	Reference		Reference		-	
	Two or more	1.33 (0.80-2.21)	0.257	1.44 (0.72-2.89)	0.299		
Social							
Social Engagement (RISE 0 – 6)	0 – 2 – Low	Reference		Reference		-	
	3 – 6 – Moderate to high	0.71 (0.41-1.21)	0.211	0.93 (0.45-1.89)	0.842		
Conflict with other residents/staff	Yes	3.43 (2.01-5.88)	<0.001**	1.71 (0.80-3.68)	0.163	1.78 (0.92-3.44)	0.085
	No	Reference		Reference			
Loneliness	Yes	8.74 (3.18-23.97)	<0.001**	8.30 (2.58-26.71)	<0.001**	7.58 (2.50-22.92)	<0.001**
	No	Reference		Reference			
Negative life events (in last 90 days)	Yes	1.85 (0.75-4.53)	0.178	1.26 (0.36-4.45)	0.710	-	
	No	Reference		Reference			
Aggressive behavior (ABS 0 – 12)	0 – No	Reference		Reference		Reference	
	1 – 4 – Mild to moderate	4.76 (2.67-8.49)	<0.001**	3.41 (1.57-7.37)	0.002*	3.98 (2.02-7.83)	<0.001**
	5 – 12 – Severe	4.10 (1.60-10.46)	0.003*	3.99 (1.06-15.08)	0.041*	3.65 (1.20-11.07)	0.022*
Communication (0-8)		1.06 (0.96-1.18)	0.210	1.14 (0.91-1.44)	0.237	-	

Note: * ($p<0.05$), ** ($p<0.001$); Univariable logistic regression – unadjusted, Model I – all variables of interest included, Model II – restricted to only significant variables from univariable regression.

4.4.2 South – Korean sample

Table 12 depicts the relationship between depression and risk factors in South - Korean sample. Univariable analysis showed that pain, having conflicts with other residents/staff, loneliness, negative life events during past 90 days, and aggressive behavior had strongest impact on depressive symptoms. Unlike Norwegian sample, in South – Korean sample age and gender were not associated with depressive symptoms in none of the models. Length of stay, cognitive function, ADL's, chronical diseases, social engagement, and communication were not significantly associated with depressive symptoms.

Risk of depressive symptoms increased with each unit increase on pain scale (Model II; OR 1.49, $p = 0.02$) and worsening on aggression behavior scale (Model II; OR 4.96, $p = 0.03$). However, unlike Norwegian sample, only severe aggressive behavior was associated with depressive symptoms. These two risk factors were significantly related to depressive symptoms in both models.

The residents who had conflicts with other residents/staff were at higher risk of being depressed (Model II; OR 3.51, $p = 0.001$). In addition, loneliness increased risk of depressive symptoms (Model II; OR 2.53, $p = 0.001$), and the statistical significance remained in all models. Another variable that reflects the social relationships of South – Korean residents, the negative life events during past 90 days, showed increased risk of depressive symptoms only in univariable logistic regression analysis. In multivariable analyses or adjusted models, I and II, there was no significant association between negative life events and depressive symptoms.

Table 12 - Multivariate Logistic Regression Analysis (South-Korea). **N = 327**

Variables		Univariable logistic regression	*P*- Value	Multivariable logistic regression Model I	*P*- Value	Multivariable logistic regression Model II	*P* - Value
		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Demographic							
Age	<75	Reference		Reference		Reference	
	75-84	1.060 (0.578-1.945)	0.851	0.981 (0.468-2.061)	0.961	0.94 (0.46-1.91)	0.871
	85+	0.705 (0.380-1.308)	0.268	0.659 (0.315-1.382)	0.270	0.61 (0.30-1.26)	0.186
Gender	Male	Reference		Reference		Reference	
	Female	1.194 (0.711-2.006)	0.502	1.206 (0.637-2.286)	0.565	1.29 (0.70-2.35)	0.406
Length of Stay (years)	≤1 year	Reference		Reference		-	
	2+ years	0.815 (0.521-1.276)	0.371	0.942 (0.553-1.605)	0.827		
Health and Function							
Activities of Daily Living (ADLH 0 - 6)	0 – 1	Reference		Reference		-	
	2 – 3	0.978 (0.465-2.058)	0.954	1.070 (0.415-2.764)	0.888		
	4 – 6	0.887 (0.447-1.758)	0.730	1.419 (0.532-3.781)	0.484		
Cognitive Function (CPS 0 - 6)	0 – 1	Reference		Reference		-	
	2 – 3	1.321 (0.617-2.830)	0.474	1.021 (0.369-2.828)	0.968		
	4 – 6	1.259 (0.583-2.718)	0.558	0.666 (0.132-3.353)	0.622		
Pain (PS 0 – 3)		1.690 (1.237-2.307)	0.001**	1.444 (1.009-2.066)	0.045*	1.49 (1.06-2.11)	0.022*
Chronic diseases (0 – 8)	One disease	Reference		Reference		-	
	Two or more	0.641 (0.407-1.011)	0.056	0.740 (0.438-1.251)	0.261		
Social							
Social Engagement (RISE 0 – 6)	0 – 2 – Low	Reference		Reference		-	
	3 – 6 – Moderate to high	0.776 (0.483-1.247)	0.295	1.194 (0.630-2.261)	0.587		
Conflict with other residents/staff	Yes	5.214 (2.687-10.121)	<0.001**	3.896 (1.772-8.565)	0.001*	3.51 (1.66-7.39)	0.001*
	No	Reference		Reference			
Loneliness	Yes	2.882 (1.716-4.839)	<0.001**	2.355 (1.298-4.272)	0.005*	2.53 (1.42-4.49)	0.001*
	No	Reference		Reference			
Negative life events (in last 90 days)	Yes	9.063 (1.120-73.345)	0.039 *	6.679 (0.740-60.310)	0.091	-	
	No	Reference		Reference			
Aggressive behavior (ABS 0 – 12)	0 – No	Reference		Reference		Reference	
	1 – 4 – Mild to moderate	1.960 (1.186-3.240)	0.009*	1.438 (0.803-2.575)	0.222	1.49 (0.85-2.62)	0.155
	5 – 12 – Severe	8.550 (3.149-23.214)	<0.001**	4.523 (1.480-13.821)	0.008*	4.96 (1.72-14.28)	0.003*
Communication (0-8)		1.005 (0.923-1.095)	0.901	1.066 (0.854-1.329)	0.573	-	

Note: * (p<0.05), ** (p<0.001); Univariable logistic regression – unadjusted, Model I – all variables of interest included, Model II – restricted to only significant variables from univariable regression.

4.5 Bivariate analysis of risk factors associated with depressive symptoms – samples comparison

Table 13 presents distribution of risk factors associated with depressive symptoms among the countries and their comparison. There was a significant difference between the countries for many of the risk factors that are associated with depressive symptoms. South – Korean residents had higher proportion of residents who had depressive symptoms (p=0.01). The Norwegian sample had a higher proportion of residents over 85 years old, while the South – Korean sample had a higher proportion of residents in other two groups that were younger. When it comes to cognitive function and ADL's, the South – Korean sample had a higher proportion of residents who had severe functional and cognitive impairment (p<0.001). Norwegian residents were more engaged in social activities while South – Korean residents had predominantly low social engagement (p<0.001). In addition, the Norwegian sample had a higher proportion of residents who had conflicts with other residents/staff (p<0.001) and who experienced negative life events during the past 90 days (p<0.001). On the other hand, South – Korea had a higher proportion of residents who were lonely (p<0.001). There was no significant difference between Norway and South – Korea when it comes to pain, chronic diseases, and aggressive behaviour.

Table 13 - Bivariate analysis of risk factors associated with depressive symptoms - sample comparison **N =588**

Variables		N = 261 Norway *n* (%)	N =327 South-Korea *n* (%)	*P*- Value
DRS Scale	Yes	99 (39.6)	151 (60.4)	0.016*
	No	161 (49.7)	163 (50.3)	
Age	<75	31 (32.0)	66 (68.0)	<0.001**
	75-84	74 (35.4)	135 (64.6)	
	85+	156 (55.3)	126 (44.7)	
Gender	Male	87 (53.4)	76 (46.6)	0.006*
	Female	173 (40.8)	251 (59.2)	
Length of Stay (years)	≤1 year	126 (40.6)	184 (59.4)	0.054
	2+ years	135 (48.6)	143 (51.4)	
Activities of Daily Living (ADLH 0 - 6)	0 – 1	62 (60.8)	40 (39.2)	<0.001**
	2 – 3	107 (53.8)	92 (46.2)	
	4 – 6	91 (31.8)	195 (68.2)	
Cognitive Function (CPS 0 - 6)	0 – 1	78 (70.3)	33 (29.7)	<0.001**
	2 – 3	118 (44.4)	148 (55.6)	
	4 – 6	59 (30.4)	135 (69.6)	
Pain (PS 0 – 3)	*Mdn* (IQR)	1.00 (1)	0.00 (1)	0.116
Chronic diseases (0 – 8)	One disease	129 (42.0)	178 (58.0)	0.138
	Two or more	131 (48.2)	141 (51.8)	
Social Engagement (RISE 0 – 6)	0 – 2 – Low	90 (30.1)	209 (69.9)	<0.001**
	3 – 6 – Moderate to high	155 (60.1)	103 (39.9)	
Conflict with other residents/staff	Yes	89 (59.7)	60 (40.3)	<0.001**
	No	171 (40.0)	256 (60.0)	
Loneliness	Yes	27 (23.7)	87 (76.3)	<0.001**
	No	230 (50.2)	228 (49.8)	
Negative life events (in last 90 days)	Yes	21 (70.0)	9 (30.0)	0.005*
	No	236 (43.5)	306 (56.5)	

Aggressive behavior (ABS 0 – 12)	0 – No	159 (46.0)	187 (54.0)	0.618
	1 – 4 – Mild to moderate	79 (45.7)	94 (54.3)	
	5 – 12 – Severe	21 (38.9)	33 (61.1)	
Communication (0-8)	*Mdn* (IQR)	2.00 (4)	4.00 (5)	<0.001**

Note: * (p<0.05), ** (p<0.001); Pain and Communication scale scores were compared using Mann-Whitney U test.

4.6 Multivariate Logistic Regression – samples comparison

Table 14 presents results of multivariate logistic regression analysis when the Norwegian and the South – Korean samples were combined. Variables that were significantly associated with depressive symptoms when samples were analysed separately, that is variables from model II, were included in this analysis. This analysis showed that there is no significant difference between the countries in terms of depression, when the model was adjusted for the risk factors that were associated with depressive symptoms. In fact, the Norwegian residents had a lower risk of being depressed compared to South – Korean residents (OR 0.68, p = 0.07), however it was not statistically significant.

Table 14 - Multivariate Logistic Regression Analysis - Country comparison **N = 588**

Variables		Multivariable logistic regression Model II	*P*- Value
		OR (95% CI)	
Age	<75	Reference	
	75-84	1.30 (0.73-2.32)	0.357
	85+	0.82 (0.46-1.44)	0.499
Gender	Male	Reference	
	Female	1.55 (1.00-2.39)	0.048*
Country	Norway	0.68 (0.45-1.03)	
	South-Korea	Reference	0.075
Pain (PS 0 – 3)		1.54 (1.20-1.98)	0.001*
Conflict with other residents/staff	Yes	2.48 (1.55-3.98)	<0.001**
	No	Reference	
Loneliness	Yes	3.34 (2.03-5.52)	<0.001**
	No	Reference	
Aggressive behavior (ABS 0 – 12)	0 – No	Reference	
	1 – 4 – Mild to moderate	2.28 (1.49-3.48)	<0.001**
	5 – 12 – Severe	3.61 (1.76-7.40)	<0.001**

Note: * (p <0.05), ** (p<0.001). Variables that were included in this analysis are variables from model II from both countries.

5 Discussion

This study investigated the prevalence and risk factors of depressive symptoms among nursing homes residents in Norway and South Korea.

5.1 Prevalence of depressive symptoms

This study showed that about 38% of Norwegian and 48% of South - Korean residents were affected by depressive symptoms. The prevalence of depressive symptoms among Norwegian residents was higher than what was reported in the previous studies conducted in Norway (Barca et al., 2009; Iden et al., 2014) and other western countries (Gruber-Baldini et al., 2005; Teresi et al., 2001). The prevalence rate in the South - Korean sample was in contrast with studies previously conducted in Asia (Choi, Jung, & Kim, 2018; O. Kim et al., 2009; L. C. Lin et al., 2005; P. C. Lin et al., 2007) that reported higher prevalence rates. There were two Asian studies that reported lower rates 21 % and 46.2% respectively (Hsu et al., 2013; Tiong et al., 2013). When Norway and South – Korea were compared, there was a significant difference in the prevalence of depressive symptom, but only in a bivariate analysis. However, after adjusting for the risk factors in the multivariate analysis, there was no significant difference, even though there was a tendency that Norwegian residents had lower risk of having depressive symptoms. All potential differences between the countries could be explained by the risk factors associated with depressive symptoms. This means that the mechanisms of depression in the nursing home setting may be the same even these two countries are from two different geographical areas. Both countries had higher prevalence of depressive symptoms than that of community dwelling elderly (Cho et al., 2011). The reason of discrepancy in prevalence rates among different countries or settings might be due to different methodologies and tools previous studies used for clinical screening of depression (Beekman et al., 1999). Another reason could be cultural differences between Western and Asian countries. As Asian countries were influenced by Confucianism, this reflected also on the family values. The expectations of the Asian older people might be bigger compared to Western countries, as it was quite common that children take care of their parents. The transition from extended family structure to nuclear family happened rapidly in South Korea and older persons did not have time to adapt to this rapid change. Nuclear family is a family consisted only of parents and their dependent children (Merriam Webster Dictionary). In addition, women's status in the society is gradually improving, which means that women are more career oriented rather than being at home and taking care of children and parents (O. Kim et al., 2009). Consequently, the number of older

persons placed in nursing homes is increasing. Therefore, elderly in South Korea may have stronger feeling of abandonment and being a burden to their children.

5.2 Risk factors and depressive symptoms

5.2.1 Demographic characteristics

The findings for the association between age, gender and depression are mixed. Some studies reported an association between depression and age (Boorsma et al., 2012; Jongenelis et al., 2004), where age over 85 years showed to have a protective effect, this study in contrast found no association between age and depressive symptoms in multivariate analysis when Norway and South – Korea were compared, which is in accordance with other studies (Eisses et al., 2004; P. C. Lin et al., 2007; Teresi et al., 2001). In both bivariate and multivariate analysis of the Norwegian sample alone, there was a significant association between depressive symptoms and age group 75-84, compared to the younger group. Possibly because of influence of other risk factors that are also correlated with age and ageing. This study found no association between gender and depressive symptoms when countries were compared, but in Norwegian sample alone, there was a significant association between gender and depressive symptoms. That is female residents had higher risk of having depressive symptoms. This might be due to a report bias, that is women having a tendency to report symptoms more often than men or because of the gender inequality and roles women had in the society (Beekman et al., 1999). However, results in the literature varies. One study found that being a male gives higher risk of developing depression (Boorsma et al., 2012), while other studies reported no association between gender and depression (Eisses et al., 2004; Jongenelis et al., 2004; P. C. Lin et al., 2007).

The transition from community-based home care to a nursing home may be a drastic change for elderly. Newly admitted residents seems to have higher risk of developing depressive symptoms as they still didn't adapt to a new environment and built new relationships (Hoover et al., 2010; Kowalska et al., 2013; Watson et al., 2003). This study did not find that length of residency was a significant predictor of depressive symptoms which is in contrast to other studies (Barca, Engedal, Laks, & Selbaek, 2010; P. C. Lin et al., 2007).

5.2.2 Health and functional status

Lack of association between ADL's, chronic diseases and cognitive function in both countries might be due to fact that the majority of residents who live in nursing homes are more physically or cognitively impaired and have more than one chronic disease than community dwelling

counterparts. Which are the main reasons of their transition from community to nursing home. That being said, there will be less discrepancy among the residents as they all have some kind of physical disability and are depending on the help they receive from the caregivers.

Pain was a significant predictor of depressive symptoms in both samples, as well as they were compared. This result was in accordance with other studies (Jongenelis et al., 2004). The number of chronical diseases was not a significant predictor of depression.

5.2.3 Social

After the transition from community to a nursing home, many residents reduce or lose their contacts with friends and family. They need to adapt to a completely new environment and cope with the fact that they are unable to take care of themselves independently. Loss of physical ability and possibility to make decisions can have negative effects on older persons that live in nursing homes. Lack of social contacts can lead to loneliness. The results from this study are confirming the findings from other studies (Jongenelis et al., 2004; O. Kim et al., 2009). Loneliness was significantly associated with depressive symptoms in both countries. When countries were compared loneliness was still a significant predictor of depressive symptoms. However, the direction of this association is not clear. That is, whether residents with depressive symptoms withdraw themselves from social contacts or is it loneliness that causes depressive feelings (Eisses et al., 2004). In South - Korea, loneliness may be evoked by the sudden change in family structure, loss of contacts and the fact that in general a South - Korean older persons look more negative on nursing home. In western world, ageing may have happened earlier, leading to better acceptance of nursing homes in the society. Surprisingly, none of the countries had an engagement in social activities as a significant predictor of depressive symptoms which is in contrast to other studies. In bivariate analysis, it could be noticed that South – Korean residents had significantly lower social engagement than the Norwegian residents. Negative life events as a predictive factor was significant only in bivariate analysis in the South – Korean sample, despite the fact that Norwegian sample had higher proportion of the residents who experienced negative life event. The literature shows that negative life events was found to be a risk factor of depressive symptoms in nursing home setting (Jongenelis et al., 2004).

This study found a positive association between depressive symptoms and aggressive behavior in both samples. Among Norwegian residents who had depressive symptoms, almost a half had expressed aggressive behavior. Even though the association was found in both group with mild to moderate and the group with severe aggressive behavior, the association was stronger in mild

to moderate one. On the other hand, 34.4% of South - Korean residents with depressive symptoms expressed aggressive behavior. However, in multivariate analysis only the group with severe aggressive behavior had a significant association with depressive symptoms. As the majority of the residents in nursing homes have either dementia, cognitive impairment or physical disability this makes this frail population dependent on caregivers and their ability to detect the symptoms of depression. The inability of self-care and dissatisfaction with care given by caregivers can trigger aggressive behavior among residents that can further be one of the causes of elder abuse in a nursing home setting (Cooper et al., 2006). If depressive symptoms are not fully recognized or addressed by caregivers, it can cause conflicts between caregivers and the residents. This study showed that conflicts with the staff and other residents was a significant predictor of depressive symptoms in both countries.

It is important to address this issue, as it is known in the literature that depression in nursing home setting is unrecognized. This is partly because of very comprehensive and time-consuming clinical screening tools for depression for which many nurses do not have required training. In addition, having structured individual interview with residents with dementia or cognitive impairment would be extremely difficult. Which was one of the reasons that a group with severe cognitive impairment was excluded in some of the previous studies. Further, this study found that the high proportion of residents who had depressive symptoms did not have a previous diagnosis of depression. Very few received and active treatment, confirming the findings from previous studies that depression is often unrecognized in nursing home setting (Volicer et al., 2011). If depressive symptoms are recognized on time, the appropriate interventions could be applied to reduce the symptoms of depression as well as other risk factors such as loneliness and aggressive behavior.

Even though there are differences in prevalence rates and how depressive symptoms were expressed by Norwegian and South - Korean residents, we found that mechanism of depressive symptoms among these two countries was the same. Namely, the same risk factors were predictors of depressive symptoms.

5.3 Strengths and limitations

This is the first study of depression in nursing home setting that compared Norway and South Korea. One of the strengths of this study is that an observational scale for depression (DRS) was used in both countries, which made it possible to compare the data internationally. In addition, it makes it possible to include cognitively and severely physically impaired residents that were often excluded in previous studies. The InterRAI LTCF and DRS scale as part of it, is the valid and reliable instrument that can be used in the nursing home setting (H. Kim, Jung, Sung, et al., 2015). In the future nurses could use this scale to screen for depressive symptoms both newly admitted residents and those who lived there longer. This could tremendously improve the quality of life of the nursing home residents. However, there are some limitations. First, this was a cross-sectional study that does not give answers on causality. Longitudinal studies are needed to explore further the etiological pathway of depression in this setting. Second, this study used a secondary data and variables that were available in both countries. Third, there may be a bias by selective refusal. That is, the residents who are depressed might be at higher risk of nonparticipation (Boorsma et al., 2012; Jongenelis et al., 2004). A yes/no question was used to measure loneliness and couple of other variables related to the social relationships, but for future studies it might be more suitable to choose more comprehensive measurement such as Loneliness Scale. In both countries, nursing homes that participated were included on voluntary basis and the residents had to give their consent. Nursing homes that have more depressed residents might not have been willing to participate. Both nonparticipation and inclusion criteria can underestimate the prevalence rate of depression. In addition, the fact that there was lack of association among some risk factors could be due to small sample size in both countries.

6 Conclusion

Even though there were limitations, this study provides an evidence of very high prevalence rates of depressive symptoms in Norwegian and South – Korean nursing homes. Pain, conflicts with other residents/staff, loneliness and aggressive behavior were found to be significant predictors of depressive symptoms in both countries. Age, and gender were associated with depressive symptoms only in the Norwegian sample. High proportion of the residents with depressive symptoms did not have diagnosis of depression. Special attention on recognition of depressive symptoms and psychosocial factors should be the main goals for improving care and quality of life in the nursing home setting.

Bibliography

Achterberg, W., Pot, A. M., Kerkstra, A., Ooms, M., Muller, M., & Ribbe, M. (2003). The effect of depression on social engagement in newly admitted Dutch nursing home residents. *Gerontologist, 43*(2), 213-218.

Achterberg, W., Pot, A. M., Kerkstra, A., & Ribbe, M. (2006). Depressive symptoms in newly admitted nursing home residents. *International Journal of Geriatric Psychiatry, 21*(12), 1156-1162. doi:10.1002/gps.1623

Ayalon, L., Fialová, D., Areán, P. A., & Onder, G. (2010). Challenges associated with the recognition and treatment of depression in older recipients of home care services. In *International Psychogeriatrics* (Vol. 22, pp. 514-522).

Barca, M. L., Engedal, K., Laks, J., & Selbaek, G. (2010). A 12 months follow-up study of depression among nursing-home patients in Norway. *Journal of Affective Disorders, 120*(1-3), 141-148. doi:10.1016/j.jad.2009.04.028

Barca, M. L., Selbaek, G., Laks, J., & Engedal, K. (2009). Factors associated with depression in Norwegian nursing homes. *International Journal of Geriatric Psychiatry, 24*(4), 417-425. doi:10.1002/gps.2139

Beekman, A. T., Copeland, J. R., & Prince, M. J. (1999). Review of community prevalence of depression in later life. *British Journal of Psychiatry, 174*, 307-311.

Blekken, L. E. (2016). Faecal incontinence, constipation and laxative use: Epidemiology and development of an implementation strategy for improving incontinence care in nursing homes. In: NTNU.

Boorsma, M., Joling, K., Dussel, M., Ribbe, M., Frijters, D., van Marwijk, H. W., . . . van Hout, H. (2012). The incidence of depression and its risk factors in Dutch nursing homes and residential care homes. *American Journal of Geriatric Psychiatry, 20*(11), 932-942. doi:10.1097/JGP.0b013e31825d08ac

Brownie, S., & Horstmanshof, L. (2011). The Management of Loneliness in Aged Care Residents: An Important Therapeutic Target for Gerontological Nursing. *Geriatric Nursing, 32*(5), 318-325. doi:10.1016/j.gerinurse.2011.05.003

Burrows, A. B., Morris, J. N., Simon, S. E., Hirdes, J. P., & Phillips, C. (2000). Development of a minimum data set-based depression rating scale for use in nursing homes. *Age and Ageing, 29*(2), 165-172.

Carpenter, I., & Hirdes, J. P. (2013). *Using interRAI assessment systems to measure and maintain quality of long-term care*. Paris: Paris: OECD Publishing.

Cho, M. J., Chang, S. M., Lee, Y. M., Bae, A., Ahn, J. H., Son, J., . . . Kim, B. S. (2010). Prevalence of DSM-IV major mental disorders among Korean adults: A 2006 National Epidemiologic Survey (KECA-R). *Asian Journal of Psychiatry, 3*(1), 26-30. doi:10.1016/j.ajp.2010.01.009

Cho, M. J., Lee, J. Y., Kim, B. S., Lee, H. W., & Sohn, J. H. (2011). Prevalence of the major mental disorders among the Korean elderly. *Journal of Korean Medical Science, 26*(1), 1-10. doi:10.3346/jkms.2011.26.1.1

Choi, H., Jung, Y. I., & Kim, H. (2018). Factors related to aggressive behaviors among older adults in nursing homes of Korea: A cross-sectional survey study. *International Journal of Nursing Studies, 88*, 9-15. doi:10.1016/j.ijnurstu.2018.07.014

Chow, E. S., Kong, B. M., Wong, M. T., Draper, B., Lin, K. L., Ho, S. K., & Wong, C. P. (2004). The prevalence of depressive symptoms among elderly Chinese private nursing home residents in Hong Kong. *International Journal of Geriatric Psychiatry, 19*(8), 734-740. doi:10.1002/gps.1158

Chung, S. (2008). Residential status and depression among Korean elderly people: a comparison between residents of nursing home and those based in the community. *Health Soc Care Community, 16*(4), 370-377. doi:10.1111/j.1365-2524.2007.00747.x

Colombo, F., ., & et al. *Help Wanted?* : OECD Publishing.

Cooper, C., Katona, C., Finne-Soveri, H., Topinkova, E., Carpenter, G. I., & Livingston, G. (2006). Indicators of elder abuse: a crossnational comparison of psychiatric morbidity and other determinants in the Ad-HOC study. *American Journal of Geriatric Psychiatry, 14*(6), 489-497. doi:10.1097/01.JGP.0000192498.18316.b6

Eisses, A. M., Kluiter, H., Jongenelis, K., Pot, A. M., Beekman, A. T., & Ormel, J. (2004). Risk indicators of depression in residential homes. *International Journal of Geriatric Psychiatry, 19*(7), 634-640. doi:10.1002/gps.1137

Fries, B., Simon, S., & Morris, J. (2001). Pain in US nursing homes: validating a pain scale for the Minimum Data Set. *Gerontologist, 41*(2), 173-179.

Gruber-Baldini, A. L., Zimmerman, S., Boustani, M., Watson, L. C., Williams, C. S., & Reed, P. S. (2005). Characteristics associated with depression in long-term care residents with dementia. *Gerontologist, 45 Spec No 1*(1), 50-55. doi:10.1093/geront/45.suppl_1.50

Hoover, D. R., Siegel, M., Lucas, J., Kalay, E., Gaboda, D., Devanand, D. P., & Crystal, S. (2010). Depression in the first year of stay for elderly long-term nursing home residents in the USA. *International Psychogeriatrics, 22*(7), 1161-1171. doi:10.1017/S1041610210000578

Hsu, Y. C., Badger, T., Reed, P., & Jones, E. (2013). Factors associated with depressive symptoms in older Taiwanese adults in a long-term care community. *International Psychogeriatrics, 25*(6), 1013-1021. doi:10.1017/S1041610213000240

Iden, K. R., Engedal, K., Hjorleifsson, S., & Ruths, S. (2014). Prevalence of depression among recently admitted long-term care patients in Norwegian nursing homes: associations with diagnostic workup and use of antidepressants. *Dementia and Geriatric Cognitive Disorders, 37*(3-4), 154-162. doi:10.1159/000355427

Jackson, J. M., Seth, P., DiClemente, R. J., & Lin, A. (2015). Association of Depressive Symptoms and Substance Use With Risky Sexual Behavior and Sexually Transmitted Infections Among African American Female Adolescents Seeking Sexual Health Care. *American Journal of Public Health, 105*(10), 2137-2142. doi:10.2105/AJPH.2014.302493

Jeon, B., & Kwon, S. (2017). Health and Long-Term Care Systems for Older People in the Republic of Korea: Policy Challenges and Lessons. *Health Systems & Reform, 3*(3), 214-223. doi:10.1080/23288604.2017.1345052

Jongenelis, K., Pot, A. M., Eisses, A. M., Beekman, A. T., Kluiter, H., & Ribbe, M. W. (2004). Prevalence and risk indicators of depression in elderly nursing home patients: the AGED study. *Journal of Affective Disorders, 83*(2-3), 135-142. doi:10.1016/j.jad.2004.06.001

Kim, H., Jung, Y. I., & Kwon, S. (2015). Delivery of institutional long-term care under two social insurances: Lessons from the Korean experience. *Health Policy, 119*(10), 1330-1337. doi:10.1016/j.healthpol.2015.07.009

Kim, H., Jung, Y. I., Sung, M., Lee, J. Y., Yoon, J. Y., & Yoon, J. L. (2015). Reliability of the interRAI Long Term Care Facilities (LTCF) and interRAI Home Care (HC). *Geriatr Gerontol Int, 15*(2), 220-228. doi:10.1111/ggi.12330

Kim, O., Byeon, Y. S., Kim, J. H., Endo, E., Akahoshi, M., & Ogasawara, H. (2009). Loneliness, depression and health status of the institutionalized elderly in Korea and Japan. *Asian Nursing Research, 3*(2), 63-70. doi:10.1016/S1976-1317(09)60017-7

Kowalska, J., Rymaszewska, J., & Szczepanska-Gieracha, J. (2013). Occurrence of cognitive impairment and depressive symptoms among the elderly in a nursing home facility. *Adv Clin Exp Med, 22*(1), 111-117.

Kvael, L. A. H., Bergland, A., & Telenius, E. W. (2017). Associations between physical function and depression in nursing home residents with mild and moderate dementia: a cross-sectional study. *BMJ Open, 7*(7), e016875. doi:10.1136/bmjopen-2017-016875

Lenze, E. J., Rogers, J. C., Martire, L. M., Mulsant, B. H., Rollman, B. L., Dew, M. A., . . . Reynolds, C. F., 3rd. (2001). The association of late-life depression and anxiety with physical disability: a review of the literature and prospectus for future research. *American Journal of Geriatric Psychiatry, 9*(2), 113-135.

Lin, L. C., Wang, T. G., Chen, M. Y., Wu, S. C., & Portwood, M. J. (2005). Depressive symptoms in long-term care residents in Taiwan. *Journal of Advanced Nursing, 51*(1), 30-37. doi:10.1111/j.1365-2648.2005.03457.x

Lin, P. C., Wang, H. H., & Huang, H. T. (2007). Depressive symptoms among older residents at nursing homes in Taiwan. *Journal of Clinical Nursing, 16*(9), 1719-1725. doi:10.1111/j.1365-2702.2007.01743.x

McDougall, F. A., Matthews, F. E., Kvaal, K., Dewey, M. E., & Brayne, C. (2007). Prevalence and symptomatology of depression in older people living in institutions in England and Wales. *Age and Ageing, 36*(5), 562-568. doi:10.1093/ageing/afm111

Morris, J., Fries, B., & Morris, S. A. (1999). Scaling ADLs within the MDS. *The Journals of Gerontology, 54b*(6), M546-553.

Park, J. H., Kim, K. W., Kim, M. H., Kim, M. D., Kim, B. J., Kim, S. K., . . . Cho, M. J. (2012). A nationwide survey on the prevalence and risk factors of late life depression in South Korea. *Journal of Affective Disorders, 138*(1-2), 34-40. doi:10.1016/j.jad.2011.12.038

Schroll, M., Jonsson, P. V., Mor, V., Berg, K., & Sherwood, S. (1997). An international study of social engagement among nursing home residents. *Age and Ageing, 26 Suppl 2*, 55-59.

Teresi, J., Abrams, R., Holmes, D., Ramirez, M., & Eimicke, J. (2001). Prevalence of depression and depression recognition in nursing homes. *Social Psychiatry and Psychiatric Epidemiology, 36*(12), 613-620.

Tiong, W. W., Yap, P., Huat Koh, G. C., Phoon Fong, N., & Luo, N. (2013). Prevalence and risk factors of depression in the elderly nursing home residents in Singapore. *Aging Ment Health, 17*(6), 724-731. doi:10.1080/13607863.2013.775638

Volicer, L., Frijters, D. H. M., & van Der Steen, J. T. (2011). Underdiagnosis and undertreatment of depression in nursing home residents. *European Geriatric Medicine, 2*(6), 332-337. doi:10.1016/j.eurger.2011.08.001

Watson, L. C., Garrett, J. M., Sloane, P. D., Gruber-Baldini, A. L., & Zimmerman, S. (2003). Depression in assisted living: results from a four-state study. *American Journal of Geriatric Psychiatry, 11*(5), 534-542.