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Risk Factors for Onset Disability in Community – Dwelling elderly : A systematic review

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Abstract

A systematic review aimed to explain the risk of disability among community dwelling elderly. the articles were identified risk factors for the study including, a cohort study, case control, and cross - sectional analysis, which had been published ten years ago (2000 – 2009). The database was selected from database of Google scholar, Pubmed, Biomed central, and Cochran review by disability term, activities daily living (ADL), and instrumental activities daily living (IADL). This inclusion criteria was determined by key word on title and abstract, and exclusion criteria were detected on the articles, such as, participants, objective, outcome measurement, research design, and during 2000 – 2009. We found 19 quality articles: 2 systematic reviews, 16 cohort studies, and a case control study

The result found that the high strength of association of risk factors for the occurrence of the disability, which the dimension was composed of three dimensions such as, chronic diseases, psycho impairment, and age. Also, it was found all five factors that was profile of risk factors: stroke, arthritis/osteoarthritis, co mobility, cognitive impairment/dementia, and age. Therefore, risk factors of disability is obvious to use in making decisions about management, prevention, and reduction disability in older people, that a disability prevention for the elderly should been appropriate to track the factors of caused the disability.

Key word: Elderly, Disability, activities daily living, instrumental activities daily living

Introduction

The current world population structure is changed, that the proportion of people aged 65 years or more increased from 5.9 percent in 1975 to 6.9 percent in 2000 and is estimated in 2025 to 2050 the proportion of elderly population will increase to 10.4 per cent and 15.6, respectively. In addition, life expectancy at birth of the world population increased from 59.6 years in 1975 – 1980, 66 years in 2000 to 2005, and was expected to increase to 72.4 years in 2025 to 2030 (United Nations,2002).The tendency of the elderly population is increasing rapidly, that many countries in the world are being into a state of aging society. This is a signal indicative of the burden from the elderly increased.

The burden of care for the elderly was problem of disability. Disability was refer to difficulty in performing activities for self-care (Verbrugge and Jette,1994; Rejeski and Focht, 2002), that it was likely to increase the number of elderly people. For instance, in Belgium, the prevalence of disability was increase 18.9 percent in 1997 to 22.9 percent in 2001 and 23.8 percent

in 2004 (Lafortune and Balestat, 2004), in Thailand, prevalence of disability in 2010 were 15.5 percent (Akpalakorn, 2010). Besides, follow-up of older people in England aged 65 years for a period of two years, who showed severe disability 6.59 percent (Yi Li Chung, et al. 2002). Disability has become a major problem that effect to family, community, and nation.

However, the disability process is complex and a variety of causes. Furthermore, disability related to the interaction between people with social and environmental, that induce to increase or decrease of disability in the elderly (Verbrugge and Jette,1994; Rejeski and Focht, 2002). Understanding the process of disability and relevant factors are necessary and important for preventing the risk of disability. It will also help to prevent and delay the occurrence of disability in the elderly. A systematic review aimed to explain risk factors of disability among elderly people living in community between 2000 to 2009, that was prevention of disability in the elderly.

MATERIALS AND METHODS

Selection of the articles

Study selection process was starting from the question of a systematic review. "What were the factors that caused disability in the elderly, and were different of risk factors? ", then, searched of the database on the occurrence of disability in the elderly. Although, it had been a systematic review on risk factors for disability in the elderly, but a review of the past, mainly focused on health conditions. In this study were selected on difference the previous database, that population was more comprehensive and the period of modern people by published in the official and unofficial data. Inclusion criteria were the key word "(ageing OR elderly OR senior citizen OR older adult) AND (disability OR disabled OR activities daily living) AND (risk factors OR risk associated OR risk determinate)" for the selection of titles and abstracts , which reported the initial study of 177 articles, then including population based study of the elderly in community and during in 2000 to 2009 were included 70 articles.

Exclusion criteria were: 1) the purpose of study was to determine risk factors of disability in the elderly, 2) outcome measurement was activities daily living (ADL), or instrumental activities daily living(IADL), and 3) type of research was the longitudinal study such as, randomized control trail, cohort study, case control, and cross section analysis. The remaining reports were 19 reports, which were 2 a systematic reviews, 16 cohort studies, and a case control study (Figure 1).

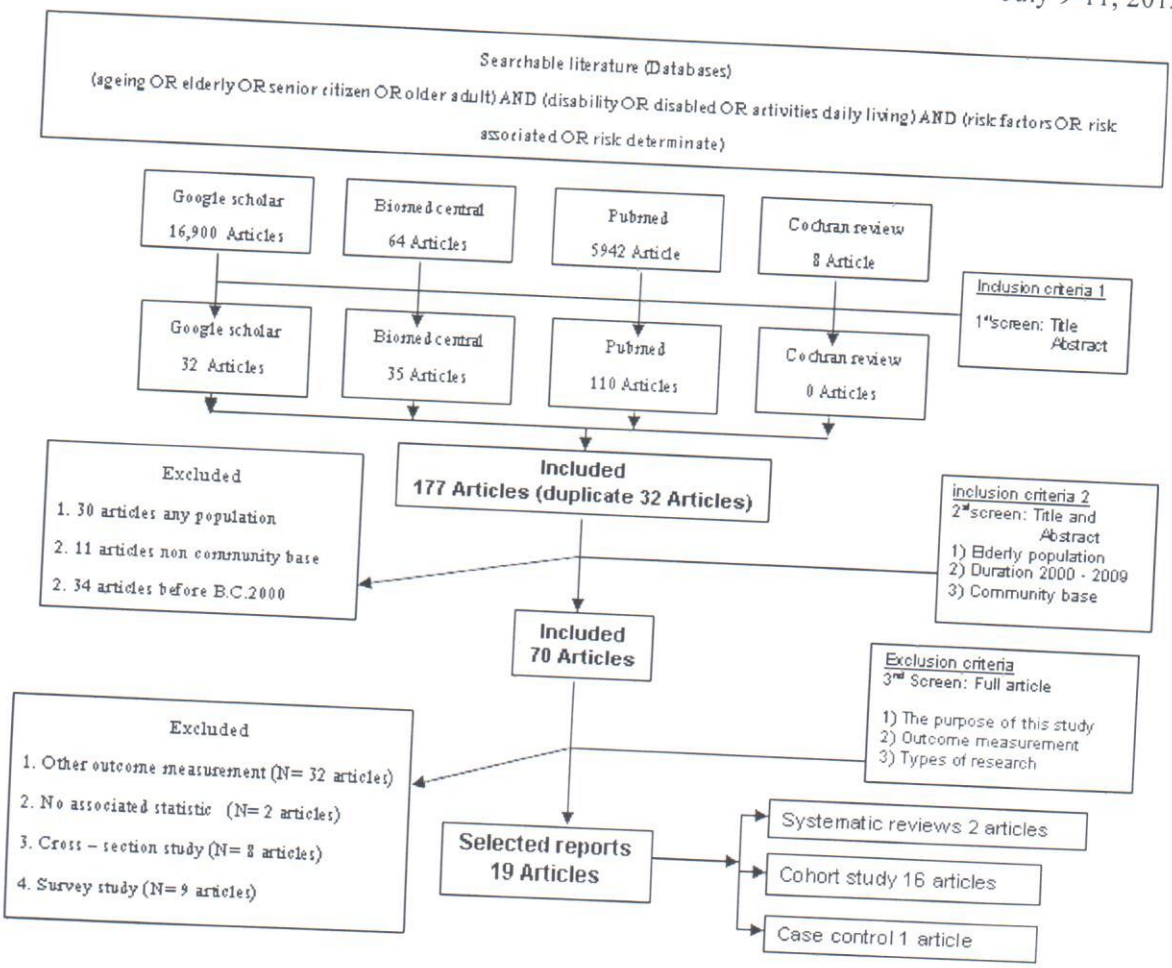

Figure 1 Study selection process

Outcome Measurement

Disability is a concept that refers the ability or the difficulty in performing activities daily living (Verbrugge and Jette,1994; Rejeski and Focht, 2002). The assessment disability tool was classified into two main categories: first, to evaluate the ability to perform activities of daily living (ADL) as measured on their ability to care for the basic activities of life. Second, to evaluate the ability to perform instrumental activities of daily living (IADL) as measured of the degree of independence or dependence in activities, which was necessary to live according to the context of a community. The measurement in this study was divided three type, ADLs only, IADLs only, and both ADLs and IADLs.

Methodology Assessment.

Report of the 19 articles was to assess the quality of research methodology by the concept of agency for healthcare research and quality (West,et al, 2002), that was represented sample, exposure or intervention, outcome measurement, criteria for selection, lack of follow-up samples, and results. The articles with the quality of the research methodology were high level 5 articles (Gregg,et al, 2002; Gill,et al, 2004; Spiers, et al,2005; Tas, et al, 2007; Tas, et al, 2007), such as, a systematic review of diseases and conditions in the United Kingdom, the present data showed access a database of 35 articles, comparison of sample group, and analysis clearly by the

statistical significance(Spiers,et al,2005). A cohort study in the hospital, it was restrictions on the activities, that was follow up onset of disability in older people with long term (60 months) and presented results to clear (Gill, et al,2004) (Table 1 in Appendix).

Strength of a body evidence

Risks factors of all 19 articles were grouped into two groups: a risk factor for ADLs disability and IADLs disability, then, grouped according to similarities based on the dimensions of risk. Next, analyzed the strength of the incidence of each risk factor by dimension of the strength of the occurrence from the agency for healthcare research this was divided quality by three main elements, such as, consistency, quantity, and quality (West,et al,2002) (Table 1).

Table 1 the dimension of the strength of the incident

Domain	Definition
Quality	The quality of all relevant studies for a given topic, where "quality" is defined as the extent to which a study's design, conduct, and analysis has minimized selection, measurement, and confounding biases
Quantity	The magnitude of treatment effect
	The number of studies that have evaluated the given topic
	The overall sample size across all included studies
Consistency	For any given topic, the extent to which similar findings are reported from work using similar and different study designs

Results

Researches were more than half the students in the United States, 7 articles in Europe's, 7 studies in the Middle East, and a subject to study in Asia. A report of more than half of the study of long-term follow-up form project database, such as, the study of such long-term women's health and aging study I, the second longitudinal study of aging (LSOA), the MRC cognitive function and ageing study, the HALE project, the Rotterdam study, the Kungsholmen project the established populations for epidemiologic studies of the elderly (EPESE), health and retirement study (HRS), and the Jerusalem longitudinal study. The sample size was a minimized of 559 people (McGuire, Ford, and Ajani, 2006.), and maximized of the 9,093 people (Gray,et al.2006), that was subject of the 66.71 females. The duration of follow-up averaged 45.94 months period to the shortest 18 months (Gill1 and Kurland, 2003.), length 147 months (Gregg,et al, 2002) (table 2 in Appendix).

Analysis of risk factors.

This was a component of the risk factors from 19 the research report, that were 27 factors identified and separated into 8 dimensions, such as, chronic disease, psycho impairment, fall, risk behavior, sensory impairment, age, restrict activity, and socioeconomic. Moreover, analyzing the strength of the relationship of risk factors for the occurrence of the disability, a critical component of the disability dimension, was composed of three dimensions such as, chronic diseases, psycho

impairment, and age. Also, it was found that all five factors, such as, stroke, arthritis/osteoarthritis, co mobility, cognitive impairment/dementia and age (Figure 2 and Table 2)

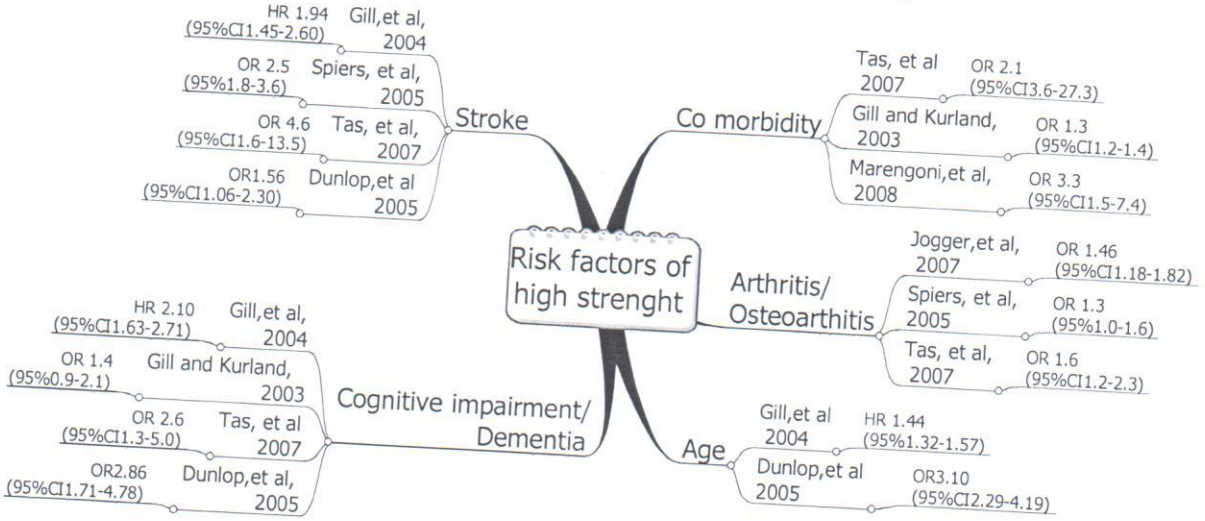

Table 2 Level of evidence risk factors for disability.

Level of evidence	Domain	Risk factor
Strong	Chronic disease	Stroke
		Arthritis/Osteoarthritis
		Co morbidity
	Psycho impairment	Cognitive impairment/ Dementia
	Age	Older
Moderate	Chronic disease	Diabetes
	Psycho impairment	Depression
	Restricted activity	Physical frailty
	Risk Behavior	BMI(30 or higher)
In conclusion	Fall	Fall
	Chronic disease	Chronic hearth failure
		Chronic airways Obstruction
		HT
	Restricted activity	Hospitalization
	Sensory impairment	eyesight problems
	Socioeconomic	Gender

Discussion

The strength of the analysis of risk factors was explained the occurrence of disability, which was determined by the constancy of the results to the disability of various risk factors (Consistent), the statistically was significant P value <0.05 or association RR/OR/HR (95% CI) range from 1.0 up to a value (Quality), and quantitative research (Quantity). It found that the risk of disability, that was seven high strong factors and two moderate factors. In addition, other factors had found a limited.

Chronic disease was risk factors of physical disease, that was high strength of associated with disability, such as, stroke, arthritis/osteoarthritis, co morbidity, psychological disease was cognitive impairment or dementia. Chronic disease was causes pathology, loss of function of organ, and led to the loss of the ability to perform daily activities (Verbrugge and Jette,1994; Rejeski and Focht, 2002). Also, age was showed a strong correlation with the occurrence of disability among elderly, that as a result aging process. It was caused sensory and nervous system to decrease, when was the old age the more chance of disability(Gill,et al. 2004; Tas, et al. 2007;WHO,2003).

The findings of this a systematic review are consistent with the World Health Organization that summarize the main risk factors for disability are three kinds: chronic disease, accidents, and age(older)(WHO,2003). Therefore, risk factors for disability that is obvious to use in making decisions about management, prevention, and reduction disability in older people, that a disability prevention for the elderly should been appropriate to track the factors of caused the disability. However, disability process is complex, that is concerned various factors, such as, health factors, socioeconomic factors. This study did not appear socioeconomic factors, that is gap between the knowledge of the risk of disability in the elderly and need to seek.

Strengths and limitations

The advantage of this study was investigation of risk disability, which factors selected for the study of high quality. However, the disability process is complex and difficult to compare, that the differences in measurement and participants. Therefore, in order to acquire more accurate understanding of the risk factors of disability and the knowledge of the risk of disability is required.

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Appendix

Table 1 Evaluation of Scales and Checklists for Systematic Reviews, by Specific Instrument and 11 Domains

Instrument	Domain											Quality
	Study question	Search Strategy	Inclusion/ Exclusion	Intervention	Outcome	Study data extraction	Study quality/ validity	Synthesis and analysis	result	Discussion	Funding	
1. Freedman Vicki A., Martin Linda G.and Schoeni Robert F, 2002	◐	◐	●	◐	◐	◐	◐	◐	◐	◐	●	
2. Umit Ta s, et al ,2007	●	●	●	●	●	●	●	●	●	●	○	High

Table 1 Evaluation of Scales and Checklists for Observational Studies, by Specific Instrument and 9 Domains*

Instrument	Domain									Quality
	Study question	Search population	Comparability 0f subject	Exposure/ Intervention	Outcom measurement	Statistic Analysis	result	Discussion	Funding	
3. Cronin-Stubbs Diane,et al, 2000	●	◐	◐	◐	●	●	●	◐	●	
4. Gregg Edward W., et al,2002	●	●	●	●	●	●	●	●	●	High
5. Volpato Stefano, et al, 2002	●	●	●	◐	●	●	●	◐	●	
6. Gill Thomas M. and Kurland Brenda F. , 2003	●	●	●	◐	●	◐	●	●	●	

Table 1 Evaluation of Scales and Checklists for Observational Studies, by Specific Instrument and 9 Domains*

Instrument	Domain									Quality
	Study question	Search population	Comparability 0f subjec	Exposure/ Intervention	Outcome measurement	Statistic Analysis	result	Discussion	Funding	
7.Thomas M. Gill, et l.,2004	●	●	●	●	●	●	●	●	●	High
8. Brenes Gretchen A., et al,2005	●	●	◐	◐	●	◐	◐	◐	●	
9. McGuire Lisa C , Ford Earl S and Ajani Umed A,2006	●	◐	◐	◐	●	◐	◐	◐	○	
10. Carol Jagger, et al,2001	●	●	◐	◐	●	◐	◐	●	●	
11. Spiers A Nicola, 2005	●	●	●	●	●	●	●	●	●	High
12. Carol Jagger, et al ,2007	●	●	◐	◐	●	◐	◐	●	●	
13. Umit Ta s, et al ,2007	●	●	●	●	●	●	●	●	●	High
14.Marengoni A., et al, 2008	●	●	◐	◐	●	◐	◐	●	●	
15.Chung-Yi Li, Shwu Chong Wu, Shi Wu Wen	●	◐	●	●	●	●	●	◐	●	

Table 1 Evaluation of Scales and Checklists for Observational Studies, by Specific Instrument and 9 Domains*

Instrument	Domain									Quality
	Study question	Search population	Comparality 0f subjec	Exposure/ Intervention	Outcom measurement	Statistic Analysis	result	Discussion	Funding	
16.Shelly L. Gray, Et al ,2006, pubmed	●	●	●	●	●	◐	●	●	●	
17.Dorothy D. Dunlop, Pamela Semanik, ,et al,2005	●	●	◐	●	●	●	●	●	●	
18.Dorothy D. Dunlop, **et al, 2005**	●	●	●	●	●	●	●	●	●	High
19.Jochanan Stessman,et al, 2002 Pubmed	●	◐	◐	●	●	●	●	◐	○	

Table 2 reports the research on risk factors for disability in the elderly (Systematic Reviews)

NO./ Database/ Country	Sources	Search Strategy	Inclusion/ Exclusion	Exposure or Intervention	Outcome	Data Extraction	Study Quality / Validity	Data Synthesis and Analysis	Result	Limitation	Quality score
1.A Systematic Review(USA)	Freedman Vicki A., Martin Linda G.and Schoeni Robert F, 2002	2 database; MEDLINE, AGEING, Jan1990-May2002	Inclusion; 65 or 70 years or over, in USA,16 articles Exclusion; institutional or health care utilization	1)physical disability 2)functional, cognitive, and sensory limitations 3) age, sex	self-reports of either needing help or having difficulty with activities of daily living (ADLs) and instrumental activities of daily living (IADLs)	1) no explicitly the reliability of outcome measure including intra rater reliability 2) 3 reviewers 3) no report blinding of reviewrs	Base on a national research council report and follow up	evaluated survey quality according to 10 criteria, ranked the surveys as good, fair, or poor, and calculated for each outcome the average annual percent change.	Evidence on trends in disparities by age, sex, race, and education was limited and mixed ,with no consensus yet emerging	Outcome had difference 4 type, no report loss follow up 5 article	High
2.Systematic review(UK, Dutch, German, French, Danish, Norwegian, Swedish, and Turkis)	*Tas Umit,et al*, 2007	3 database; Pubmed (1966-2006), EMBASE (1980-2006), PsycINFO (1975-2006	19 articles, Inclusion; outcome, longitudinal study,age 50 years, in UK, Dutch, German, French, Danish, Norwegian, Swedish, and Turkis	1)demographic and socioeconomic factors,lifestyle factors, and medical conditions 2)functional status	Experiencing difficulty in ADLs or IADLs	1) consistency process 2) 5 reviewers 3) no report blinding of reviewrs	based on 15 criteria of internal and external validity. the assessment resulted with a score of 70% of the maximum obtainable points or higher were rated as high-quality studies.	It was possible to pool the data if terms of homogeneity were met. In the case of heterogeneity, a synthesis of the best evidence was performed. The strength of evidence was rated as follows: strong evidence; moderate evidence; limited evidence; conflicting	1) strong evidence that higher; age and cognitive impairment are prognostic factors of disability. 2) strong evidence that moderate; vision impairment,and poor self-rated health are prognostic factors of disability.	1)ADL and IADL give a common basis for many investigators, heterogeneity in the way 2)standardisation of assessment and analysis of disability	High

Table 2 reports the research on risk factors for disability in the elderly (Cohort Study)

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
3.East Boston, Massachusetts, (USA)	Cronin-Stubbs Diane,et al, 2000	65 years or older	3,434	NR	Mild depression / NR	Depression	72 (1999–1994)	1)ADLs(6 items; bathing, dressing, eating, toileting, walking across a room, and transferring from a bed to a chair)	1) disabled increased with symptom of depression : OR= 1.16, 95% CI, 1.13-1.19 (the Katz) and OR = 1.14; 95% CI, 1.11-1.16 (the Rosow-Breslau)	1) our measure of chronic health conditions was imperfect, as it relied on self-reports of previously diagnosed conditions and lacked detail on the severity of disease. 2) It is unlikely that non response bias limits the interpretation of the study's results.	

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
4.Baltimore, Monongahela Valley, Portland, and Minneapolis (USA)	Gregg Edward W., et al,2002	65 years or older	8,344	18	Diabetes / Non Diabetes	Diabetes Insulin treatment BMI Stroke	147 (1989–2001)	1)ADLs(5 items; walking two to three blocks on level ground, walking up or down 10 steps, and doing housework, shopping, and cooking meals)	1) associated with diabetes ranged from 2.12 (1.82–2.48) for doing housework to 2.50 (2.05–3.04) 2) Insulin-treated women with diabetes had a higher risk of disability HRR=2.70,1.90–3.83 than those not on insulin 1.96,1.68–2.30 3) BMI > 30 was HRR 2.57 (1.82 – 3.63) 4) Stroke was HRR 1.46 (0.94 - 2.27)	1) The study population was limited to white, noninstitutionalized women who were probably healthier than those in the typical same-aged population. 2) collected diabetes status by self-report, our findings may not be generalizable to women with undiagnosed diabetes 3)lacked information about glycemic control and specific diabetes medications	High

Table 2 reports the research on risk factors for disability in the elderly (Cohort Study)

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
5.Baltimore, Maryland (USA)	Volpato Stefano, et al, 2002	65 years or older	729	NR	With diabetes / without diabetes	Diabetes	36(1999-2002)	1) ADLs(5 items; bathing, transferring from bed to chair, using the toilet, and dressing)	1) adjustment for age and compared with women without diabetes, with diabetes had an RR 1.57 (1.15–2.14) P<0.01 for incident activity of daily living disability.	1) this study was that the algorithm used for diabetes ascertainment did not include a fasting glucose level.	
6.New Haven (USA)	Gill Thomas M. and Kurland Brenda F. , 2003	70 years or older	580	22.8	Physical frailty / no Physical frailty	Chronic condition(no) Cognitive impairment Physical frailty Prior history of disability	18(1998–2002)	1)ADLs(4 items;bathing, dressing, walking inside the house, and transferring from a chair)	1) HR found significantly associated; a prior history of disability HR* 2.0, 95% CI 1.4- 2.7; cognitive impairment 1.4 , 95% CI 0.9- 2.1, p<0.002; chronic condition(No.) 1.3, 95% CI 1.2- 1.4 p<0.001; physical frailty 1.5, 95% CI 1.1 – 2.1 p<0.001	1) Although our disability assessment had excellent reliability, it is possible that some of the disability transitions represented measurement error rather than a true change 2)eating, toileting and grooming were omitted from assessment. 3)oversampled persons who were physically frail.	

Table 2 reports the research on risk factors for disability in the elderly (Cohort Study)

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
7.New Haven, Conn, (USA)	Thomas M. Gill; Heather G. Allore; Theodore R. Holford; et al.,2004	70 years or older	754	21.9	Physical frailty / no Physical frailty	Prior Hospitalization restricted activity Physical frailty disease Age	60 (March 1998 to March 2003)	1) ADLs(4 items; bathing, dressing, walking inside the house, and transferring from a chair)	1) The HR for the development of disability were 1.35,95% CI (1.21-1.51) p<0.001 within prior of hospitalization and 5.54 (4.27-7.19) within a month of restricted activity. 2) Age per each 5 year associated with disability HR 1.44(1.32-1.57) 3) Physical frailty was development of Any Disability; HR 3.19 (2.62-3.89) p<0.001 4) disease was development of any disability: Congestive heart failure 2.33 (1.71-3.17) p<0.001, cognitive impairment 2.10 (1.63-2.71) p<0.001, Stroke 1.94 (1.45-2.60) p<0.001	1)analyses were limited to the first episodes of any disability, persistent disability, and disability with nursing home admission,	High
8.Women's Health and Aging Study I (USA)	Brenes Gretchen A., et al,2005	65 years or older	1,002	NR	Anxiety / No Anxiety	Anxiety	36(2003 – 2000)	1)ADLs(5 items; bathing, dressing, eating,transferring from bed to chair, and using the toilet) 2) IADLs(3 item; walking across a room, lifting ten pounds, and performing light housework)	1)Unadjusted models indicate that anxiety was associated with a greater risk of worsening disability: ADL disability HR 1.40, 95% CI 1.10–1.79 and mobility disability HR = 1.41, 95% CI 1.06–1.86	1)that the sample consists of disabled women 2)this study is that anxiety symptoms, rather than anxiety disorders, are assessed.	

Table 2 reports the research on risk factors for disability in the elderly (Cohort Study)

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
9.The Second Longitudinal Study of Aging (LSOA II). (USA)	McGuire Lisa C , Ford Earl S and Ajani Umed A,2006	70 years or older	559	NR	Disabled / Non-disabled	Cognitive functioning Diabetes	26 (1997 - May, and the second follow-up between June 1999 - August2000)	1)ADLs(6 items; bathing, dressing, eating, transferring, walking, and toileting) 2)IADL(6 items; preparing meals, grocery shopping, managing money, using the telephone, doing light/heavy housework, managing medications)	1)Participant had cognitive functioning becoming disabled ; AOR = 0.87, 95% CI 0.78–0.97 compared to those people who were disability free.	1) functional disability outcomes were assessed using respondent-reported, they may not reflect adaptations a person makes to successfully complete a task 2) unfortunately, medication adherence and depression were not assessed on the LSOA II, which can potentially impair cognition	
10.Melton Mowbray, Leicestershire, (UK)	Carol Jagger, Antony J. Arthur, Nicola A. Spiers, Michael Clarke,2001	75 years or older.	1,345	NR	Men/ Women	Sex Age	72(1991 – 1997)	1)ADLs(7 items; mobility around the home,getting to and from the toilet, transfer from chair, transfer from bed, feeding, dressing, and bathing)	1)Women had a higher risk of disability in bathing; RR=51.6, 95% CI 1.3–1.9, p<.001 and Toileting; RR= 1.7, 95% CI 1.2–2.5, p<.003 2) for all ADLs there was a significant increase in the risk of disability with increasing age.	1)the data from routine health assessments, the substantial variability in time between observation points	

Table 2 reports the research on risk factors for disability in the elderly (Cohort Study)

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
11.England and Wales(UK)	Spiers A Nicola, 2005	65 years or older	35 article, 7,913	27.2	Disabled / not Disabled	Disease Impairment	36(1998–2001)	1)IADLs(5 items : transfer to and from a chair, put on shoes and socks, prepare a hot meal, get around outside, and have a bath or an all-over wash)	1) disabled by disease: Parkinson's disease OR 3.7,95%CI 1.5-11.3 p<0.01; Stroke OR 2.5,1.8 – 3.6 p<0.001; Treated diabetes OR 1.7, 1.2-2.5 p<0.01; chronic airway obstruction OR 1.5,1.2-2.0 p<0.001;coronary hearth disease(angina and hearth attack) OR1.4,1.1-1.8 p<0.01; Arthritis OR1.3,1.0-1.6 p<0.01 2) disabled by impairment: MMSE score(0-21) OR 3.6,2.6-5.1 p<0.001; hearing problem OR 1.2, 0.9-1.5 ; eyesight problem OR 1.3, 1.0-1.7 p<0.05 3) disabled by current smoker OR 1.5, 1.2-1.9 p<0.01	1)There is evidence for self-report data on some diseases and conditions, but the uncertain validity of other self-reported diagnostic data suggests caution in interpretation. 2)The lack of an association between prevalent depression and onset of disability could be due to the Measure	High
12.The MRC Cognitive Function and Ageing Study;MRC-CFAS (UK)	Carol Jagger, et al ,2007	65–69 years old	689	3.0	New cohort / Old cohort	Arthritis Chronic airways obstruction Age	24 (between 1991 – 1992 and 1996 – 1997)	1) ADLs(5 items; transfer to and from a chair, put on shoes and socks, prepare a hot meal, get around outside, and have a bath) 2) IADLs(3 items; shopping , carrying heavy bags and heavy housework)	1) Risk factor of chronic conditions; arthritis OR : 1.46< 95% CI, 1.18 – 1.82 p<0.001 and chronic airways obstruction OR 1.36,1.04 - 1.78 p=0.02 2) Risk disability of physical limitation OR 1.34, 0.98 – 1.83, p=0.06	1) the majority of information on chronic conditions was self-report and therefore our findings,	

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NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
13.The Rotterdam Study, Rotterdam (Germany)	Umit Ta s, et al ,2007	55 years or older	4,258	27.5	Men / Women	Health conditions Age	72 (first wave 1990 - 1993; second wave 1994 - 1996; third wave 1997 - 1999)	1)ADLs(8 items; dressing and grooming, rising, reach, hygiene, eating, walking, grip and activity)	1) Risk factors of mild* and severe** disability for men by; self rated health (worse) OR 3.6,95%CI 1.5-8.7 p<0.01** ; BMI(30 or higher) 2.0, 1.1 3.4 p<0.05*; depression 2.4, 1.4-4.1 p<0.01**; stroke 4.6, 1.6-13.5 p<0.01**; ,Joint complaints 1.6, 1.2-2 p<0.01*; fall 1.7,1.0-2.9 p<0.05*; comorbidities 2.2,1.4-3.5 p<0.05**; a medication use 1.8,1.1-3.2 p<0.05** 2)For women by : self rated health (worse) 2.7, 1.2-5.8 p<0.05*; cognitive impairment 2.6, 1.3-5.0 p<0.01**; BMI(30 or higher) 2.8, 1.7-4.4 p<0.01**; osteoarthritis 1.6, 1.2-2.3p<0.01* and 1.5, 1.0-2.2 p<0.01**; Joint complaints 1.8, 1.2-2.6 p<0.01*; fall 1.7,1.0-2.9 p<0.05*; and medication use 2.2,1.3-2.9 p<0.01** and 1.6,1.2-2.1p<0.01* 3) Age associated with mild* and severe** disability in men and women	1) this study data on chronic conditions were based on self - reports. 2)A drawback of our study is the proportion of non-completers probably due to a longer follow-up period.	High

Table 2 reports the research on risk factors for disability in the elderly (Cohort Study)

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
14.The Kungsholmen project, Stockholm, (Sweden)	Marengoni A., Strauss von E., Rizzuto D., Winblad B., and Fratiglioni L.,2008	75 years or older	680	38.13	Disability / Without Disability	Chronic multi morbidity Functional decline	32(1987–2000)	1) ADLs(6 items; bathing, dressing, going to the toilet, transferring, continence and feeding)	1)The HR for functional decline increased from 1.5, 95% CI 0.6–3.7) in persons affected by one disease to 6.2 ,95% CI 2.5–15.2 in those with 4+ conditions. 2) having chronic multi morbidity and no disability showed risk of functional decline HR 3.3; 95% CI 1.5–7.4 and chronic multi morbidity and with disability risk HR 9.9; 95%CI 3.6 – 27.3	1)a potential limit of using the sum of diseases as ordinal scale without taking into account severity. 2)the diagnoses included definition of multimorbidity to those conditions with potential of severity	
15.in northern Taiwan.	Chung-Yi Li, Shwu Chong Wu, Shi Wu Wen	65 years or older	2,198	NR	Disability / free Disability	1)longest held occupation in a lifetime 2) social class indicated	60 (1993-1997)	1) ADLs (6 items: bathing; dressing;moving between bed and chair; using the toilet; eating; and walking inside the house)	1) had increased risks of subsequent ADL disability; workers in agriculture, animal husbandry, forestry, or fishing OR 1.9, 95% CI (1.1 to 3.5) p=0.04 and workers in craft and related trades OR 1.9, (1.1 to 3.4) p=0.04 2) social class in unskilled blue collar worker had increased risks of subsequent ADL disability OR 1.8 (1.1-2.8) p=0.01		

Table 2 reports the research on risk factors for disability in the elderly (Cohort Study)

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
16.the Established Populations for Epidemiologic Studies of the Elderly, EPESE, (USA)	Shelly L. Gray, Et al ,2006, pubmed	65 years or older	9,093	2.94%	Benzodiazepine user / nonusers	Benzodiazepine	72 (NA)	1) ADLs (6 items; bathing, eating, dressing, transferring from a bed to a chair, using the toilet, or walking across a small room).	1) benzodiazepine users were 1.23 times to develop ADL disability OR 1.28 (95% CI = 1.09–1.52). 2) Risk for ADL disability was greater with short- (HR = 1.58, 95% CI = 1.25–2.01) but not long-acting (HR = 1.11, 95% CI = 0.89–1.39) agents than for no use.	1) misclassification of benzodiazepine exposure may have occurred, these analyses may have underestimated the true risk , because long-term exposure included those who tolerated benzodiazepines	
17.Health and Retirement Study (HRS) (USA)	Dorothy D. Dunlop, Pamela Semanik, ,et al.2005	65 years or older	5,715	NR	Functional Limitation / Non Functional Limitation	Functional Limitation with arthritis	24(1998-2000)	1) IADLs (5 items; preparing hot meals, shopping for groceries, making telephone calls, taking medications, and managing money) 2) ADL(6 items; walking across a room, dressing, bathing, eating, using the toilet, and transferring from a bed)	1)Function declined Significantly; in women than men OR1.4 (CI=1.2,1.7); cognitive impairment OR 2.86 (1.71-4.78); depressive symptoms OR 1.27(1.05-1.55); DM OR 1.55(1.21-1.99); stroke OR1.56(1.06-2.30); vision poor OR 1.63 (1.20-2.20); lack of regular physical activity OR 1.94(1.54-2.44) age 85 or over OR 3.10(2.29-4.19)	1) secondary databases may affect the findings, it is unknown which may be consequences or causes of baseline functional problems 2) the physical activity assessment does not provide information on the types or levels of activities in which people engaged	

Table 2 reports the research on risk factors for disability in the elderly (Cohort Study)

NO./ Database/ Country	Sources	Age	Number	Loss follow up	Comparability Study/Control	Exposure or Intervention	Length of follow up	Outcome	Result	Limitation	Quality score
18.Health and Retirement Study (HRS) (USA)	Dorothy D. Dunlop, **et al, 2005**	54 – 65 ปี	6,871	7.19	Depression / not Depression	Depression	24(1996-1998)	1)ADLs (6 items; dress, toilet, bathe, eat, walk across a room, and transfer in and out of bed)	1)ADLs disability were 4.3 times greater for depressed adults than their non-depressed peers (95% confidence interval=3.07 - 6.0).	1)limitations common to secondary databases may affect the present findings. 2)Self-reported measurement of limitations in function and IADL disability may not be as sensitive as objective measures	High
19.The Jerusalem Longitudinal Study, Jerusalem (Israel)	Jochanan Stessman,et al, 2002 pubmed	70 – 77	605 และ 1021	32	Exercise / No exercise	Exercise	62 (1991 – 1998)	1)ADLs(4 items; bathing, dressing, toileting, and rise from chair) 2)IADL(4 items; cook, shop, clean home, laundry)	1)ADL tasks was independently related to exercise at age 70 for women OR 8.5, 95%CI (2.0–36.2) p=.0037 and for men OR 4.3, (1.1–17.1) p=.36 2) IADL tasks also correlated to exercise for men in this regression OR 3.7, (1.1–12.2) p=.0334 but not for women OR 2.0, (0.6–6.3) p=.229	1) Loss follow up in first stage	

Table 3 Risk factors analysis of onset disability in elderly peoples

Domain	Risk factor	Number of study (No. of database)	Disability(ADLs/IADLs/Mobility) ADLs RR or OR or HR(95%CI)	P value	IADLs RR or OR or HR(95%CI)	P value	ADLs + IADLs RR or OR or HR(95%CI)	P value	Strength of Evidence Quality	Quantity	Consistency
1.Chronic disease						P<0.001					
1.1 Cardiovarcular	Chronic hearth failure	1 (7)	HR 2.33 (1.71-3.17)	p<0.001							
	Coronary heart disease (angin and hearth attack)	1(11)			OR 1.4 (1.1-1.8)	p<0.01			High	Limited	Limited
1.2 Cerebrovascular	Stroke	4(2,7,11,13)	HR 1.94 (1.45-2.60)	p<0.001	OR 2.5 (1.8 – 3.6)	p<0.001			High	Limited	Limited
			OR 4.6 (1.6-13.5)*	p<0.01	HRR 1.46 (0.94-2.27)	p<0.05			High	High	Consistency
	HT	1(11)	OR 1.9 (1.0–3.8)**	p<0.05							
1.3 Metabolic	Diabetes	3(2,5,11)	OR 1.3 (1.0-1.6)	p<0.05							
			RR 1.57 (1.15-2.14)	p<0.01	OR 1.7 (1.2 – 2.5)	p<0.01			High	Limited	Limited
1.4 Musculoskeletal	Arthritis/Osteoarthritis	3(11,12,13)	OR 1.6 (1.2-2.2)***	p<0.01					High	High	Consistency
			ORI.5 (1.0-2.2)**	p<0.01	OR 1.3 (1.0-1.6)	p<0.01	OR 1.46 (1.18-1.82)	p<0.001	High	High	Consistency
	Joint pain	1(13)	OR 1.6 (1.2 – 2.2)****	p<0.01							
			OR 1.8 (1.2 – 2.6)**	p<0.01							
1.5 neurological	Parkinson disease	1(11)							High	Limited	Limited
	Cognitive impairment	4(6,7,9,13)	HR 2.10 (1.63-2.71)	p<0.001	OR 3.7(1.5-11.3)	p<0.01					
			HR 1.4 (0.9 – 2.1)	p<0.09					High	Limited	Limited
			OR 0.87 (0.78–0.97)						High	High	Consistency
1.6 Respiratory	Chronic airways Obstruction	2(11)	OR 2.6 (1.3 – 5.0)*	p<0.01							
					OR 1.5(1.2-2.0)	p<0.001	OR 1.36 (1.04-1.78)	p<0.02	High	Limited	Consistency
2. Multi morbidity	Co morbidity /	4(9,12,13,14)	OR 2.2 (1.4 – 3.5)***	p<0.01	HR 1.27 (1.17 – 1.25)		OR 1.4 (1.15 -1,71) P<0.006		High	High	Cosistency
	Chronic condition(4 disease)	6,13	HR 1.3 (1.2- 14)	p<0.001							
			HR 6.2 (2.5–15.2)						High	Moderate	Incon.
3. Medication	Use of medicine	2(13)	OR 1.8(1.1-3.2)	p<0.05							
			OR 2.0(1.2-2.1)	p<0.01							
	Benzodiazepine	16	OR 1.28 (1.09–1.52)						High	Limited	Limited
4. psycho impairment	Anxiety	1(8)							Limited	Limited	Consistency
	Dementia (MMSE score <21)	4(3,11,13)	HR 1.40 (1.10–1.79)	p<0.007							
			OR 2.4 (1.4 – 4.1) *	p<0.01	OR 3.6 (2.6-5.1)	p<0.001			Limited	Limited	Limited
			OR 1.7 (1.2 – 2.5)*8	p<0,01					High	High	Consistency
	Depression		OR 1.16 (1.13-1.19)	p<0.001							
5. fall	Fall	2(13)									
6. sensory impairment	eyesight problems	3(2,11,17)	OR 1.7 (1.0-2.9)***	p<0.05							
	Hearing problem	1(11)			OR 1.3(1.0-1.7)	p<0.05			High	Limited	Limited
					OR 1.2 (0.9-1.5)	p<0.05			High	high	Limited
									High	Limited	Limited

* Severe in men, ** Severe in women, ***Mild in women,****Mild in men, *****HRR in each activity such as walking, climbing, heavy housework, shopping, prepare meals, any task Rank form 2.05-2.50(1.64–3.21) p<0.05

Table 3 Risk factors analysis of onset disability in elderly peoples

Domain	Risk factor	Number of study (No. of database)	Disability(ADLs/IADLs/Mobility)						Strength of Evidence		
			ADLs		IADL		Mobility		Quality	Quantity	Consistency
			RR or OR or HR(95%CI)	P value	RR or OR or HR(95%CI)	P value	RR or OR or HR(95%CI)	P value			
7. function limitation	Physical frailty	2(6,7)	HR 3.19 (2.62-3.89)	p<0.001					High	high	Consistency
	Prior Hospitalization	1(7)	HR 1.5 (1.2 – 2.1)	p<0.001							
	Prior history of dis.	2(6,9)	HR 1.35 (1.21-1.51)	p<0.001					High	Limited	Limited
			HR 2.0(1.4-2.7)	p<0.001					Limited	Moderate	Consistency
	Restricted activity	4(6,7,12,17)	HR 5.54 (4.27-7.19)	p<0.001				p<0.01			
	NO Exercise	19	OR 8.5(2.0–36.2)	p=0.0037	OR 3.7(1.1–12.2)	p=0.0334			High	high	Consistency
8. risk behavior	Smoking	1(11)	OR 4.3(1.1–17.1)	p=0.36	OR 2.0(0.6–6.3)	p=0.229			limited	Limited	Incon.
	BMI(30 or higher)	2(4,13)			OR 1.5(1.2-1.9)	p<0.01					
			OR 2.0 (1.1 – 3.4)*	p<0.05					High	Limited	Limited
			OR 1.6 (1.1- 2.3)**	p<0.05					High	Moderate	Consistency
			OR 2.8(1.7-4.4)***	p<0.01							
9. Age	Age	4(6,7,10,13)	HR 2.57 (1.82 – 3.63)								
			OR 1.1 (1.1-1.1)*	p<0.01							
			OR 1.1 (1.1-1.1)**	p<0.01					High	High	Consistency
			HR 1.44 (1.32-1.57)	p<0.001							
			HR 1.1 (1.0-1.1)	p<0.001							
10. Socioeconomic	longest held occupation in a lifetime(Agriculture)	15	OR 1.9(1.1 - 3.5)	p=0.04							
	workers in craft and related trades		OR 1.9 (1.1- 3.4)	p=0.04					Limited	Limited	Limited
	social class indicated (Unskill)	15	OR 1.8 (1.1-2.8)	p=0.01							
	Gender	10	RR 51.6(1.3–1.9)*****	p<.001					Limited	Limited	Limited
			RR= 1.7(1.2–2.5)******	p<.003					Limited	Limited	Limited

*Mild in men, **Mild in women,***Severe in women,****bathing in women,*****Toileting in women