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Infections and Injuries in Dementia Patients

Thesis

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Thesis abstract

Dementia is a continuous, permanent deterioration in mental functions manifested by deficit in memory and cognitive abilities. These factors escalate the situation of dementia patients to hazardous incidences of infections and injuries.

The aim of this thesis is to assess and incorporate researched information about the risk factors that bind dementia patients to the most common infections and injuries found on long term. The purpose of this thesis is to have an insight on the mechanisms causing the decline in dementia patients and to recognize areas which can be acted upon during the care to prevent recurrently occurring infections and injuries in dementia patients.

Data was collected by literature review method. Online databases and articles were used to find contemporary data. The collected data was analysed by the guidelines of content analysis. The found data was read thoroughly and the findings were categorized to determine results.

The results of the thesis suggested numerous risk factors which were grouped under two headings for the purpose of clarity and individually the factors causing infection and injuries in dementia patients were reviewed and analysed.

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Tables and figures

Abbreviations

AD	Alzheimer's Disease
ADL	Activities of Daily Living
CATCH	Critically Attained Threshold of Cerebral Hypo-perfusion
CJB	Creutzfeldt-Jakob disease
DLB	Dementia with Lewy bodies
EHE	Enhancing the Healing Environment
GCS	Glasgow Coma Scale
ISS	Injury Severity Score
MCI	Mild Cognitive Impairment
MCV	Mean Corpuscular Volume
MMSE	Mini Mental State Examination
RDA	Recommended Daily Allowances
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization

INTRODUCTION

Dementia, as represented in this thesis, is a disease commonly occurring in people aged above 50 years, progressively disintegrating mental faculties to nullity. In an effort to understand the complexities of the processes that dominate during the course of the disease, it is invaluably essential to get accustomed to the modifying factors which define the illness. There has been considerable amount of studies in this regard and some of the attributed variables were hypertension, high erythrocyte Mean Corpuscular Volume (MCV) levels, poor pulmonary functions and aetiologies affecting cerebral circulation in general. (Verghese 2013.)

The onset, progress and prognosis in dementia vary from person to person, hence making the care relatively difficult. Due to the fact, that dementia is an associated feature in many neurological diseases; it is impossible to predict the pace of decline in the patients. The progressive nature of the disease makes the decline certain but not definite, hence a systematic approach is required to get acquainted with the risks in every presented case. (Wierenga & Bondi 2011.)

The endeavour of this review was to know the status of the individual suffering from dementia where the common understanding in general, of physical and biological dangers are gradually becoming blurred and the risks to which he or she is exposed to' due to loss of cognitive functions and memory. To counterbalance the effects of the disease and boost the quality of life, the care-giver must act as surrogate decision maker in important situations, as well as in activities of daily living, to prevent potentially critical circumstances precipitating health risks. (Draper 2011.)

1 Dementia

Dementia is relatively defined in health sciences literatures but the most relevant definition used for this study is described by the World Health Organization (WHO). WHO defines dementia as a syndrome where there is chronic or progressive impairment of memory and cognitive functions of an individual which is characterised by memory deficit, dissociated thought-process, loss of orientation of space and time, aphasia and behavioral changes. (WHO 2012a.)

In dementia, the neuro-pathological and neuropsychological effects incapacitates a person in routine activities of daily living, progressively deeming them physically and emotionally incapable and exposing them to various vulnerabilities (Wierenga & Bondi 2011). Primarily dementia is identified with mild amnesia in very early stages, which progresses gradually or rapidly depending on the underlying disease. In early stages, the memory loss is not evident and could be attributed to simple forgetfulness, but it is fairly noticeable due to the nature of the disease over a period of time. In such situation, a term mild cognitive impairment (MCI) is commonly used to describe the clinical status of the patient. In addition to memory loss, the cognitive functions begin to decline and impede the activities of daily living, compounding the overall reduction of neuropsychological functions. This acquired deterioration of cognitive functions impairs the mental faculties which include visuo-spatial abilities, language processing, basic mathematical accuracy and problem solving. (Longo, Fauci, Kasper, Hauser, Jameson & Loscalzo 2012.)

Cognition as described in Oxford Dictionaries (2015):

> The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses.

Cognition involves basic comprehension and interpretation of any abstract knowledge through the process of logical reasoning, perception, awareness or occasional intuition (Venes & Taber 2005). Thought processing, language usability, calculation, judgment, learning ability, intelligence and socio-psychological behaviour form an integral part of cognition. In cognitive deficit

disorders such as dementia, the disease potentially depreciates the basic ability of the individual to comprehend thoughts and awareness using logical reasoning and perception leading to further memory impairment. (Longo et al. 2012.) The estimation of the incidence of dementia worldwide by WHO (2012b) can be found in figure 1.

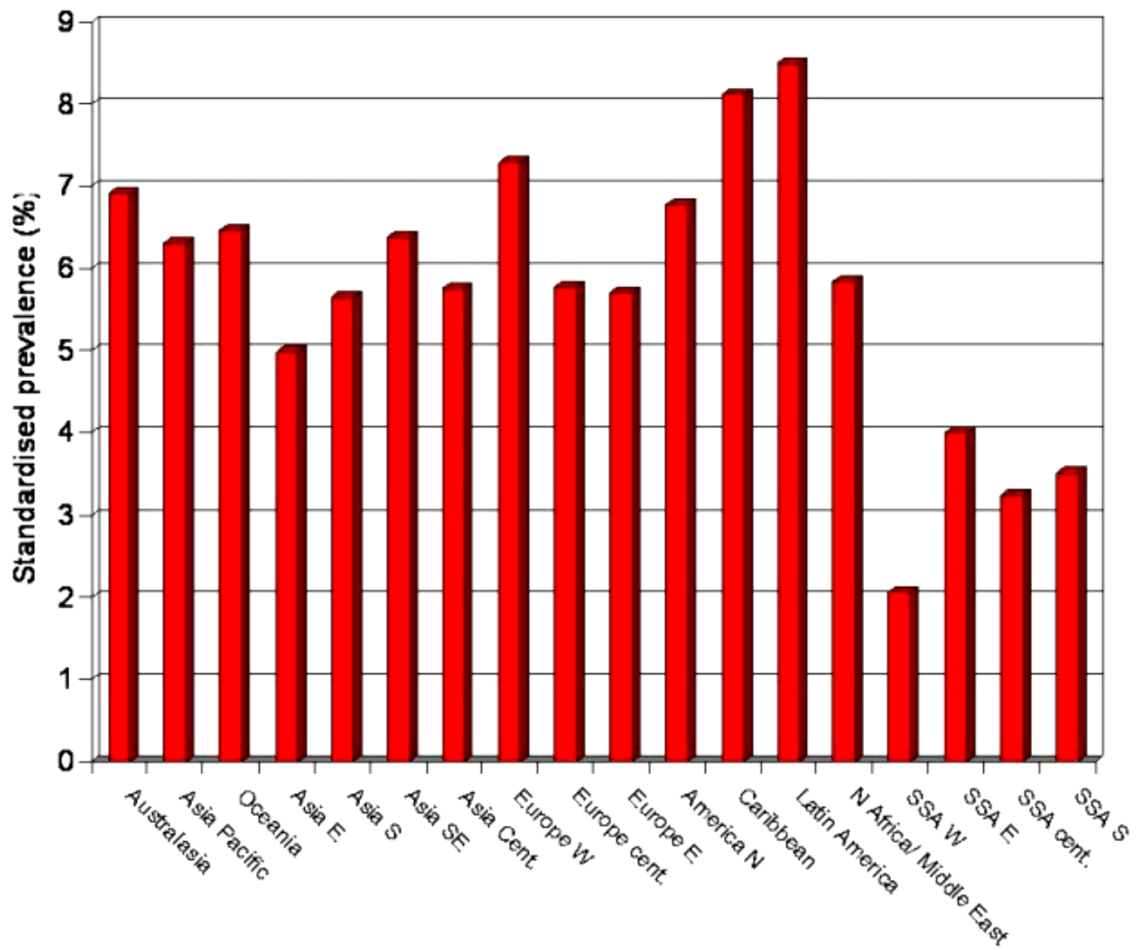FIGURE 1: Estimated incidence of dementia globally according to WHO (2012b).

1.1 Classification of dementia

The most common form of dementia is found in Alzheimer's disease (AD) worldwide. It accounts for almost 60-70% cases of dementia, other less common forms are vascular dementia, dementia with Lewy bodies (DLB), fronto-temporal dementia and dementias associated with chronic illnesses. (WHO 2012a.)

1.1.1   Alzheimer's Disease

AD, being the principle cause of dementia around the globe, usually occurs in age above 45. The clinical presentation is the impairment in the ability to process and remember new information which is classically seen with gradual memory loss and degeneration of other cortical functions. It affects both short-term and long-term memory but it is identified with the pronounced loss of short-term memory in day to day life. Advanced cases typically show features of apraxia (distorted motor functions), aphasia and disorientation of space and time. Most cases have either depression or aggression or both due to the initial awareness of loss of cognitive functions. (Draper 2011.)

1.1.2   Vascular dementia

Vascular dementia is caused when the disease affects the circulation of brain and is classed under cerebrovascular diseases. It is the second most common form of dementia after AD and has an incidence rate of about 20-30 per cent of all dementias. Earlier in the 19th century it was called as arteriosclerotic dementia. It is mostly common after an episode of stroke or cerebrovascular bleed. The sign and symptoms vary in vascular dementia as the primary cause is circulatory disturbances in the brain, like thromboembolism or cerebral bleed which may occur in different areas of the brain leading to different presentation of the disease. The presentation may mimic AD but further investigations and underlying arteriosclerotic disturbances may give a differentiating picture of the disease. Classically all vascular dementia patients have a history of thromboembolism and related symptomatological findings in the past. (Draper 2011.)

1.1.3   Dementia with Lewy bodies

As reported by Draper (2011), dementia with Lewy bodies (DLB) is characterized as a neurodegenerative disorder with signs of dementia and Parkinson's disease. This dementia is associated with symptoms of hallucinations and delusions; and adverse effects of medication for Parkinson's are known to worsen these

symptoms. The clinical features of DLB are very definitive as the presentation of dementia is relatively more rapid compared to other forms of dementia. The sign and symptoms of DLB include progressive cognitive impairment with poor attention and decline in visuospatial functions. Confusion and depression may occur frequently leading to a lucid state depending on the anti-psychotic medication. Recurrent falls, fainting episodes and accidental injuries are common in DLB. Draper also states that "Lewy bodies are found in neurons and contain the protein alpha-synuclein, which interferes with neuronal function."

1.1.4   Fronto-temporal dementia

As the term fronto-temporal dementia suggests, the disease primarily affects the frontal and the temporal regions of the brain. Fronto-temporal dementia is a less common form of dementia and is seen in Pick's disease where a characteristic Pick bodies is observed in the affected neurons. Other than Pick's disease, frontotemporal dementia includes progressive wasting and loss of nerve cells in the frontal and temporal regions of the brain. Thence, the language centres and speech areas are affected pre-dominantly. Since, the frontal lobe is responsible for higher brain functions like judgment, reasoning and personality traits, in this form of dementia mood disorders are common along with behavioral changes. Depending on the affected regions, fronto-temporal dementia is divided into two sub-categories, behavioral-variant fronto-temporal dementia and semantic dementia. (Draper 2011.)

1.1.5   Dementia secondary to chronic ailments

Many chronic diseases present signs and symptoms of dementia which may be associated or part of a syndrome complex. Commonly found neurodegenerative dementias secondary to other chronic diseases are in Huntington's disease, Creutzfeldt-Jakob disease (CJD), neurosyphilis, senile dementia, hydrocephalus, head injuries and brain infections including meningitis. Among all the other causes of dementia in chronic diseases, CJD is known to be the most progressive and

rapidly declining form of dementia with life expectancy of less than two years. Dementia is also found in long-term substance abuse such as alcohol and narcotic substances. Thiamine deficiency secondary to alcohol abuse and Wernicke-Korsakoff syndrome is also suggested to be a pre-cursor of dementia in alcoholics and substance abusers. (Draper 2011.)

1.2 Memory loss related to dementia

Memory is the most common cognitive ability lost with dementia. Memory is a phenomenon of the brain which facilitates processing, recollecting and storing information over short or long periods of time. As memory is related in terms of time, the classification of memory is based on the duration of time in which the memory is retained. Apart from sensory memory, short term and long term memory are two broader classes, which further divide into subtypes. (Longo et al. 2012.)

The long-term memory subtypes which stores past occurrences and experiences are affected in AD which in turn results in semantic and episodic memory loss. Semantic memory stores information which forms conceptual memory based on facts and hence the loss of semantic memory affects the cognitive functions heavily in dementia from AD. It is agreed that AD is recognized and diagnosed clinically in early stages with the evident signs and symptoms of memory loss, with or without dysphagia and visual disorientation. As will be explained further, hippocampal neuronal circuit responsible for long-term memory and semantics are gradually degenerating, influencing the executive functions (Longo et al. 2012.) Degeneration of working memory situated in the fronto-temporal and fronto-parietal cortex usually is displayed by the increasing levels of distraction exhibited during memory exercises (Holger 2013). The types of human memory referred to, by Mastin (2010) are visualized in figure 2.
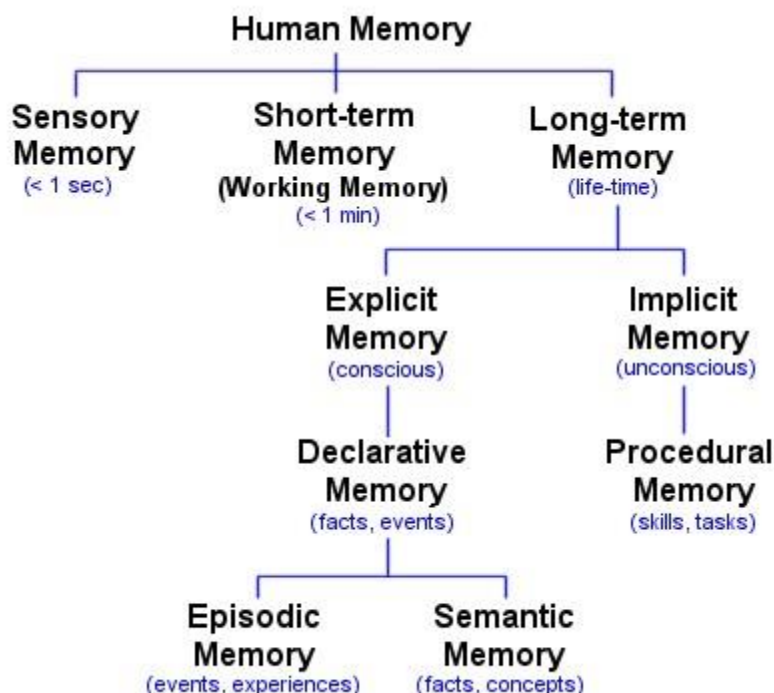
FIGURE 2: Types of human memory referred to, by Mastin (2010).

1.3   Cognitive deficit

As described and introduced earlier, the Oxford Dictionary (2015) defines cognition as a complex mechanism of the mental faculties of an individual in reasoning, problem-solving, evaluating, decision-making, theorizing and thought processing using memory and sensory abilities. According to Härlein, Dassen, Halfens & Heinze (2009), altered behavior forms an important marker to assess cognitive deficits, which manifests through altered personality changes, as in fronto-temporal dementia. Impaired cognition is visible by loss of emotional warmth, selfishness, apathy, altered eating behaviour, socially and sexually inappropriate behaviours, irritability, and compulsive behaviours, usually accompanied by loss of awareness or concern about the behavioural change. A defunct cognitive ability is the most probable sign in dementia but may occur with some degree of amnesia. As cognition is also responsible for orientation of space and time with the physical surrounding, deterioration in cognitive functions has a direct impact on the daily activities of living, exposing the affected individual to higher risks of physical harm including physiological injury due to lack of reasoning

of personal habits and hygiene. In other words individuals suffering from dementia are predisposed to simple infections and trivial injuries which otherwise would be avoidable. Figure 3 explains the different types of cognitive functions.
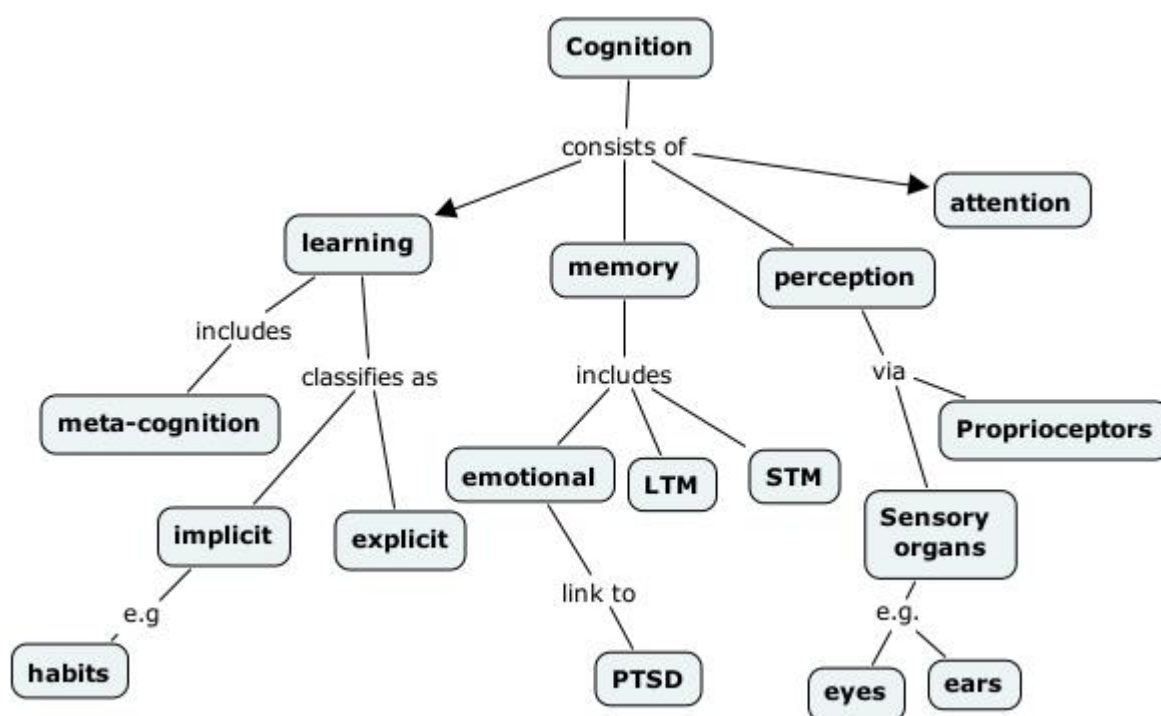
FIGURE 3: Cognition. (IHMC CmapTools)

2 Patho-physiological uncertainties in dementia

In AD, the affected region of brain is usually the hippocampal area which includes a circular pathway of neurons which is responsible to manage episodic memory along with semantic memory (Longo et al. 2012). As described earlier, the neurological and cognitive deficit imposes a serious long-term health risk to patients suffering from dementia, as in they are predisposed to infections due to inability to maintain proper hygiene and social inhibition. A normal response for precaution of a disease is practicing aseptics and proper hygiene, but failure to learn new experiences and loss of conceptual memory disables the dementia patient to take simple precautions leading to avoidable infections. (D'Agata, Loeb & Mitchell 2013.)

According to D'Agata, Loeb & Mitchell (2013) the most common infection routinely diagnosed in dementia patients is urinary tract infection with high frequency of recurrence especially in advanced cases of dementia where the patient is bedridden and is totally dependent on health care professionals for personal hygiene.

The other forms of infections are skin and soft tissue infections secondary to decubitus ulcers and dry skin due to improper circulation. By far the most lethal infection in patients suffering from dementia is pneumonia. (Zimmerman, Gruber-Baldini, Hebel, Sloane & Magaziner 2002.)

Interestingly, another contentious point of view is quoted by Ribbe, Van der Wal, Heintz, Van der Steen, Mehr, & Ooms (2004) regarding invasive interventional procedures in the care of dementia patients suffering from pneumonia and the resultant pros and cons of such interventions. It was argued and debated in reference to monetary situations; whether such interventions were needed, as full recovery was never possible in dementia patients. However, the counter argument was to deploy invasive interventional procedures in accordance to improve the quality of life, which was regarded as a goal of prime importance.

2.1   Ramifications of infections and inflammatory responses

According to Zimmerman et al. (2002), approximately 1.5 million infections are reported in dementia patients residing in care homes. Out of which 5-10% of the cases are fatal in nature. Infection is the most common reason for hospital visits and admissions. It is known that delirium secondary to inflammatory response of any origin, both chronic and acute has a progressive effect on neurodegenerative process accelerating brain atrophy and overall decline of cognitive functions.

Systemic infections have shown to have biochemical alteration in brain chemistry on a molecular level increasing the risk of delirium and also perpetuate cognitive deficits and memory loss. Inflammatory mediators such as interleukins, tumour necrosis factors and prostaglandins induce biochemical cascade during inflammation to cause delirium, which is more obtuse in dementia patients. Successful anti-microbial and anti-inflammatory therapies although improve the general condition, they are unable to control the acceleration of neuronal loss leading to permanent loss of higher brain function after recovery. The incidence rate of delirium rises with every subsequent inflammatory response in the body contributing to rapid decline of brain physiology. (Cunningham 2011.)

2.2   Altered nutritional status and metabolism

Ragdale (2014) argues the alteration in cognitive and sensory functions destabilizes the hunger, appetite and satiety centers in the brain leading to improper diet and food habits, especially a disinterest towards food due to lack of sensory urges. It was indicated that the physiological functioning of the gastro-intestinal system is intact in dementia patients too, but it is the lack of sensory functions which are key elements for appetite arousal and satiety stimulus leading to malnutrition and wasting in a long-term dementia patients except in fronto temporal dementia where the patients are prone to overeating and subsequent gain in weight. Progressive brain deterioration reduces the sensory inputs required for healthy appetite and hence the patient shows little or no interest in food which would otherwise be interesting, for example not recognizing the favourite food of an individual in question.

Unintentional weight loss and malnutrition is seemingly increasing factor which can be attributed to staffing of the care institution, existing comorbid conditions in the patient and progression of dementia. A very important factor in malnutrition and frailty of dementia patients is chronic pain, almost 45-80 percent of dementia patients suffer from chronic pain, which has a direct impact on the daily activities of living and decidedly on appetite and nutrition. Regular pain medication helps in such cases, but special therapy like opioids often give undesirable adverse effects such as constipation, hypotension, ataxia leading to increase in risk of accidental falls. Opioids also reduce appetite compounding the malnutrition and frailty in an already compromised-cognitive state of a dementia patient. (Unwin, Porvaznik & Spoelhof 2010.)

2.3 Co-existing diseases

Kovach, Logan, Simpson & Reynolds (2010) pointed out that; there is minimum one co-morbid condition present in almost 93% of AD cases globally. And, statistically, most of the AD cases require acute care therapy because of the co-morbid condition, rather than dementia.

Recent studies (Wang, Guo, Shen, Kream, Mantione & Stefano 2014) show that pre-existing chronic diseases or conditions developing simultaneously have an association with the development of AD, such as type 2 diabetes mellitus (T2DM). T2DM has definite vascular pro-inflammatory changes in the body including micro-circulation of the brain. The vascular continuity is maintained crucially by the endothelial layer of the vasculature. Glucose metabolism is affected in T2DM which results in vasculopathies across the circulatory vessels throughout the body. Interestingly, vascular changes of similar nature are predominantly observed in both AD and T2DM. Vascular changes are susceptible to inflammatory agents like leukocyte-derived cytokines and endothelial-derived chemotactic agents culminating to organ dysfunction. Sclerotic changes of the vasculature retard the brain perfusion and impaired glucose metabolism hastens ageing process, thereby predisposing neuronal metabolism in a state of vulnerability. Declining cerebral

circulation and ageing together forms an event known as 'Critically attained threshold of cerebral hypo-perfusion' (CATCH).

Additionally, according to Gąsecki, Kwarciany, Nyka & Narkiewicz (2013), hypertension is another systemic disease which magnifies the prognosis of dementias, especially vascular dementia. Arterial hypertension is known to cause emergence and development of cerebro-vascular diseases and hence impacts the declining cognitive functions in dementia patients. With increasing average life-expectancy across the globe, concurrent studies of cognition in hypertensive and ageing has been carried out to reflect that, poorly controlled blood pressure has an obvious presence in declining cognitive functions in individuals above 70 years of age. Lower scores of Mini Mental State Exam (MMSE) were routinely found in subjects with poorly managed systolic blood pressure. The ever rising incidence rates of co-morbid conditions like hypertension and DM are potential modifying factors in progress of dementia worldwide.

3 External risk factors and dependencies

It has been observed that the probability of injuries in dementia patients is two to three times higher than the individuals in the same age group and according to the review paper by Härlein, Dassen, Halfens & Heinze (2009), it has been seen as a deficit of the motor controls which is particularly very high in dementia patients. The incidence rate of falls among dementia patients' population in nursing care homes is approximately 50% annually, out of which nearly 4% have moderate to severe fractures requiring hospitalization. (Van Doorn et al. 2003.)

Certain studies suggest that gait abnormalities are not only simple automated motor function, but also executive cognitive functions. The study reflects on the relationship between dysfunction in gait and dementia in patients with neurodegenerative diseases. A finding of the study points out that gait involves definitive cognitive executive functions while performing tasks and hence an impaired cognition poses a continuous threat for the risk of falls and injuries in patients with concurrent dementia and ataxia. Statistically, ataxia is seen in 35% of individuals of age above 70 years and the prevalence percentage increases up to 46% in people who are 85 years old or above (Amboni, Barone & Hausdorff 2013.)

Kearney, Harwood, Gladman, Lincoln & Masud (2013) explains the intricacies of executive functions, falls and gait abnormalities with various researches conducted elsewhere exploring the obvious possibility of fall prevention in dementia patients and advocating future research in the subject with different variables such as fall prevention strategies, risk assessment, gait speed decline ratios, etcetera. According to Kearney et al. review, a gradual decline in executive cognitive functions like decision-making, reasoning abilities, problem solving capabilities are directly proportional to the risks of falls and consequential injuries. The adaptability of changing environment and focus on gait speed is remarkably challenged in cognition deficit individuals, thereby creating a vulnerability to injury prone accidents in dementia patients.

Another distinctive element which amplifies liability in dementia patients is frailty, which is depicted by weight loss, weakness, gross inactivity and exhaustion. The likelihood of frail individuals having accidental falls is much greater with dementia

as a co-morbid condition. The mortality rate of dementia patients with frailty is six times more compared to those who do not have frailty and malnutrition. The prognosis of disease progression is twice as rapid as in dementia patients without frailty. Nursing interventions for prevention of malnutrition and frailty is to assess factors such as degree of cognitive deficit, nutritional needs, physical disabilities and other co-existing conditions. (Unwin, Porvaznik & Spoelhof 2010.)

3.1   External environment and accommodation facilities

As reported by Cook (2011), onset of dementia deteriorates the sensory stimulation of an individual but the progress of this sensory deprivation may not be very profound in the beginning. Essentially the external environment is perceived through the senses of smell, touch, vision, olfaction and taste specifically in dementia subjects, the sensory functions which forms important executive actions are also affected along with cerebral atrophy. It is often noted that the delusions and hallucinations are representation of the external surroundings interpreted in faulty manner due to the pathology of the disease. Although sensory impairment remarkable alters dementia patient's ability to interact with the external habitat, if the external surrounding is in accordance to likeability of the concerned patient, the outcome of long-term patient-centric care has better life-expectancy.

The architectural design of a care home for dementia patients has to be age-appropriate. The décor and furnishings in area of living affects the mood and emotional responses in general and hence dementia patients have noticeable effects such as mood swings, agitation, aggression and altered behaviour in an environment which does not agree with their innate nature. Proper ambience in the living premises helps to reduce the episodes of mood flares giving more desirable outcome for dementia patients on long-term care. Lighting arrangements have special effects on the mood and also sometimes distorts the interpretation in dementia patients. Bright lights often cause restlessness and anxiety in dementia patients giving rise to an alienated feeling coupled with hallucinations. On the contrary the sense of hearing is upheaved with mild music, which can be attributed to the sense of feeling good, therefore in many care settings usage of mild music

as a concurrent therapy is effectively utilized. Daily challenges of dementia patients are alleviated in the presence of an ambient environment, thereby improving the quality of life. (Cook 2011.)

A study of Alzheimer's Society in 2009 suggests that the prognosis of dementia increasingly gets worse after hospital visits as patients become more dependent on the care worker (Waller 2012). Waller stated that statistical data of National Audit Office of the NHS in United Kingdom in 2010 predicts the occurrence of dementia to be doubled in the next 30 years and currently almost 25% of admissions to the hospital for acute disease in the elderly, have some form of dementia. Cognitive deficit is aggravated during the hospital visits as the environment is unfamiliar for the patient.

As mentioned by Waller (2012), a programme initiated as 'Enhancing the Healing Environment' (EHE) funded by the King's Fund was designed for improvement of external environment of care including specific activity by the care personnel for dementia patients admitted to the hospital. EHE programme focused on the design and décor of the hospital wards which were to treat dementia patients. Aim of this programme was to modify the existing outlay of hospital premises including care areas, keeping in consideration the emotional response it would evoke in the elderly patients being treated. Another aspect of this programme was to set examples of architectural designs for future modifications of care homes and hospitals alike.

3.2 Activities and Personal habits

As introduced by Tom Kitwood in the 1990s, a patient-centric care is the optimal method for dementia patients. It defines key areas of care such as personal worth, sense of acknowledgement, social confidence and hope. The model was designed to motivate and encourage dementia patients to care for themselves involving activities of daily living. (Nazarko 2009.)

Nazarko (2009) argues that assisting patients with dementia in activities of daily living can render them dependant over a period of time, hence patients should be

encouraged to carry out simple motor functions by themselves. But, recognizing the degree of cognitive deficit is relatively difficult to predict and challenging for the care providers with limited resources.

A relative decline in physical abilities in dementia patients and elderly is most widely observed occurrence, thereby deteriorating the Activities of Daily Living (ADL) in dementia patients. Trauma and related medical admissions were studied to analyse the relationship of ADL function in dementia patients and variable degrees of cognitive impairments. It was observed that 90% of the patients involved in accidents pertaining to ADL were living at home or assisted living and had to be institutionalised in a specialised dementia care facility, due to the fact that unassisted ADL were risky in these individuals. The assessments of neurological functions for these patients were carried out with the help of Glasgow Coma Scale (GCS) and Injury Severity Score (ISS). The ISS was relatively higher in patients with pre-injury dementia with more motor deficits and high risk of recurrent injuries due to falls. (Dunham, Chance, Hileman, Flowers, Ransom & Puet 2015.)

According to Japanese research by Kobayashi, Wati, Yamamoto, Sugiyama & Sugai (2009), recurrent falls and subsequent injuries, especially severe head trauma was common in dementia patients with abnormal gait. In dementia care homes, the care provider's actions focus on the prevention of falls and improving the risk management of falls. Figure 4 enumerates the multiple risk factors and relative outcomes of such risk incidences.

Context: Long-term Care Facility

Predisposing factors

Intrinsic risk factors of the elderly

Personal attributes of the elderly

1. Age
2. Gender
3. Activities of daily living
4. Medication

Severity of the dementia
Impairment of

1. Memory
2. Orientation
3. Judgment and Problem solving
4. Community Affairs
5. Home and Hobbies
6. Personal Care

+

Causes of functional decline

1. Comorbidity
2. Balance impairment/ Frail gait
3. Visual/ hearing disorder
4. Incontinence

Extrinsic risk factors

1. Unsafe assistive device
2. Slippery floor
3. Poor lighting setting
4. Inappropriate clothing and footwear
5. Restraint
6. No hand rail
7. High bed set
8. Inappropriate furniture

Precipitating causes

1. Trips & slips
2. Drop attack
3. Syncope
4. Dizziness

Strategies for prevention

Assessment of the risks

Nurse & Care Staff

Fall Incidents

No Fall
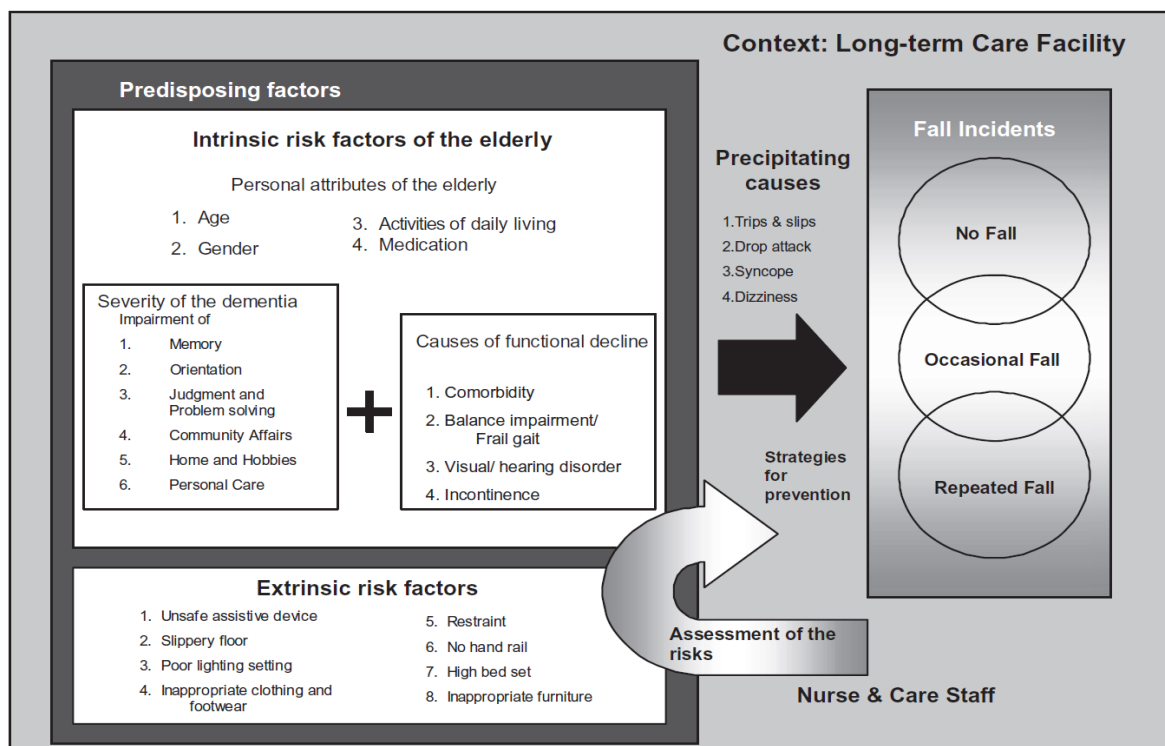
Occasional Fall

Repeated Fall

FIGURE 4: Conceptual framework for fall risk assessment according to Kobayashi et al. (2009).

4 The goals and the purpose of the thesis

4.1 Goals

The goal of this thesis was to review the risk factors encountered during Activities of Daily Living in dementia patients and to determine the role of health care professionals in understanding the preventive measures as discussed in the various citations used in this thesis. The objective was reached by way of studying scientific articles which reflected the mechanism and complexities arising from impaired cognition and exploring the recognizable risks such as infections and injuries.

4.2 Purpose

The purpose of this thesis was aimed at the current health care situation dealing with dementia care, to assess the probability of injuries and infections, to identify the methodology of health care professionals in prevention of such occurrences and to suggest evidence based knowledge to improve the existing methods. Literature sources related to risk evaluation were reviewed and scrutinized for nursing interventions in prevention of recurrently occurring comorbidities eventuating to overall decline in the prognosis of dementia patients.

4.3 Research questions

What factors and how do they play an important role in dementia patients' inclination or propensity to infections and injuries?

What is the cause and effect relationship between advanced dementia and tendencies to physical comorbidities?

5 Data selection methodology

The data selection method in this thesis was literature review. Inclusive and exclusive criteria were according to content analysis format. Based on the topic, a systematic search with the keywords was planned, to get reliable scientific articles for the purpose of literature review. The literature review process includes selecting a thesis topic, searching the literature, and gathering, reading and analyzing the information, writing the thesis and adding the references. (Cronin, Ryan & Coughlan 2008.)

5.1 Literature review

Cronin, Ryan & Coughlan's (2008) methodology for literature review has been undertaken in this thesis, which describes distinctive methods of literature reviews, such as narrative or traditional literature review, systematic literature review, meta-analysis and meta-synthesis. The narrative type of literature review consists of structure and elements from various literary sources. Information from different scientific articles are combined and analysed to form a probable hypothesis. The reasoning is deduction of conclusions from the scientific materials related to the main subject to reach a verifiable outcome. For the purpose of a narrative literature review, the essential criteria is establishing a research question or statement, which can be searched and reviewed through vast databases with relevant information. Narrative literature review draws conclusions and facets of diverse nature.

In contrast, systematic literature review is theoretically very stringent and specific to the research question. A precise framework is defined for the research question, before the actual collection of information on the subject in question. Systematic literature review is time-bound to every process flow in the framework, where a time limit for every step of the research is demarcated for the purpose of further analysis. Selection of materials in a systematic literature review is based on the exclusion and inclusion criteria and critical thinking is applied for evaluation and analysis. (Cronin, Ryan & Coughlan 2008.)

5.2 Data collection process of the thesis

Data collection was done using keywords from the databases available in Seinäjoki University of Applied Sciences library and published books. The thesis topic was pre-selected hence; keywords were chosen and combined carefully to get relevant information. Every search word produced huge amount of information; and materials were selected on the specificity of our research topic. The language used in body of the text is academic English, and terminologies and abbreviations are explained for better understanding.

Databases used in this thesis include CINAHL with Full Text (Ebsco), Sage premier and Medline-PubMed. Databases chosen were available in Seinäjoki University of Applied Sciences library. Online thesaurus and dictionaries were used for replication and paraphrasing assistance.

Search words used to find information were dementia, infection, fall, injuries and cognition. More specific definitions of these keywords can be found in table 1.

TABLE 1. Definition of keywords according to Venes & Taber (2005).

Cognition	Thinking skills that include the usage of language, mathematical and social skills, awareness, reasoning, judgment and imagination.
Dementia	Continuous, permanent deterioration in mental process of an individual, manifested by deficit in memory and cognitive functions.
Fall	Unwittingly drop to the floor or ground. According to Venes & Taber (2005), this is the most common cause of death in elderly people.
Infection	A disease that is caused by microorganisms that release toxins or infest body tis-sues, associated with acute or chronic inflammation of the tissue. According to Venes & Taber (2005), infections are the most common cause of impairment and death worldwide.
Injury	A blunt or piercing trauma or damage to a part or several parts of the body of an individual.

5.2.1   Inclusion and exclusion criteria

The databases mentioned before have articles from different scientific journals and magazines in several languages. Articles published only in English language were chosen by the authors of this thesis. The full text articles available for free for students in Seinäjoki University of Applied Sciences were used, and the articles chosen were published after the year 2004. The authors also used some articles

published before the year 2004, since those articles were found to be useful for this thesis. The exclusion and inclusion criteria for the chosen articles by the authors are cited in table 2. The authors also used books that had the theoretical data for this thesis work.

TABLE 2. Inclusion and exclusion criteria's of the literature

Inclusion criteria	Exclusion criteria
Literature published in English language.	Literature published in language other than English.
Full text articles with citations.	Articles with only abstract available.
Published in 2004 or later.	Published before the year 2004.
Published literature.	Non-published literature.
Available free for Seinäjoki University of Applied Sciences students.	Non-free journals and articles.

5.2.2 Data found from searches

Databases used when searching for the literature for this thesis include CINAHL with full text, Medline-PubMed and Sage premier. For finding relevant information for this thesis, the keywords mentioned before were used along with the inclusion and exclusion criteria.

CINAHL with full text

While searching articles from CINAHL with full text, keywords mentioned in Table 1 were used along with Boolean operators AND and OR. Also different available criteria's including searching only full text articles with abstracts were being used to limit the amount of search results. The search resulted in 48 hits. After reading the topic of the articles, the irrelevant articles were discarded as the researched topics were too specific and had no relevance to this thesis. The remainder 12 articles were further read thoroughly. After reading the abstract of all these 12 articles, 7 articles were found to be valid for this thesis. After carefully reading

these 7 articles, they were included for use in this thesis. The search process of CINAHL with full text is structured in the figure 5.
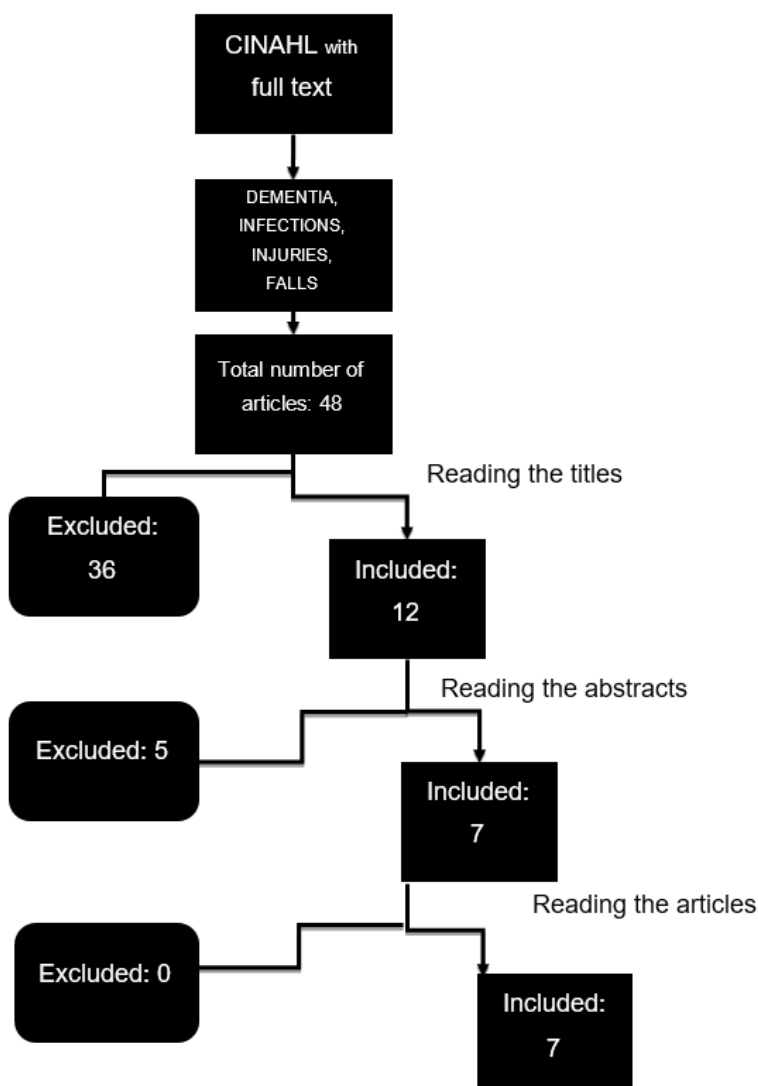

Figure 5. The search process of CINAHL with Full Text articles.

Medline-PubMed

When searching Medline-PubMed databases, the keywords listed in Table 1 were used. The search results were limited using search criteria's including the exclusion of articles over 10 years old, the inclusion of only human species and the availability of the article for free full text. This resulted in 765 articles. The titles of these articles were read and reviewed, resulting to exclusion of 731 articles, leaving the number of included articles to 34. After reading the abstract of remaining articles, 24 articles were excluded, resulting in 10 articles remaining.

The authors proceeded to critically read and evaluate the remaining articles and further excluded 4 articles, thus making the final count of usable articles to 6. The search process of Medline-PubMed is illustrated in the figure 6.
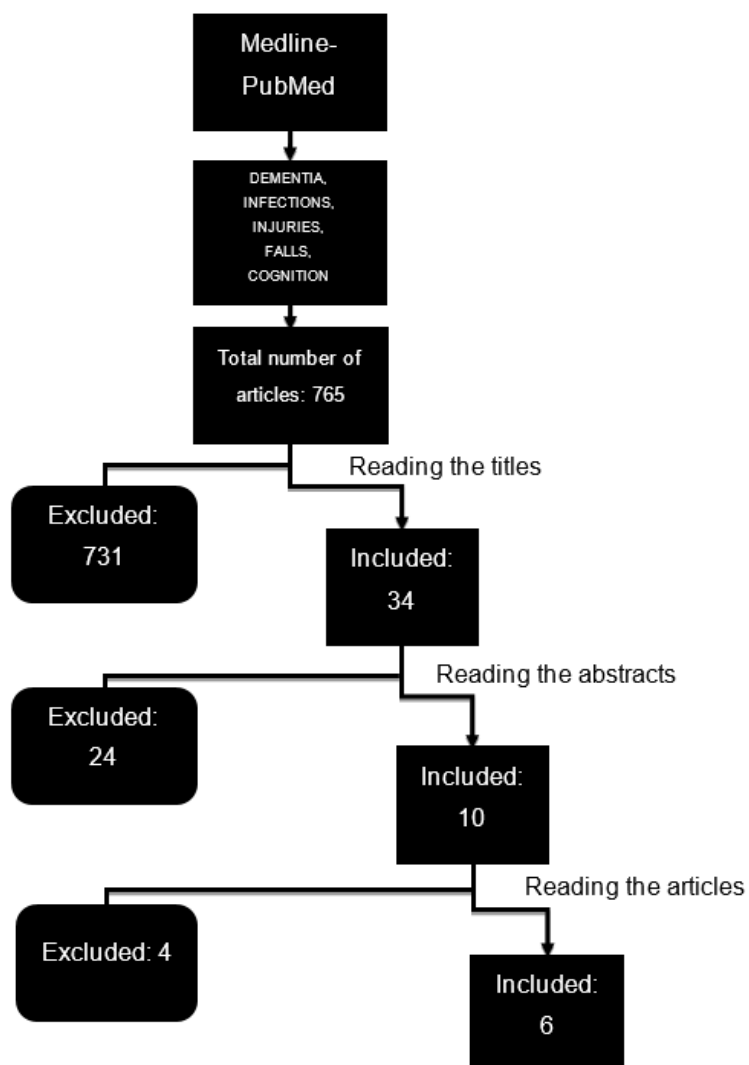

Figure 6. The search process of Medline-Pubmed articles.

Sage premier

While searching full text articles from Sage premier database, the keywords listed in Table 1 were used with the inclusion and exclusion criteria listed in Table 2. These resulted in 702 articles, which were reduced to 24 after reading the titles of the articles. Subsequent reading of abstracts of remaining articles, further 20 articles were excluded and 4 remained. After reading and critically evaluating the

articles remained from exclusion, 1 article was chosen to be valid for this thesis work. The search process of Sage premier can be found in the figure 7.
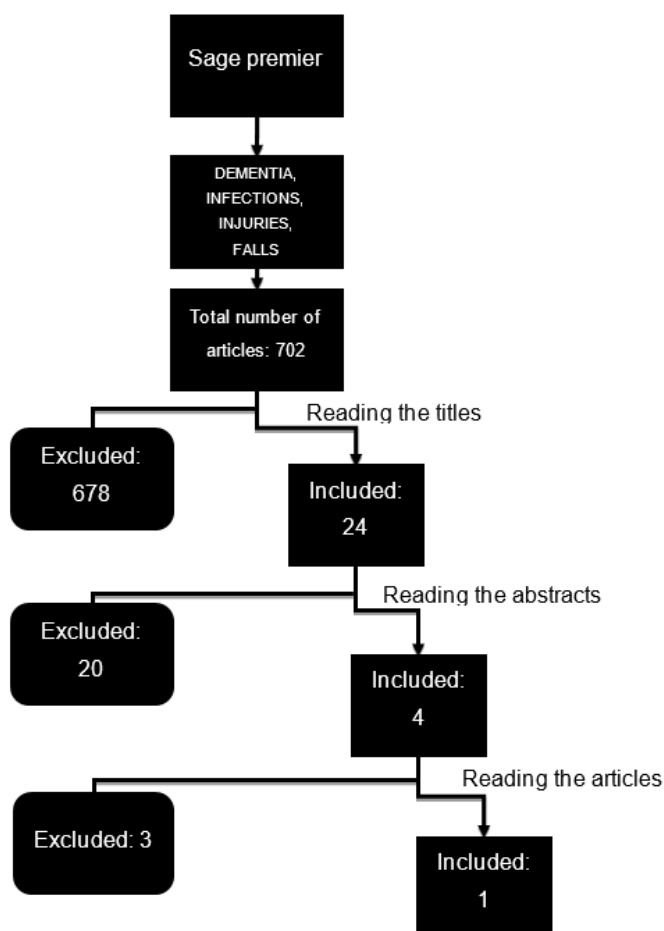

Figure 7. The search process of Sage premier articles.

In conclusion, altogether 14 articles from the mentioned databases were used in this thesis work and additionally published books were referred to.

6 Data Analysis: Applying process of Content Analysis

6.1 Content Analysis

The method of content analysis was adopted for data analysis. Analysis of data using the content analysis method has the advantage of analysing both qualitative and quantitative information. Additionally, the process of content analysis can be carried out using deductive reasoning or inductive reasoning, depending on the aim of the analysis. Inductive analysis is used to form a general concept from a large amount of specific relevant data, whereas deductive analysis moves from general concepts to a deduced specificity. (Elo & Kyngäs 2007.)

As the topic of thesis was infections and injuries in dementia patients which has been researched in the past many times by academicians, the concepts chosen for the thesis were based on previously researched theories, literature reviews and models. Culmination of an unconstrained categorization matrix was observed during the analysis process, which was further categorised using inductive analysis into subcategories. Figure 8 reflects the analysis process with highlighted path chosen for this thesis. (Elo & Kyngäs 2007.)
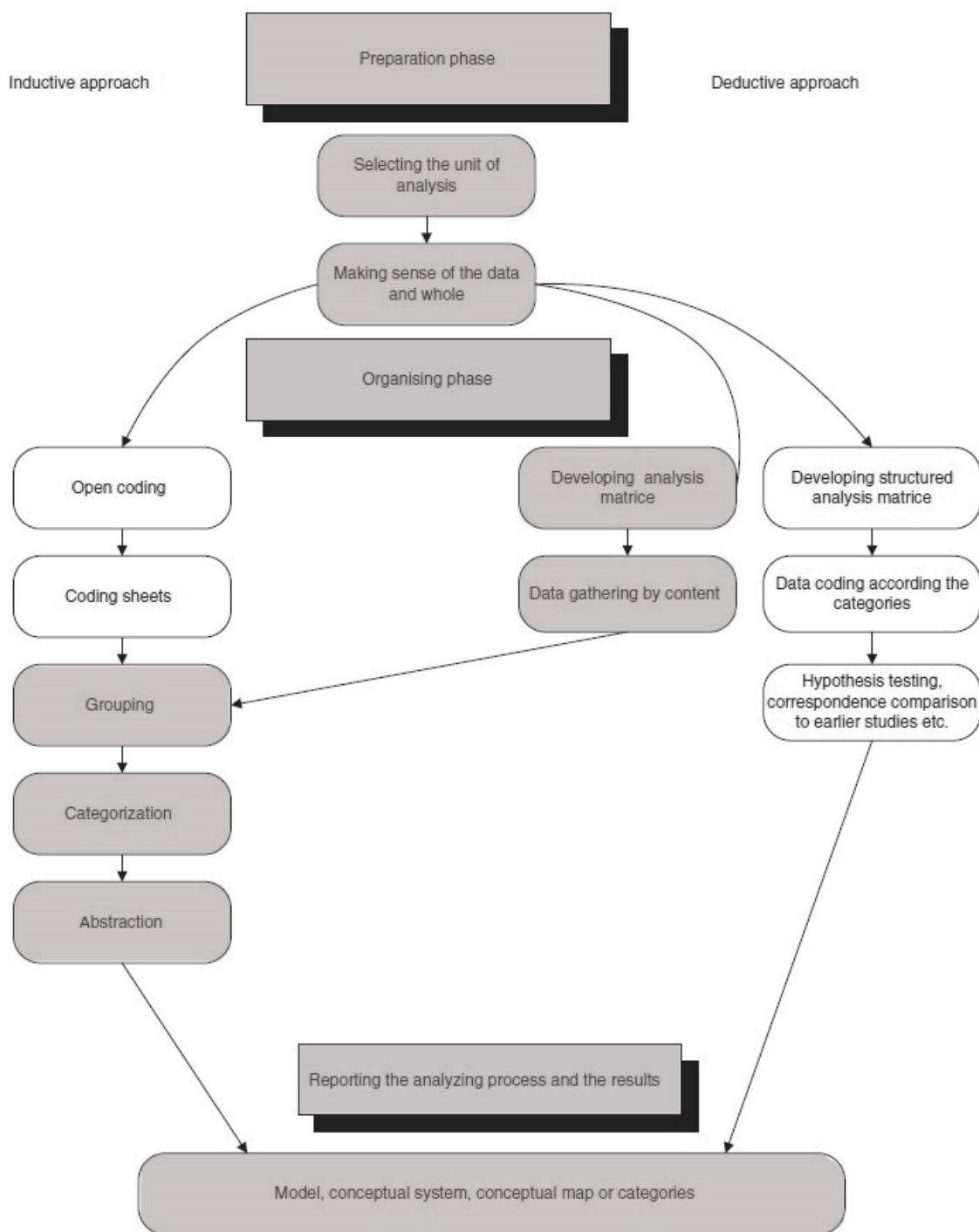
FIGURE 8. Preparation, organizing and resulting phases in the content analysis process according to Elo & Kyngäs (2007).

6.2 Analysis Process of the thesis

In this thesis, the objective was pre-chosen and the purpose was to review earlier work in the similar area of expertise to deliberate a compilation of information on

the risks evolving in the progress of dementia. The three phases of preparation, organization and reporting were maintained throughout the process of analysis and both induction and deduction were used for the development of abstraction. Reference of the process is illustrated in figure 8 in highlighted portion. Deductive logic was used to gather information from different sources and induction was used for the compilation of categories. In this thesis, the final categories were the various risk factors encountered by a dementia patient. Figure 9 shows the abstraction process of this thesis.
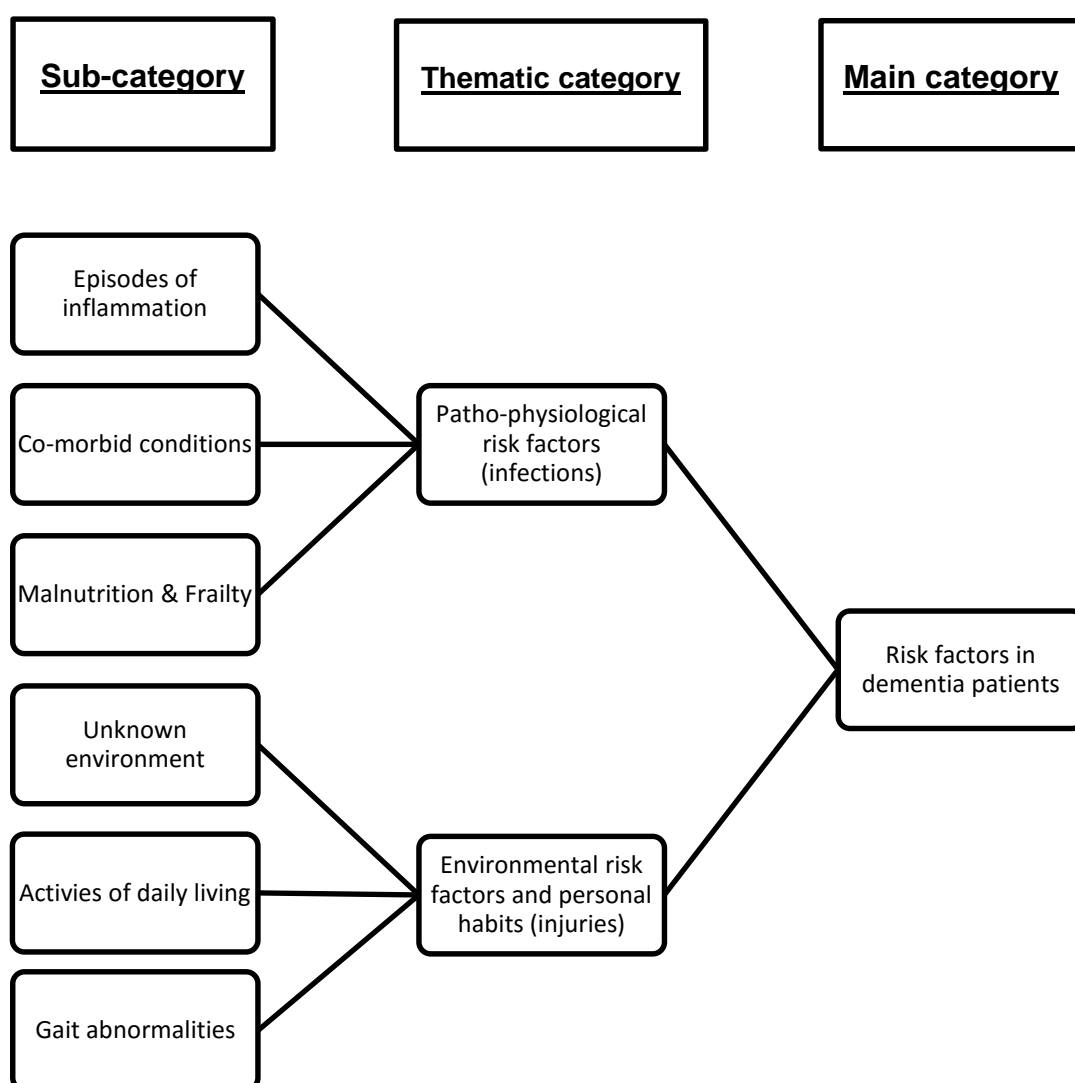

FIGURE 9. The abstraction process of this thesis.

7 Results

The goal of this thesis was to analyse and understand the risk factors involved in the day-to-day activities of dementia patients by revisiting the incidence of infections and injuries in dementia patients and considering the factors which predispose a dementia patient to health deterioration. Therefore, the work is aimed at collating the risk factors and summarizing them for healthcare professionals as an evaluation tool or tangible reference data for appropriate use in dementia patients. The numerous risk factors were, for narrative coherence clubbed in two main categories; i.e., infections and injuries, although all the factors can be argued and combined under different headings.

7.1 Patho-physiological risk factors

Infection risk was one of the areas which were intended to be researched and analysed with factors modifying the same. The co-existing factors which were found to have considerable effects on long-term in dementia patients were recurrent inflammation, malnutrition and concurrent chronic diseases.

7.1.1 Episodes of inflammation

Zimmerman et al. (2002) pointed out earlier that statistically, the occurrence of dementia is mostly a disease of the aged population and the effects of infection in dementia patients. Consequently, in old age, the incidence of infection and inflammation has progressive effects on the general health of the patient.

Implying that infection is always accompanied with inflammation and immunological responses, the process is debilitating in individuals with dementia, the recovery time of patients is prolonged with prostrating adverse outcomes. As validated in the researched sources, inflammatory responses have deleterious changes in the brain physiology, triggering the neuronal loss at an accelerated pace. (Cunningham 2011.)

Increased frequency in recurrence of inflammatory response prompts delirious states, which further affects the cognitive functions in dementia patients. The symptoms of cognitive deficit have known to be worsening after an episode of infection requiring hospitalization; hallucinations, agitation and mood fluctuations are observed during hospitalization. The typical infections in dementia patients are urinary tract infection, skin and soft-tissue infections and respiratory infections, out of which, respiratory infections are the most fatal ones. An associated symptom of chronic pain is also a common denominator in most dementia patients. (D'Agata, Loeb & Mitchell 2013.)

7.1.2   Co-morbid conditions

Kovach, Logan, Simpson & Reynolds (2010) suggested that dementia alone is a crippling disease, but presence of co-morbid conditions simultaneously decidedly exacerbates the general condition of the patient. Lifestyle diseases, which occur much earlier in life, are hypertension, diabetes and coronary heart disease; and have certain effects on the prognosis of dementia. T2DM, as discovered in the research has atherosclerotic changes in blood vessels throughout the body including brain circulation. Vasculopathy caused by T2DM reduces the brain perfusion, initiating CATCH which in combination with ageing adds to cognitive functions deterioration. (Wang et al. 2014.)

7.1.3   Malnutrition & Frailty

In any chronic disease, a proper diet regimen is the most important aspect to maintain health and the quality of life. Likewise, in dementia patients, a proper dietary needs fulfilment under supervision is a critical to the general health. As the cognitive functions are declining with the sensory functions, the patient's ability to appetite arousal is also disturbed. Most patients show signs of anorexia and malnutrition due to disinterest in food, but over-eating is also seen in dementia. (Unwin, Porvaznik & Spoelhof 2010.)

Ragdale (2014) discussed in detail the process of alteration in cognition with relation to appetite, hunger and diet. It was reasoned that the sensory deficits, especially taste and smell were liable for the disinterest in food and reduction of appetite.

The Recommended Daily Allowances (RDA) of micronutrients appeared to be highly deficient in dementia patients in care homes. Although, supplementary vitamins and minerals were adequately administered, long-term outcomes were found to be wanting. (Liu, McGeer, McArthur, Simor, Aghdassi, Davis & Allard 2007.)

7.2 Environmental risk factors and personal habits

Second main category was risk of injuries in dementia patients, where different influences were analysed to have proclivity towards injuries in dementia patients. Particular influences which were grouped under this category were environment and surroundings of living, daily activities, gait and physical disabilities.

7.2.1 Unknown environment

Lack of familiarization with the area of living, such as hospital visits, increased agitation and confusion with visible cognitive deficits in dementia patients and wandering which ultimately was seen as potential for accidental injuries. Due to progressive memory loss, simple working memory which deals with day-today activities is found to be impaired leading to aggression and discomfort. (Waller 2012.)

Behavioural changes are observed quite frequently in dementia patients and is used as a crucial indicator for the assessment of cognitive disability which worsens in change of surrounding environment and living premises. (Härlein, Dassen, Halfens & Heinze 2009.)

It was observed that the ambience and architecture of the place of living also had an effect on the prognosis of health in dementia patients, such as bright lights

were considered to be negative factor, whereas, familiar wall colours, pictures, photographs, toys proved to be therapeutic. Music as a therapy was found to be helpful tool. (Cook 2011.)

7.2.2 Activities of daily living

Most accidental injuries in dementia patients usually occur during the activities of daily living, but it is the cognitive disability which brings about situations of injuries and not the activity itself. Depending on the cognitive deficit and type of dementia the working memory is affected and physical activities involved with the usage of disorganized working memory increases the incidence of fatalities. (Holger 2013.)

All activities involve motor co-ordination, and lack of which, is agreeably an important deviation in dementia affected individuals. In early dementia, ADL is still managed by the patient themselves and cognitive impairment is mild, but intermediate stages have a higher risk of accidental injuries due to confusion and memory loss, especially, recent memory or working memory, responsible for basic tasks involving ADL. (Kobayashi et al. 2009.)

7.2.3 Gait abnormalities

During the search of data regarding risks of activities in dementia patients, it was found that activities involving physical movement are seriously challenged in moderate to severe dementia, threatening accidental falls as a common phenomenon (Amboni, Barone & Hausdorff 2013). It is seen that visuo-spatial orientation, gait speed is measurably defective in proportion to the progress of dementia. Flawed balance control is noticeable in the presence of defective executive functions and frailty, which can exponentially prohibit any activity requiring locomotion. (Kearney et al. 2013.)

8 Discussion

The intention of this work was to derive a combined conclusion from different sources studied to form a concept for academic purposes and future research. The research questions in this thesis were coined to re-assess the various factors and their repercussions in multi-dimensional aspects of the disease in daily life.

Since the goal and purpose of this thesis was of academic importance and to enhance the insight of the reader on the practical aspects of long term dementia care, search of the knowledge is based on narrative type of literature review, although the theoretical frame-work has been maintained according to systematic literature review method.

8.1 Global scenario

Current trend of advancements in health science has improved the average life-expectancies around the globe, which has been an admirable direction, but in the process, researchers have come across many diseases which occur with ageing, dementia being one of them. It is already established that the probability of development of dementia increases with age above 70 years, and acknowledging the progressive nature of the disease with care-giver's point of view in different settings forms a crucial facet in the long term care.

8.2 Inference drawn

In order to care for dementia patients, the carer must understand the intricacies of the disease itself and understand the affected individual's personality. A totality in care guidelines should be formed to give a patient centric care and to do that, minimization of controllable risk factors should be accounted first. Carer's accountabilities drastically rises, when his or her patient's general health declines either due to injuries or avoidable infections owing to sub-standard hygiene practices. The idea of this thesis is to venture into the different types of uncertainties endured by people suffering from dementia and the routine

challenges of the carer to provide a safe physical and social environment to the patient. Evidently, dementia will get worse over the period of time, but the carer's prerogative is to enhance and prolong the quality of life as best as possible.

8.3   Authenticity and ethical consideration

The data collected in this thesis is from scientific journals and research articles already established to be authentic and ethically valid in terms of consent, confidence and authorization from the concerned authorities and hence assumed it to be in accordance with the accepted guidelines. The authenticity of the thesis is maintained by acknowledging the sources used and citations have been added throughout the work. This work is based on previously researched material and any suggestions and propositions made would require further research and analysis to either prove or modify the contents in order to get to a conclusion which is scientifically obtained by the standard research methods leading to an established evidence-based practice.

This work was done in limited amount of time, with no prior experience in such academic exercise. English language was used right through with lots of professional words and abbreviations, explanation for which has been included additionally.

BIBLIOGRAPHY

Amboni, M., Barone, P. & Hausdorff, J. 2013. Cognitive Contributions to Gait and Falls: Evidence and Implications. International Parkinson and Movement Disorder Society 28(11), 1520-1533.

Cook, G. 2011. Dementia care: sensory environments. Nursing & Residential Care 13(5), 240-243.

Cronin, P., Ryan, F. & Coughlan, M., 2008. Undertaking a literature review: a step-by-step approach. The British journal of nursing 17, 38–43.

Cunningham, C. 2011. Systemic inflammation and delirium - important co-factors in the progression of dementia. Biochem Soc Trans 39(4), 945-953.

D'Agata, E.D., Loeb, M.B. & Mitchell, S.L., 2013. Challenges in assessing nursing home residents with advanced dementia for suspected urinary tract infections. Journal of the American Geriatrics Society 61, 62–66.

Draper, B. 2011. Understanding Alzheimer's Disease and Other Dementias. 1st ed. Australia: Longueville Books.

Dunham, C.M., Chance, E., Hileman, B., Flowers, L., Ransom, K. & Puet, T. 2015. Geriatric Preinjury Activities of Daily Living Function Is Associated With Glasgow Coma Score and Discharge Disposition: A Retrospective, Consecutive Cohort Study. Journal of Trauma Nursing 22(1), 6-13.

Elo, S. & Kyngäs, H. 2007. The qualitative content analysis process. Journal of Advanced Nursing 62(1), 107-115.

Gąsecki, D., Kwarciany, M., Nyka, W. & Narkiewicz, K. 2013. Hypertension, Brain Damage and Cognitive Decline. Current Hypertension Reports 15(6), 547-558.

Holger, J. 2013. Memory loss in Alzheimer's Disease. Dialogues in Clinical Neuroscience 15(4), 445-454.

Härlein, J., Dassen, T., Halfens, R.J.G. & Heinze, C., 2009. Fall risk factors in older people with dementia or cognitive impairment: a systematic review. Journal of advanced nursing 65, 922–33.

IHMC CmapTools. Cognition. Available at: http://cmapspublic2.ihmc.us/rid=1KZ272GND-22FWFHQ-357N/Cognition%20JDN%20revision.cmap

Kearney, F., Harwood, R., Gladman, J., Lincoln, N. & Masud, T. 2013. The Relationship between Executive Function and Falls and Gait Abnormalities in Older Adults: A Systematic Review. Dementia and Geriatric Cognitive Disorders 36, 20-35.

Kobayashi, N., Wati, N.K., Yamamoto, M., Sugiyama, T. & Sugai, Y. 2009. Severity of dementia as a risk factor for repeat falls among the institutionalized elderly in Japan. Nursing and Health Sciences 11, 388-396.

Kovach, C.R., Logan, B.R., Simpson, M.R. & Reynolds, S. 2010. Factors associated with time to identify physical problems of nursing home residents with dementia. American journal of Alzheimer's disease and other dementias 25, 317–323.

Liu, B.A., McGeer, A., McArthur, M.A., Simor, A.E., Aghdassi, E., Davis, L. & Allard, J.P. 2007. Effect of multivitamin and mineral supplementation on episodes of infection in nursing home residents: A randomized, placebo-controlled study. Journal of the American Geriatrics Society 55, 35–42.

Longo, D., Fauci, A., Kasper, D., Hauser, S., Jameson, J.L. & Loscalzo, J. 2012. Harrison's Principles of Internal Medicine. 18th ed. United States: The McGraw-Hill Companies, Inc.

Mastin, L. 2010. The Human Memory: Types of Memory. [Web page]. Available at: http://www.human-memory.net/types.html

Nazarko, L. 2009. Providing high quality dementia care in nursing homes. Nursing & Residential Care 11(6), 296-300.

Oxford Dictionaries. 2015. [Web page]. Available at: http://www.oxforddictionaries.com/definition/english/cognition

Ragdale, S. 2014. Dementia and its relationship with food. British Journal of Community Nursing, July 2014, 21-26.

Ribbe, M.W., Van der Wal, G., Heintz, L.L., Van der Steen, J.T., Mehr, D.R. & Ooms, M.E. 2004. Treatment of Nursing Home Residents with Dementia and Lower Respiratory Tract Infection in the United States and the Netherlands: An Ocean Apart. Journal of the American Geriatrics Society 52, 691–699.

Unwin, B.K., Porvaznik, M. & Spoelhof, G.D., 2010. Nursing home care: Part II. Clinical aspects. American Family Physician 81(10), 1229–1237.

Van Doorn, C., Gruber-Baldini, A.L., Zimmerman, S., Hebel, J.R., Port, C.L., Baumgarten, M., Quinn, C.C., Taler, G., May, C. & Magaziner, J. 2003. Dementia as a Risk Factor for Falls and Fall Injuries Among Nursing Home Residents. Journal of the American Geriatrics Society 51, 1213–1218.

Venes, D. & Taber, C.W. 2005. Taber's Cyclopedic Medical Dictionary. 20th edition. Philadelphia: F.A. Davis Company.

Verghese, J., 2013. Slaying dementia dragons with blood, lungs, and guts. Journal of the American Geriatrics Society 61, 155–7.

Waller, S. 2012. Redesigning wards to support people with dementia in hospital. Nursing Older People 24(2), 16-21.

Wang, F., Guo, X., Shen, X., Kream, R., Mantione, K. & Stefano, G. 2014. Vascular Dysfunction Associated with Type 2 Diabetes and Alzheimer's Disease: A Potential Etiological Linkage. Medical Science Monitor Basic Research 20, 118-129. Available at: http://www.basic.medscimonit.com/abstract/index/idArt/891278

Wierenga, B.C.E., Bondi, M.W., 2011. Dementia and Alzheimer ' s Disease : What We Know Now. Journal of the American Society on Aging 35, 37–46.

World Health Organization 2012a. Dementia. [Web page]. Available at: http://www.who.int/mediacentre/factsheets/fs362/en/

World Health Organization, 2012b. Dementia: a public health priority, Dementia. Available at: http://whqlibdoc.who.int/publications/2012/9789241564458_eng.pdf

Zimmerman, S., Gruber-Baldini, A.L., Hebel, J.R., Sloane, P.D. & Magaziner, J., 2002. Nursing home facility risk factors for infection and hospitalization: Importance of registered nurse turnover, administration, and social factors. Journal of the American Geriatrics Society 50, 1987–1995.